Hawaiian Volcano Observatory Record Book 1921

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U. S. DEPARTMENT OF AGRICULTURE

WEATHER BUREAU

DAILY JOURNAL OF THE

HAWAIIAN VOLCANO OBSERVATORY

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JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Date

ABBREVIATIONS

cam	camera
dist	distance
elev	elevation
ex	exposure
f/	F. system of stops
Graph	Graphic
Hal	Halemaumau
h.i.	height of instrument (5 feet if not specified)
hor	horizontal angle
H.V.O.	Hawaiian Volcano Observatory
I.P.	Ilford panchromatic plate
I.P.J.	I. P. Jaggar
lev	level reading
mon	monument
no	number
P	Premo
pl	plate
pt	point photographed or located
pres	pressure
R.H.F.	R. H. Finch
scr	screen
sta	station
sad	saddle (in ridge)
t	time
T.A.J.	T. A. Jaggar
W.P.	Wratten panchromatic
Woll	Wollensac
vert	vertical angle
Z.A.	Zeiss anastigmat

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date January 1,1921
Sunday " 2, "

January 1.
11 a.m. to 1 p.m. Circuit by E and N.

At 4 a.m. the E pond had overflowed for a distance of 150 feet to NNE, low place adjacent to N end of pond S of NNE station. Pond had built up its own slag heap 3 feet above rim level of pit.

All border ponds flowing away from wall and towards center. Central lake flowing S and SW. Scores of fountains in all pools. Occasional large perpetual or migratory central fountains. Very large fountains in N pot cove of central lake. Glow cracks at night in NE crag. NE crag higher. Fresh flows over N and S floors from the border pools. Cone 12 feet high S margin SW arm. Lava floor 4 feet below SW rim of pit, 20 feet below NE station, 30 feet below S saddle, covers upper N bench. All the lakes built up above adjoining floors. W central cone flinging up heavy blobs.

11:30 a.m. Overflows from the marginal ponds including more overflowing rim NNE slightly, and at noon the upper SW rift cone was flowing from a W-facing beehive opening, cone 10 feet high and 10 feet wide. Both cones enlarged, and flow in SW valley lengthened both E and W. Probably 1000 feet long.

End of SW arm nearly to under S saddle station by its eastward lengthening. E, W, SE and SW pools all have crusts with a bright zigzag edge on the wall sides, as though the liquid were welling up the wall-crack, and have rampart grottoes on the center side.

The fountaining has increased in size and number of fountains (many score) last two weeks and the situation resembles in many respects the rise of December 1919. The beginnings of overflowing the outer wall of pit resemble the 1919 flows so far as the SW rift cones are concerned, and the overflows from the N lake of 1919 were like the flows now breaking over the NNE rim. No sign of flows in Kau Desert, or of Mauna Loa activity.

New W point crag higher than S peak of W crag. Small filagree cone on floor under SE station.

T A J

January 2. From H. V. O.

Lakes lower. No fresh overflow NNE. W pond 3 or 4 feet below banks and fewer fountains. No fountains of E pond visible. Apparently a glowing chimney cone tip protruding above rim of pit at SE station -- opposite end of SE pool. Crag looks a little lower. Much smoke. Fume a strong purplish red in the afternoon sunshine.

T A J

4-6 p.m. Lakes somewhat lower. Outline of all lakes distinct. Banks from 4 to 10 feet high. Grottoes active in all lakes as well as some bubbling and central fountaining. Filagree patches with voluminous flames around bank of all lakes. The cone in the W crag intermittently active; hissing and ejecting lava 20 or 30 feet Flow from Red Solfatara continues, toes having reached bluff at W. Cones quiet.

R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Saturday Date January 1, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11a.m. to 1 p.m.		General view near NE station to overflow NNE	1		8x	f/16	1	Stereo Kodak
		E pond and NE crag	2		"	"	"	"
		W niche to W pond fountain	3			f/7	1/100	"
		W central cone from W niche	4		"	"	1/4	"
		same	5		"	f/11	"	"
		Upper rift cone spouting	6		"	"	1/2	"

T A J

4

1921, Jan 1

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Jag

1921, Jan. 1

4

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6

Tag

Day Monday Date January 3, 1921
Tuesday " 4, "

January 3.
10-11 a.m. SE pool 10-foot inner wall, E pond 4-foot wall, action of fountains same but bubble fountains smaller. Open hole over deep cupola in floor under SE station. Only 6-foot climb down to floor. Large grotto with chimney at S corner SE pool. Large grotto rampart SW bank E pond. Numerous fountains central and SW pools. No blowing heard from the two rift cones. Heat vibrations above the lower cone. Both cones very large heaps, 20 feet high.

Floors have sagged with upturned crusts against wall of pit. Floors and crags covered with much Pele's hair. Sharp flame cone at N pot site. Some ejections from W central cone still. Central lake has large grottoes and walls 10 or 15 feet high.

1:30 to 3 p.m. From Uwekahuna Bluff.

The lakes seen going down. E lake 15 feet below overflow point NE. W lake 10 or more feet down its cup. Pit smoky. No activity SW rift cones. Flows around SW heap to SE as well as NW. Latter against W wall and making a few toes. No activity Kau Desert.

Evening. Lakes less visible than before from a distance. W central cone still flinging and W pond fountaining abundantly.

T A J

January 4.
11-11:30 a.m. Streaming from N and S bank of SE arm to center where many bubble fountains were playing. Lake skins inflated the same as during last several days. A small cone outside SE arm near SE station ejecting lava occasionally. Floor slopes down to SE lake from the wall and the outer bank is from 3 to 6 feet above liquid. Banks of SE pool by S floor 10 to 12 feet high. Streaming to N in E lake, to long line of grottoes on W bank. Bubble fountaining vigorous in N end. Banks 3 to 9 feet high. (Lake rose 2 or 3 feet about 10:45 a.m.). Bubble fountaining in W pond and streaming from under crust along NW bank. B anks at NE and SW 2 to 3 feet above liquid. Inner spatter rampart 4 to 7 feet high. Bubble and large central fountains in main lake and SW arm. S sunken banks of SW arm 3 to 5 feet high. Lower outside cone making some noise and red hot at a top vent. Lava splashing inside.

R H F

2-3 p.m. With Burkland and Bailey. Rainy. Lakes very slightly higher. Same activity. Lava higher in SE cupola. Streaming from three directions to middle in SE pool. W pond now a large lake.

Flow increased in width against W wall of Kilauea.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Monday Date January 3,1921

t	sta	subject	no	pl	scr	stop	ex	cam
1:30p.m.		Uwekahuna Bluff to pit	1		8x	f/22	1	P
		Near lower Uwekanuna trig to new flow against wall	2		"	"	"	"
		Kilauea W station to pit(cloudy)	3		"	f/11	"	"
								T A J

1921, Jan. 3

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

SURVEY RECORD

Day Tuesday Date January 4, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10a.m.	NNE	N	0					
	N	NNE	0					
	NNE	Peak new NE crag	86 41	+7 53	0	486	+67	
	N	same	48 56	+5 49		644	+66	
	NNE	W peak new W crag	66 13	+0 39		875	+99	
	N	same	83 15	+0 35		808	+82	
	NNE	Lava E lake	110 42	-3 55		500	34	
	N	same	35 36?	-1 47?		795	25	
	NNE	Lava W lake	50 00	- 1 06		900	17	
	N	same	100 43	-1 44		704	21	
	N	Old W crag		+0 09				
								R H F

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Hawaiian Volcano Observatory

Day Wednesday Date January 5, 1921

8-9 a.m. Bubble fountaining in SE arm, diminished height much the same as on the 4th. Outer cone near wall less active. E lake higher, small new flow over sunken floor near S end of lake, streaming northward. E lake fell a foot or more while being observed. W pond about same height as on 4th and some lower than a few hours previous as a small flow on a low place in the floor to the NE was still very hot.

Cones around main lake hissing. Grottoes in S end of SW arm active. Glowing vent in lower Red Solfatara cone, more quiet than on the 4th. Flow moving observed on flat below this cone directly over crack line. The island in the main lake is further cracking up.

R H F

11 a.m. Uwekahuna. No trace of smoke in distance Kau Desert. Fresh small flow on rift below lower SW cone in Kilauea. Lakes high. Fountains same. Fume abundant in pit. Only pale blue veil at lower rift cone (source of present flow) where Red Solfatara fume was before.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date January 6, 1921

10 a.m. to 12 noon. Northeasterly rain.

Visited SW floor of Kilauea and found smooth glistening pahoehoe flowing vigorously from many toes and lobes about the eastern margin of a new heap formed in the valley between the SW heap and Halemaumau. This was crowned with a crusted pool fed from the rift cones, and cracking and foundering was seen in this pool. The lava had spread all around the E end of the SW heap of 1919 and Peter Lee's Pit appeared to be buried. The entire fill of new flows of 1921 occupied an area three-quarters of a mile long extending SE from the W corner of Kilauea crater. The flow from the cones was now in tunnels. E limit on line between K 3626 SW and Halemaumau.

Visited the marker at Kau Desert rift chasm and found no change, Signs of motion in cracks wholly lacking.

Halemaumau unchanged except for general diminution slightly in numbers and size of bubble fountains. The cupola E of SE pool built up by last night's activity into a dome. Less gas pressure in SE pool. E pond had a short sinking spell, down 2 feet, streaming at S end of pond eastward toward the wall-crack side during this spell. Streaming westward at N end of pond. A half hour later pond up again with westward streaming everywhere.

Hissing cone at N pot and at N end of NW trench cove. Lava of main lake not aplashing above these two coves.

Fountaining in W pond less vigorous. Recent overflows of W pond NE and of E pond S have been short and small. Crags quiet and Pele's hair accumulating. Closed horseshoe cone NE side of W pond. Sluggish fling at rare times from W central cone. Streaming E in W pond.

The situation appears to be an adjustment to flowing with diminished gas pressure, and the slight overflows of the lakes have been merely the process of attaining the right height and opening the rift vent enough to achieve an adjustment.

No new developments in W extension of the flow on Kilauea floor.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Friday Date January 7, 1921

4:30 to 7:30 p.m.

Lakes high and flow SW vigorous.

SE pool streaming from SE, from NW and from N, balloons of skin in center. Large grottoes at S and E cormers. Bank has caved E corner.

SW pool seen across end of SE pool from SE station high, with cone at SE end near S pressure ridge and dark skin on itd SW margin. Seen from W station this pool has a counter-clockwise whirl and many score fountains large and small, rapid streaming into it from central lake, and several large flaming domes and fissures at W corner. Crusts from which the local streaming in the lake departs, along SW margin, break away during subsidence spells.

Centeal lake streaming from N to SW, many fountains (50 or 60), large spatter accumulations about N arm, and a flaming cone beyond N arm on floor in direction of N end of E lake. NW arm of lake not splashing over, but a new pot beyond its end in N floor, spraying high and building a ring.

W pond streaming with scores of fountains to E bank, brimming level with rampart, balloon skins and flames, bright-edge crust along W margin as point of departure for current. Occasional break of large areas of this stiff crust from bank, these blocks float out and break up and founder along E bank. Sometimes during such breaks very large fountains at W bank. The W central cone S of W lake flings up melt and jets of flame occasionally. W crag remnants small rock points. Highest peaks are next lake, and the island in lake is also high.

E pond long, from just S of NNE station to beyond NE station. Grottoes along W margin, streaming rapid from S to N and against largest grottoes with overhang and drip stalactites on NW margin. At 5 p.m. lake high and overflows S end half way to SE pool -- perhaps due to sinking of bench magma there. Balloons, flames, and large central fountains. At 6 p.m this pond down. At 7 p.m up again.

NE crag mass dominates everything else, appears scaled off at its N end over N arm; extends all the way to SE pool; much uplift of the E pot region and the E central region into crags, and a cone seen there in the midst of flame and fume.

S crag still exists, but SW arm island appears to be gone.

NE and W stations still 25 feet above floor level, N trail 15 feet above floor, SE station 8 feet above floor, SW rim 5 feet above floor, also NNE lowest rim 4+ feet above E lake.

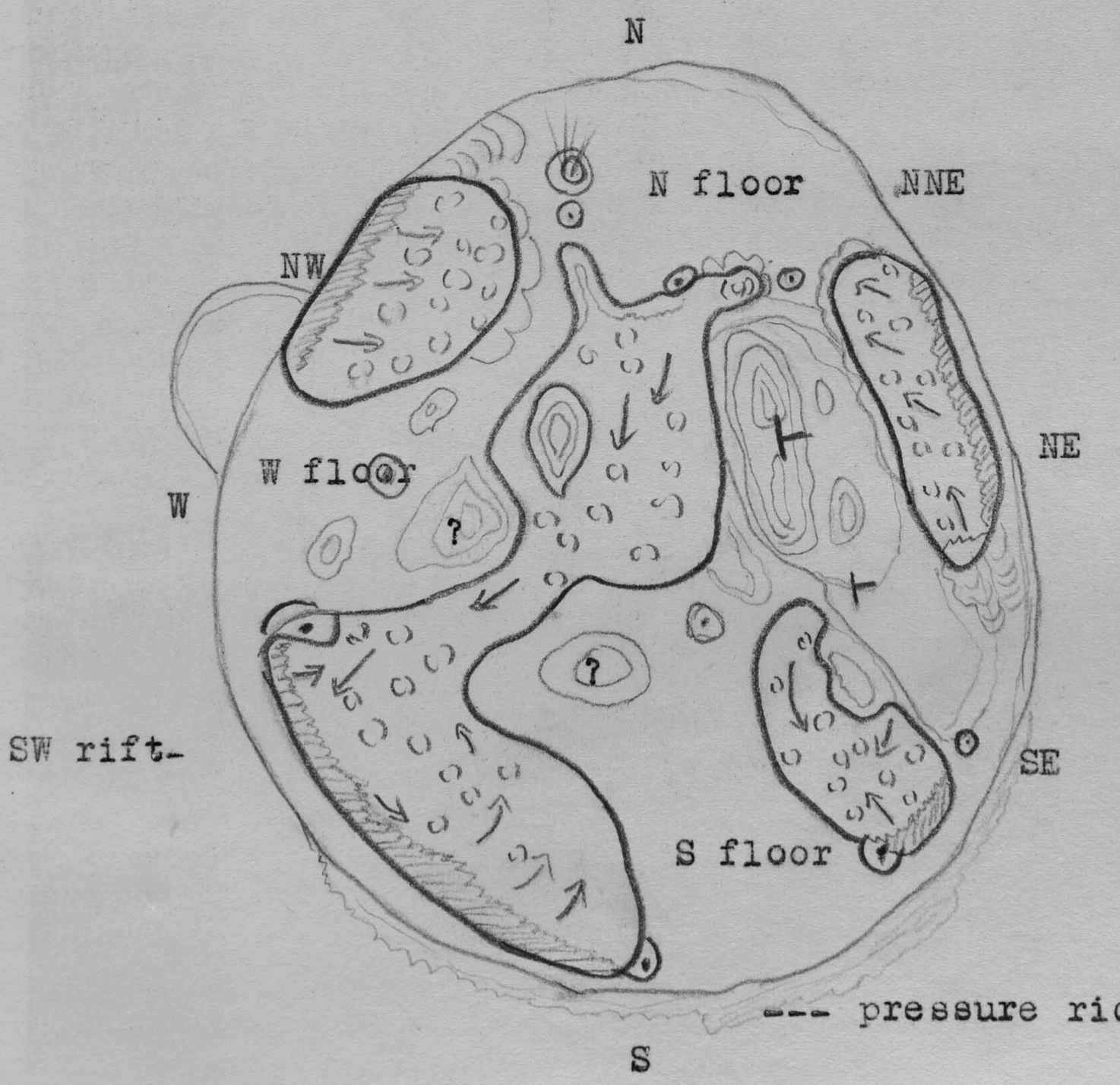
SW rift cones at 7 p.m.: - Upper one shows a low glowing oven opening on SW side leading to a shell cavern in a fresh flow about 1 to 2 feet deep, no running lava. Lower one alive, flame hole 2 feet across on top, cone 9 feet high, big stalactites of grape-bunch variety, glowing bright yellow, inside, fountain below inside. On SW side at base of cone, along the rify, a roof slab 4 feet across has fallen in making a window and revealing the torrent, pouring down the rift

under an arch, 2 to 3 feet high, of continuous heavy lava shells extending beyond to the SW. From the cupola inside, and off through the tunnel to the slag heap pool at the foot of the slope rushed a silent yellowish-white torrent, about 2 to 3 feet wide, and indefinitely deep here at the top, occupying the width of the rift itself, seen only at the window. Below, it doubtless widens out to occupy a big cavern. Estimated rate of flow here 15 miles an hour or more. Very smooth melt and very hot and steady flow, no marked bubbling. Must suck air along with it from the window.

Lava all about cones bulbous pahoehoe, red heat down cracks, not very hot. One or two feet of air space above the torrent in the cavern where the flow disappears.

The front of flow against W wall of Kilauea has migrated N several hundred feet towards Uwekahuna, over the 1894 aa, and live toes in abundance seen trickling there, making the flow sparkle with lights, both at edges and on top. Smooth gray pahoehoe. Considerable extension since yesterday, one quarter the way to Uwekahuna.

Sketch Halemaumau:-



T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date January 8, 1921

1:30 to 4 p.m. Streaming from under crust outer end of SE arm to center, this stream striking one side of a stream from the center produced a slow swirl. Floor to the S of E lake has subsided.

Glowing pot and glowing cone near N base of NE crag. A large section of rampart of main lake N of NE crag fell in and extended the main lake to the above mentioned pot.

W lake is banked up so that the liquid lava is a few (1 to 3) feet higher than the floor to the N and S. Main and W lakes appear to be essentially of the same height when viewed from the narrow isthmus separating them. The N crack leading from the main lake with the blowing cones alongside are filled with molten lava. Lava in crack crusted over. By 3:30 p.m. the E lake was bank full and higher than the floor to the N and S. Sinking was in progress in the floor between the E lake and SE arm and at times causing considerable vibration even on the rim. Part of the grotto at SE end of SE arm broke off and caused large waves. Central fountains playing in all lakes being very large at times in E lake.

Some indications of a tunnel along N end of NE crag between main and E lakes.

Observed melt dripping from a nearly closed grotto in SE arm. Purely fusion product as the drip was continuous while no splashing reached the stalactites.

E lake dropped 2 or 3 feet at 4 p.m.

Southern part of SW arm crusted over with heavy crust breaking off from time to time and going to the center of the arm where there were several fountains.

Flow toeing out near wall of Kilauea. Glow shows in top of cone.

R H F

Evening. The flow can be seen glowing against S part of Uwekahuna wall, from H.V.O. W pond fountains a sparkling line, some fountains E side show, bright glow on fume. After the rain, which has been heavy, the whole 1919 postal rift flow outlined by tails of steam.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

SURVEY RECORD

Day Saturday Date January 8, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
2 p.m.	NNE	Peak NE crag (69-13 = 56)	86 43	+8 04		486	69	
	N	same	48 50					
	NNE	Peak new W crag	66 05	+0 41		878	+10	
	N	same	83 21	+0 38	-02	809	+85	
	NNE	E lake	118 48	-2 17	?	356	14	
	N	same	26 46	-1 14		696	15	
	NNE	W lake	49 46	-0 54		910	14	
	N	same	101 20	-1 33		710	17	
	N	Main lake	66 34	-1 00				
								R H F

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date January 9, 1921
Monday " 10, "

January 9. Lakes very high. Big fountains and W central cone blowing and spraying in evening. Strong fluctuations in level thereafter during night.
Glow of flow seen base of Uwekahuna south.

January 10.
4:30 p.m. Crag by measurement slightly higher today.
Lakes now depressed 5 to 8 feet within their rims, fountains numerous but mostly small; streaming various.
Large glow cone E corner SE pool. Depression 8 feet deep with slumped floor crusts parallel with wall of pit 15 feet from wall extending from E pond most of the way to SE lake. This appears like the breakdown of the roof of a tunnel below. Cracks parallel to wall of pit between SE pool and wall, the bench there sloping towards pool. NW end of SE pool is extended nearly to central lake and the crag block N of pool appears increasingly broken down. The NE crag mass has a smoking valley between a newly slumped escarpment block on the central lake side and the higher mass farther NE. All of these changes in bench magma seem to indicate tilting of the crag blocks in progress.
From S saddle the SW arm seen to be much larger than SE arm with a long row of spatter heaps along its southern shore. Streaming mostly northward in the arm but not rapid and sometimes changing. Bubble fountains small.
All the lakes at this time show glow edges of recent subsidence and from H.V.O. during evening general appearance low.
At 5:30 p.m. inspection with field glass could detect no glow in flow front under Uwekahuna S. At 9 p.m. glow was apparent there in two places.
Examination at 5 p.m. of the area S of Halemaumau showed no evident live toes at the front near the Kilauea S trig station and little progress eastward of the flow as a whole. No fire could be seen in daylight distant view of the two rift cones.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date January 11, 1921.

2:30 to 3:30 p.m.

SW pool streaming to southern grottoes, large central fountains, bubble fountains not very numerous, no marked marginal skin at origin of streaming. Crack 2 feet wide and quite deep parallel to wall, back of SSW grottoes. Depression parallel to wall 15 feet from wall in S floor.

SE pool not connected through to central lake. Crack extending from SE pool in direction of old S crag site, as though block breaking down on N side. Cove of pool with fountain on N side where crack from E pot emerges. Immense open active half-dome 8 feet high S corner. Gas pressure smaller than of late.

E pond has freshly overflowed into the depression S of it, filling it. The streaming and fountaining were moderate with even-topped rampart on NW edge. Dish with curved rampart at N end confining the pond and standing 10 feet above N floor beyond; pond one or two feet below edge, has recently slightly overbrimmed edge all around. Same is true of the other marginal pools. Slight flow down NNE slope of dish towards N floor. Chasm open on wall side of pool in places, along wall crack.

Central lake sluggish, groups of fountains, streaming W. Blowing filagree glow holes in NW and NE marginal cones and along bank and in high talus NE corner of NE crag.

W pond streaming to E side with coarse bubble fountaining as usual. Another chasm observed between W pond and wall of pit, here 3 feet wide, with cascades of recent overflow into it.

Sag in N floor between site of former N shelves (buried) and the main lake. Fresh flow from W pond along this sag half way to E pond.

W central cone full of live lava level with top (8 or 10 feet high) but not spurting much.

Flow from rift cones making upwelling patches here and there over western area and only one or two such patches over eastern area. W area extends to under second monument S of Uwekahuna (Kilauea West) and all around the SW heap of 1919, to the base of the sand at valley Kilauea SW, and E to line joining Halamaumau with S trig station 3659'. The fill has levelled the top of new slag-heap opposite the cones to the height of old SW heap (1919).

Rift cone (lower) had new splashes about the orifice constricting and new crust over the torrent at window, but the torrent can be seen farther down the slope, in the cavern.

<u>Pipes at NE solfatara patch near hut</u>.

At 3 p.m. removed the three pipes which have been a month in the hot crack for testing. Copper, galvanized iron and black iron. All coated with oxides, black iron most eaten. Temperature of this crack lower than when pipes were inserted -- probably not over 100° C at the bottom. Heavy rains lately continuous. Crack covered with a pile of stones. Blue fume and much steam rising from the area. Pipes have been there since 5 p.m. December 13.

T A J

JOURNAL

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Hawaiian Volcano Observatory

Day Wednesday Date January 12, 1921
Thursday " 13, "

January 12.
8:30 to 9:30 a.m. Large grotto southern part of SW arm, otherwise southern part of this arm quiet. Small fountains in northern part of SW arm and in main lake. Lava about one foot below lower southeastern bank of SE arm. Streaming northward from under marginal crust in E lake whose lava was from 3 to 6 feet below bank. A closed grotto near northern end of E lake was hissing loudly. The cones along northern bank of main lake were making a little noise.

W pond nearly level with its bank and streaming from under crust along the wall side. Inflated skins very pronounced, with small fountains numerous.

Flow vigorous as seen through window near cone; also much flowing visible on floor.

The S floor near its point between SE arm and main lake is cracking up, making fracture block.

A flow from the northern end of the E lake had gone nearly three-quarters of the way across the N floor and joined with the flow from the W lake. Flow took place on January 11, judging from the temperature of the lava.

R H F

January 13. Rainy day. Morning and evening lakes low. As seen from H.V.O. only tops of the fountains show. Crag stationary. Some spurts from the W central cone.

Flow progressing toward Uwekahuna. Glow at night in flow. No marked changes.

T A J

JOURNAL

19

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Friday Date January 14, 1921
Saturday " 15, "
Sunday " 16, "

January 14.
3 p.m. With Dr. Sherzer of Ypsilanti, Michigan.

SW pool very large, slightly down, S ramparts caved away, moderate fountaining.

SE pool enlarged E corner to where outside glow cone had been. Streaming to center of pool from SE and NW.

E pool moderate fountaining, broken down rampart and overflow N end, rather low, 5 or 6-foot walls. Renewed sag in bench magma S end.

W pool rapid streaming from crust on W side and bubble fountaining as before.

SW flow making extensions NW. SW rift cones open window and slower flow to cavern SW from lower cone; fountain within; filagree openings and flames; chimney open on top. Upper cone blowing and flaming.

Prepared Bench Mark holes at Hut and Pele's Kitchen.

Found blue-green copper sulphate on N floor in hot crack.

January 15.
3 p.m. Visit stick marker at rift in desert and find no movement.

After rains the site of Postal Rift flow of 1919 and the SW heap of 1919 steaming abundantly, but the hot flow of 1921 not steaming much, too hot. Such flow only steams under deluges of rain.

Conditions same as yesterday. Lakes low in cups except W pond. Five to ten-foot banks around E pond. SE pool again an arm of central lake; streaming into arm and out to central lake from E pot region (E central vent?). Streaming to SW and to N in central lake. No fling seen from W central cone. Sags noted over upper and lower N shelf sites.

SW rift cones as before, feeding flow. Flow extended far up S sand valley, <u>up hill</u>, up the gulch in valley several hundred feet. Alive at E base of SW heap of 1919. Shark-skin lava and breached schollendomes in the new flow. Large schollendome ridges in the new heap. Flow tip on W side now under the first trig station next S of Uwekahuna, long tongue following base of wall. Live places in this direction. Flow in general slowing up.

At night lakes bright seen from Uwekahuna, flow dark.

January 16. Rainy, big NE storm. Glimpses of pit show lakes very low, fountains only rarely visible from H.V.O. when flung high.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date January 17, 1921
Tuesday " 18, "

January 17.
7 p.m. Lakes 5 to 15 feet down their cups, streaming changed, banks have fallen in. Flow from SW cone has stopped. A distinct lowering of the liquid lava.

SE arm enlarged by complete collapse of the large dome at S corner and new cove formed there with streaming into it. New long island 3 feet high nearly across entrance to arm, apparently a fault block dropped down from S end NE crag mass. Bright lines on lake, bubble fountains fewer, some travelling fountains. S cove lowest part of wall, 3 feet high; walls higher toward center of pit, 5 to 15 feet.

E pond has lowest wall at N end, 2 feet high, where rampart has collapsed; elsewhere 8 to 10 feet high. Streaming N to S and against SW side of pond, where there is a flaming crack back from the edge. Occasional large migratory fountains with lowering afterwards. Mostly moderate fountaining, fountains fewer than of late. Bright lines. Crust source of streaming along NE edge. Walls above pond vertical.

W pond enlarged at N end, N floor appears slumped. E and W walls of pond 8 to 10 feet high. Small fountaining, eastward streaming.

Central lake moderate fountaining, northward streaming. Glowing cones still at NE and NW arms but much of banks broken down. Large cavern high in W face of NE crag mass. Crag remains high.

SW lake streaming eastward.

W central cone flaming.

SW flow cone more open on top with small stalactites inside, noisy fountains low inside. Window shows frozen waves of orange glow and no flowing lava. Flow heap SW cracked with fresh glowing pudding of lava on top and several shell caverns glowing inside but no lava seen in motion.

January 18.
3 p.m. No essential changes. At N cove of main lake liquid 8 feet down. No glow seen in W central cone. Both W and E ponds have liquid flush with bank at N ends, elsewhere high banks; this due apparently to a slumping of N floor, which shows an E-W pressure ridge about where old shelves ended. Lakes 10 to 15-foot walls. No apparent change yet in NE crag. Sag in floor again S of E pond. Activity about the same with much ballooning of skins. N streaming in central lake. New island seen on W side of SW channel. Old island on W side of central lake was a high table standing 20 feet above lake.

SW rift window shows dark cherry red cavern, cones less bright. Some trickling of flow at extreme NW end under Uwekahuna.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date January 19, 1921

8 to 9 a.m. SW arm has extended to the E so that there is a bridge only about 20 feet wide separating this lake from the SE arm. A torrent poured under this bridge into the SE arm. Lakes about the same height as yesterday. Violent whirlwind in S floor near E central edge of SW arm. A little later this whirlwind moved to the W bank of this lake and was stationary for some time in the vicinity of the place where the Kau rift crack emerges in Halemaumau. The ejecta from a fountain at the base of the whirlwind together with large pieces of loose lava from the wall were carried up over 150 feet. The noise from the whirlwind and the greatly accelerated fountain was very loud. The whirlwind finally moved down the rift line with diminished intensity. Vortex fountains were observed four times in the W lake. The crust over the lake where the fountains would break out would sometimes go spinning through the air for a distance of 20 feet. The balloon skins from this pond would sometimes rise clear from the liquid, turn over and land 8 or 10 feet away. There was undoubtedly a voluminous escape of gas to make the above.

Cracking in the N floor, which is a little lower, has increased. Streaming in the E lake directed toward a concealed tunnel in the W side nearly opposite the southern remnant of the old NE crag. As the current disappeared it was moving nearly south.

Lava more noisy in the lower outer cone and apparently higher.

R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date January 20, 1921

3 p.m. From a distance (H.V.O.), the only fountains seen are in N extension of W pond. The glisten of NW extension of flow under Uwekahuna S appears as though still flowing.

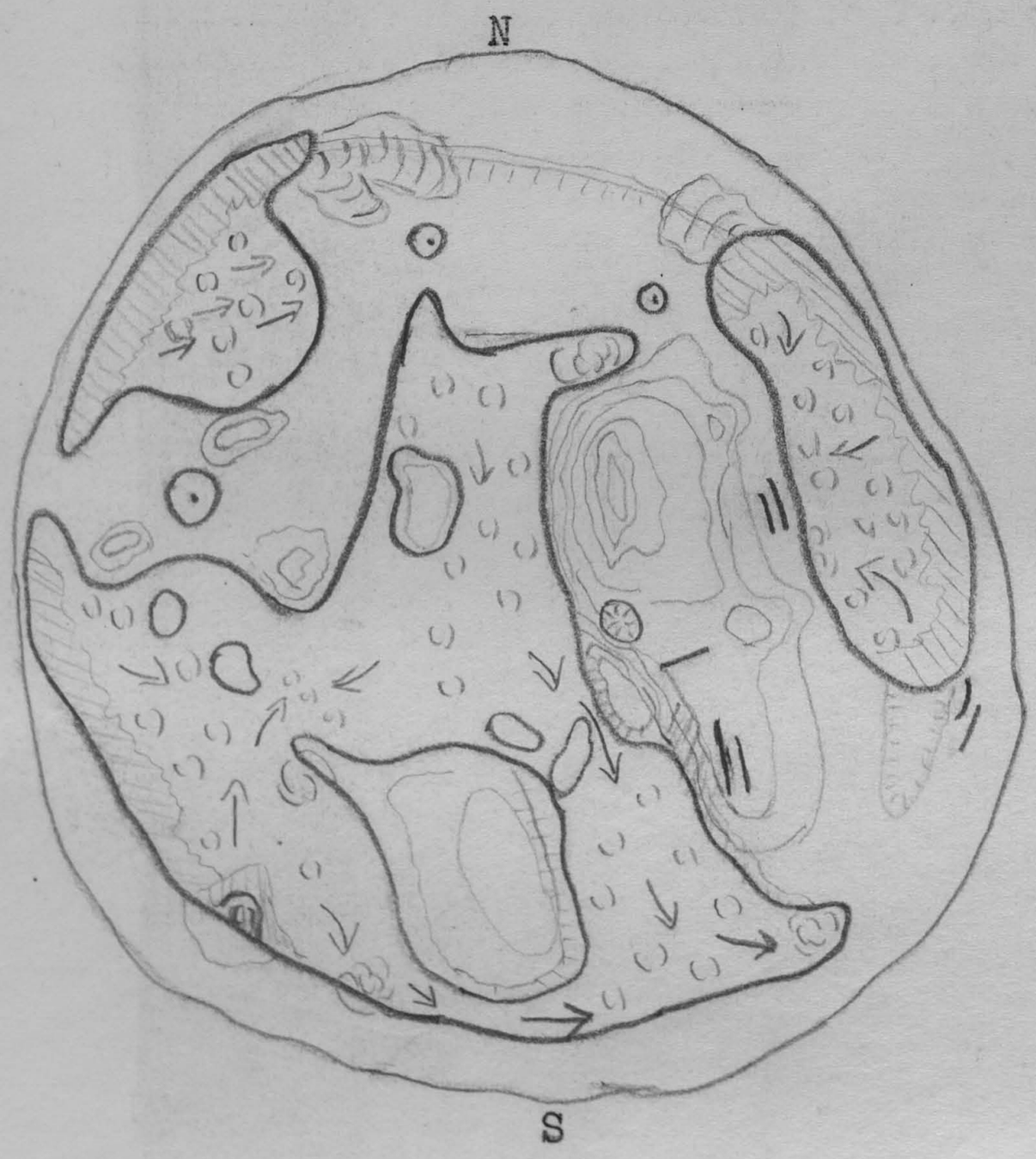
SW cones fountaining noisily inside; drip seen through small window and delicate stalactites above. The large window below lower cone and cavern retains hardly any glow. Much sulphur stain. Upper cone has opening at base showing another fountaining cupola below.

SW lake extended along wall crack breaks both N toward W pond and E toward SE arm, the last extending clear through so as to make a channel 12 feet wide with east flowing current 5 miles per hour. Streaming from a crust with a sluggish fountain in its midst, the same lying under a raised and abandoned half-dome SSW side. Streaming radial outward to E and to N. Hundreds of medium size fountains, sharp flings, grottoes SE and NE of pool, peculiar roaring hissing noise of a crisp variety. Fountaining generally increased in lakes. The crag block between SE and SW arms tilted down to SW, 5 feet above that pool, 15 feet above SE pool. Two islets in SW channel. Walls of SW pool 5 to 10 feet high.

SE arm abundantly fountaining; streaming into it mostly on E side of island at entrance, and also from SW arm. Grotto at E corner. Walls 5 to 20 feet high.

Climbed NE crag mass from SE owing to SE wind. Found crack with blowing cone inside about E pot locality. Depression S of summit and an inclined shaft or upturned tube. Flaming and hissing cracks SW of E pond.

E pond streaming from S and E and N to SW wall, very hot small fountains, crust on source sides. New short overflow N.



Central lake much small fountaining; cones N are decadent; large noisy grotto fountains; lake 10 feet down.

W pond small fountains abundant and streaming E. Small overflow NE. Pond extended S along wall crack to point under W station. No activity seen in W central cone.

General situation rising liquid and increase of gas pressure since flow stopped. Rising bench magma towards the south.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

JOURNAL

Day Friday Date January 21, 1931
Saturday " 22, "

January 21.

9 to 11 a.m. Bubble fountaining in SE arm. Streaming into SW arm, the curremt coming from main lake. Many small fountains in E lake, streaming directed to the tunnel in the SW bank. Several small fountains in W pond and a large grotto opposite the W crag cone.

Later only a few fountains in the W pond and SW arm. Slight streaming from SW arm into main lake where there were a few central fountains.

Noise from both Red Solfatara cones. Splashing lava could be heard in lower cone.

R H F

6 p.m. Lakes a little lower. Streaming irregular through channel from SE arm to SW arm. Large crust over S part of SW arm. E lake (and other lakes) 10 to 15 feet down. Rapid streaming to grotto SW side of E lake. Much <u>blistering</u> in the slopped lava thrown over N bank of E lake. NW cone of NW arm main lake shore glowing still and place in talus glowing N end NE crag. N floor sagging. No flowing seen in SW flow. Much steam from all flows (7 inches rain last night).

T A J

January 22.

10 to 11 a.m. Lakes a little lower again. Streaming SE lake to SW lake. Usual abundant fountaining. Slop over bank SE lake seen to swell up with a 3-inch bubble while cherry red; apparently gas still escaping from solution. NE bank of E pond fell in, made big wave and violent fountaining, and lake sank two feet. Showed 3 feet of overhang W side. SW side, under the flame chasm which extends through bench above, at point of convergence of all surface streaming of E lake, the current passes under a grotto curtain of stalactites into a void over an edge, cascading to a lower level beyond. Arch over cascade 3 feet high; width of cascade 5 feet. Torrent inside going in direction of E pot, appears to be a broken chasm way rather than a rounded tunnel. White fume above.

Much fume today from several such places, especially cracks NE and NW from N cove. A notable grotto on SE side of W pond. Sag in curve from W pond to E pond across N floor marking margin of inner Halemaumau.

Lake banks 3 to 20 feet high. Looks as though both bench magma and lake magma were slowly sinking.

The overhang W side E pond a curtain of splash beneath where the rampart was built above during the higher level, and there appears to be a space behind the curtain, for at night there are flame holes in rampart above. This curtain <u>is</u> the overhang.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

SURVEY RECORD

Day Friday Date January 21, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9a.m.	NNE	Peak NE crag		+8 25		486	72	
								R H F

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date January 23, 1921

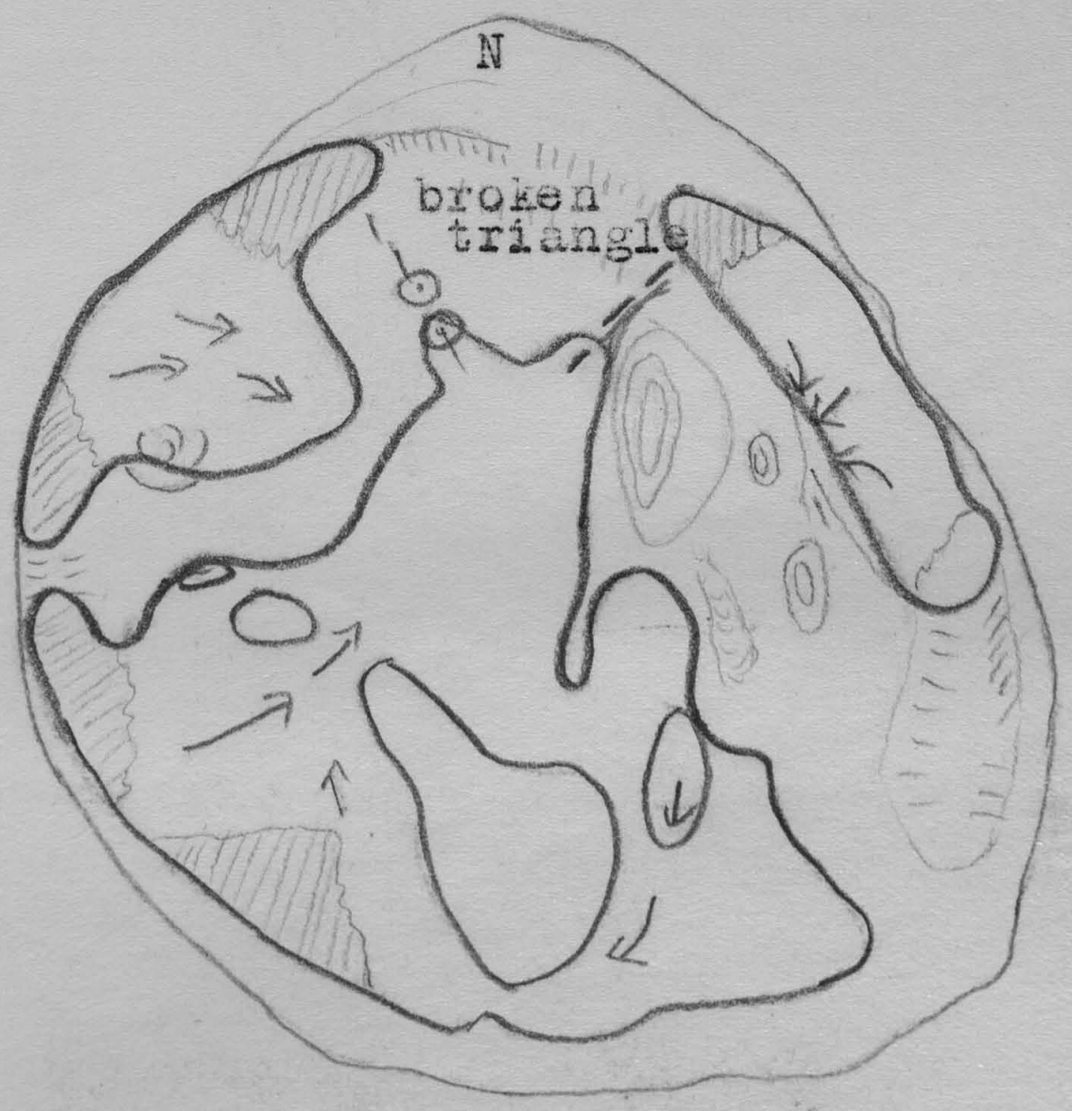
10:15 a.m. Lava continues to lower slowly, walls around pools 10 to 25 feet high; island in entrance to SE pool appears to have moved SE; bubble and other fountains moderate; occasional very large explosive fountains break out, spraying up 50 feet in E pond. Rush to chasm grotto SW side of E pond continues, cascade inside to lower level, smoke and flame crack above.

Both E and W pond banks have sagged down at N ends along with subsidence of bench magma. E pond bank at S ens also, making a valley with fault cliff on E side. At N end of W pond, the bank continues into a short fault cliff over the sag of N floor. This sag in curve from E pond to W pond, west pond crusted lava encroaching upon the sag in fresh toes. N ends of both W and E ponds crusted, streaming from the crusts to W bank in E pond and to E bank in W pond. W pond walls 10 to 15 feet high.

Cracks extending and smoking through the NE and NW coves and cones of main lake, so as to make a symmetrical triangular block of the N floor bounded by the sag and the two cracks, the two cracks headed for the N ends respectively of the W and E ponds.

The grotto SE side of W pond appears to lead through a tunnel to W central cone. The bridge between the two wall crack extensions of W pond and SW arm is only 15 feet wide and sagging down; the two pools have nearly joined.

Central lake fountaining moderately with scores of bubblings and some high flings. Crusts break away at marginal bright lines of E and W ponds occasionally and slide across the pools to break up.



Lake reflections bright at night on the fume cloud.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

SURVEY RECORD

Day Sunday Date January 23, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10:15a	NNE	N	0					
	N	NW	0					
	NNE	NE end W pond	31 30	-4 03	0	480	-35	
	N	same	37 24					
	NNE	NW wall at W pond level	35 19	-2 17	0	812	-32	
	N	same	4 07					
	NNE	Point W side E pond	115 37	-5 27	0	352	-34	
	N	same	90 37ca					
	NNE	N end E pond (bank 3 feet above pond)	107 28	11 27	0	138	-28	
	N	same	103 35ca					
	NNE	Summit NE crag	86 39	+8 10	0	482	+69	
	N	same	69 43					
	NNE	Summit central lake island	70 42	+0 38	0	760	+9	
	N	same	43 55					

T A J

PHOTOGRAPH RECORD

27

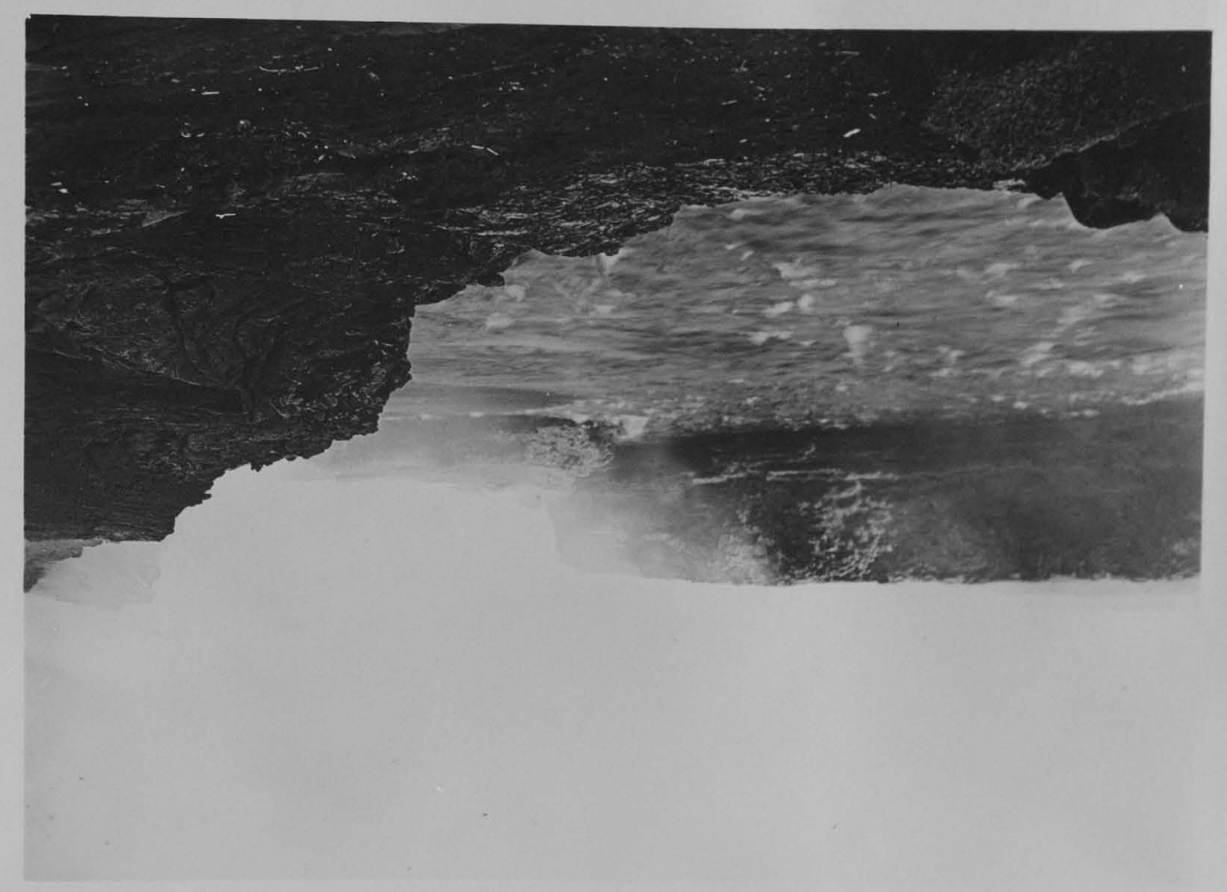
U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Sunday Date January 23, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
10:15a	SE	S channel	1	W P	8x	f/22	1	P
	Back of SE	Island in SE arm	2	"	"	"	"	"
	"	NE crag	3	"	"	"	"	"
	E edge	E pond	4	"	"	"	"	"
	10' N of N	W pond	5	"	"	"	"	"

T A J

1921, Jan. 23



JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date January 24, 1921

11:30 a.m. Halemaumau. From Uwekahuna, lakes low, deep walls E and W ponds, much fountaining. Natural arch at NW cove of central lake where the cone on N floor has collapsed and left an arched chasm on lake side. (Arch fell during afternoon.) Crags lowering. Note long low peninsula extending from NE crag SW into central lake.

SW rift cone brightly glowing. Lakes bright at night.

T A J

9-10 p.m. Many bubble fountains in SE arm. Intermittent current from this arm into SW arm. Streaming northward in E lake part of current going to tunnel in SW bank. At 10 p.m. the streaming was from both ends of the lake into this tunnel. Streaming from wall towards center in W pond. Crack through crust patches in this lake were flaming. Large central fountains at all times in the main lake and occasionally in the other lakes. SW arm for the most part quiet. Some of the fountains in main lake were arranged along a N-S line. The Red Solfatara cones showed sheets of flame. The flames from the lower cone were issuing from five separate vents. Lava was splashing out of one of the vents.

R H F

Mauna Iki.

11:30 a.m. Rumor of activity in Kau Desert led us to inspection from Uwekahuna. Hazy view, steam alomg rift and on Mauna Iki from heavy recent rains, no blue smoke, nothing new.

Afternoon. Went to Halfway House and to Mauna Iki from there, following foot of Keamuku Flow, then across the aa of the "cirque" breakdown of 1920, the same greatly flooded over its upper part by newer pahoehoe. Crossed top of Mauna Iki. Some steaming with hundreds of tails of white vapor, warm moist air, like the SW heap in Kilauea. No activity.

Went to the old Dome Hill on E side which had been just below the E side breach which gave vent to the aa flow of January, 1920. Entire source amphitheatre of that flow buried under later pahoehoe, which forms a river channel of collapse with 10-foot walls for several hundred yards N of the Dome Hill. Just below and to the E the aa stream appears. The upper eastern part of Mauna Iki a confused field of pahoehoe and same aa extending far to the E.

Crossed the terrace of Mauna Iki just opposite and below the Dome Hill on W side (Dome Hill buried all but one small scarp under pahoehoe) and found collapsed circular summit lake and two cones at N end of same, coarse semi-aa spatter, large dome cone, burst open showing red layers, smaller cone with gas mouth which I collected.

Found no trace of blue smoke or gas pressure anywhere. Vapor on pahoehoe heaps, not on aa flow. Vapor from summit of dune slag-heap and from the two rift cracks above. No sign of any flowing since August, 1920.

T A J

PHOTOGRAPH RECORD

30 U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date January 24, 1921

t	sta	subject	no	pl	scr	stop	ex	cam	
		Upper flow heap Kau Desert, from near the middle. Looking up mountain to N end of heap showing hundreds of steam jets	1	film				Kodak	
		Narrow collapse line at upper end of the large lava river of 1919-1920. Lower E side of the slag heap looking up the stream-way.	2	"				"	
								R H F	

1921, Jan. 24

1

2

RHJ

3 to 5 p.m. Lakes continue to lower; crag measurement at H.V.O. shows three feet lowering.

SE pool 15 to 40-foot banks, shoal at wall side of inner cliff S channel. Streaming from E and W in that channel with meeting and lines of fountains, abundant medium bubble fountains, streaming past island southeastward at entrance to SE arm. Highest wall on NE crag side, next highest SW side, lowest at S channel (leading to SW pool).

E lake greatly enlarged by collapse at each end leaving vertical fresh walls showing horizontal stratification. Debris probably near surface at S end, for the pool is there crusted, and at N end it is both crusted and shows fallen blocks which do not sink, resting presumably on a submerged talus. Middle region streaming as before to a focus at SW chasm where it cascades into the chasm and under the NE crag mass. Chasm entrance narrowed by spatter. Fountains greatly decreased in number. N end of lake enlarged beyond the depression in floor leading towards W pond.

Central lake region, seen from NNE, shows 40-foot walls around lake. NE chasm more enlarged and crack from it extending through to E lake; there is another chasm, trending NE athwart middle of NE crag mass, which has enlarged. Bubbling fountains seen in central lake, and SW islands still there, and large island appears tipped westward. Large chasm 20 feet wide extending NW from central lake towards N end of W pond, occupyinh area of recent cove and cone and natural arch. Curved sag in N floor more pronounced.

W pond streaming from W as usual but fountaining greatly reduced, and sag in direction of NW chasm receiving toes from W pond.

W central cone collapsing and splitting open, red natural arch there, crack extends thence to SE side of W pond.

Partition arch separating W pond from SW bay appears to be still in place.

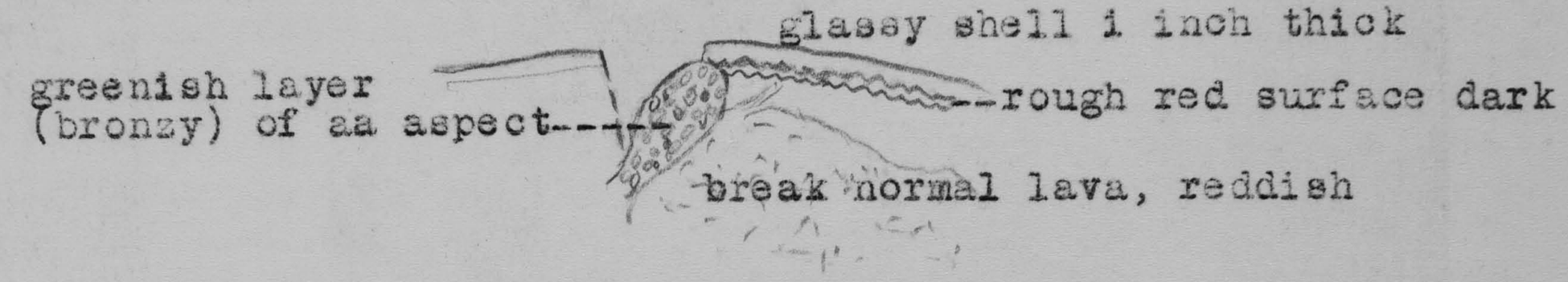
SW flow cone still has open holes showing stalactites and large cupola with fountains plashing inside, occasional glowing droplets flung out.

SW flow not moving. Examined extreme NW front of flow and found the last sheets and toes which had moved forward were extremely glassy and blistered, and lay under a part of wall somewhat S of the trig station next S of Uwekahuna. Lava hot but has not been flowing for several days. Last positive flowing was about January 20, and on that day there was seven inches rain, mostly at night, when minimum temperature was 55°. The blistered toes show gladsy lava a half inch layer on top, glass thinning to zero under bottom of toe, and many of the blisters have swollen up and burst under gas pressure, and then the floor of the blister has again swollen slightly, giving in one or two cases distinct double blisters, one within the other.

The suggestion is that the heavy fall of cold rain made more vitreous by quick congelation the surfaces actually

flowing and incandescent, and at places least exposed to quick solidification the vesicles merged together to blow bubbles on the surface, the localized release of pressure at such places causing the final escape of gases from solution locally. The localization of a blister is something of a problem, and why blisters are most abundant on glassy lava.

Section of lava at a rupture:-



Glassy portion highly iridescent.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date January 27, 1921

8:30 to 10 a.m. Part of the new shelf under the pressure ridge and over the narrows between SE and SW arms has scaled off. Island in the entrance to SE arm 5 or 6 feet above liquid. Streaming from center through SE arm thence to SW arm. Streaming southward in E lake, part of current going into tunnel over a ledge which is in line with bank of lake, and part going down against the bank opposite the N end of NE crag. Close to the latter sinking place some 10 feet from the SW bank is a small island with a grotto at its southern end. This lake rose a foot while under observation. The E lake has further extended northward so that the N end is beyond the lowest part of the valley leading to the W pond. A crack filled with debris connects the main and E lakes. Streaming NW in main lake (from SW arm). Small island in channel between main and SW lake 5 or 6 feet high. Streaming out from the wall in W pond and from W side of SW lake. There is a depression in the W crag adjacent to the place of the collapsed tall cone.

The valley between W pond and SW arm is but 3 or 4 feet above the liquid. Banks of lakes from 6 to 35 or 40 feet high.

Deep rumblings of splashing lava in cones outside indicating liquid at lower depth though the windows are as bright as ever.

R H F

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date January 28, 1921

11 a.m. SE pool no lower, outer bracket of recent lake margin material broken away and fallen under S saddle station, broken back to old wall. Debris makes a shoal below, above level of liquid in channel. Entrance to SE pool on central lake side blocked with fallen material in addition to island which was there. All of this material large blocks of the S cliff of NE crag mass. Cliff was 30 feet above liquid, the blocks have gone down 25 feet leaving 5 feet or less emergent, showing that the lake in SE channel region was not more than 25 feet deep. These blocks do not sink farther, showing that their density is less than or equal to the lake bottom material.

Streaming to S channel from the NW to SE and a current from the W in the S channel meets the other. Moderate fountaining. NE crag looks much broken at its S end. The sag valley between E pond and SE pool more broken and smoking at SE pool end.

Seen from the bench at SE end of SE pool, the SW pool mostly crusted, with a low islet E of where old island was, pool very large, 20-foot walls, slow streaming and large bright lines. Block between SW pool and W pool narrow and sunken, but still in place. Streaming from central lake into SW pool, meets the slow currents from the shores of pool. Grotto fountains along NE side of SW pool.

W pond enlarged N; streaming E; SE cliffs covered with Pele's hair; 20-foot cliffs; numerous bubble fountains, of continuous golden pattern along edge of western dark crust.

W central cone broken down; much smoke about low W crag remnants and about western shores of SW pool.

Central lake numerous fountains; streaming N; island lower; much broken bench matter W side. E-W pressure ridge along the sag valley in N floor between E and W lakes, due to the coming together of N and S slopes of valley, formerly arched, now slumped.

E lake little changed; island of debris resting on lake bottom opposite the crack leading to NE chasm of main lake.

Flow cones SW both with flaming windows, stalactites inside and deep fountaining wells inside. Could see into the well of the lower cone, orange heat inside, well 25 feet across, circular, marginal spatter levels, lava at least 40 feet down, occasional fling seen against wall, fountain rumble.

SW heap of 1919 making vapor jets; almost none on 1921 flow. Front of 1921 flow at S end against sand valley no so glassy as NW end, but still light colored and dense, and not very hot.

Marker at crack in desert shows no motion whatever. Abundant vapor from all the big cracks of 1919. Excessive rain lately.

With Dr. Sherzer studied the ash of SE wall of Kilauea, the limu of desert, the bomb pits and the algae.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Friday Date January 28, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11a.m.	E shelter	E pond	1		8x	f/16	1	P
	NE cliff	E pond cascade chasm	2		"	"	"	"
	"	Debris fall resting on bottom of E pond. Crack leading to central lake	3		"	"	"	"
	Hump S of NNE sta.	Pressure ridge bet. E and W ponds	4		"	"	"	"

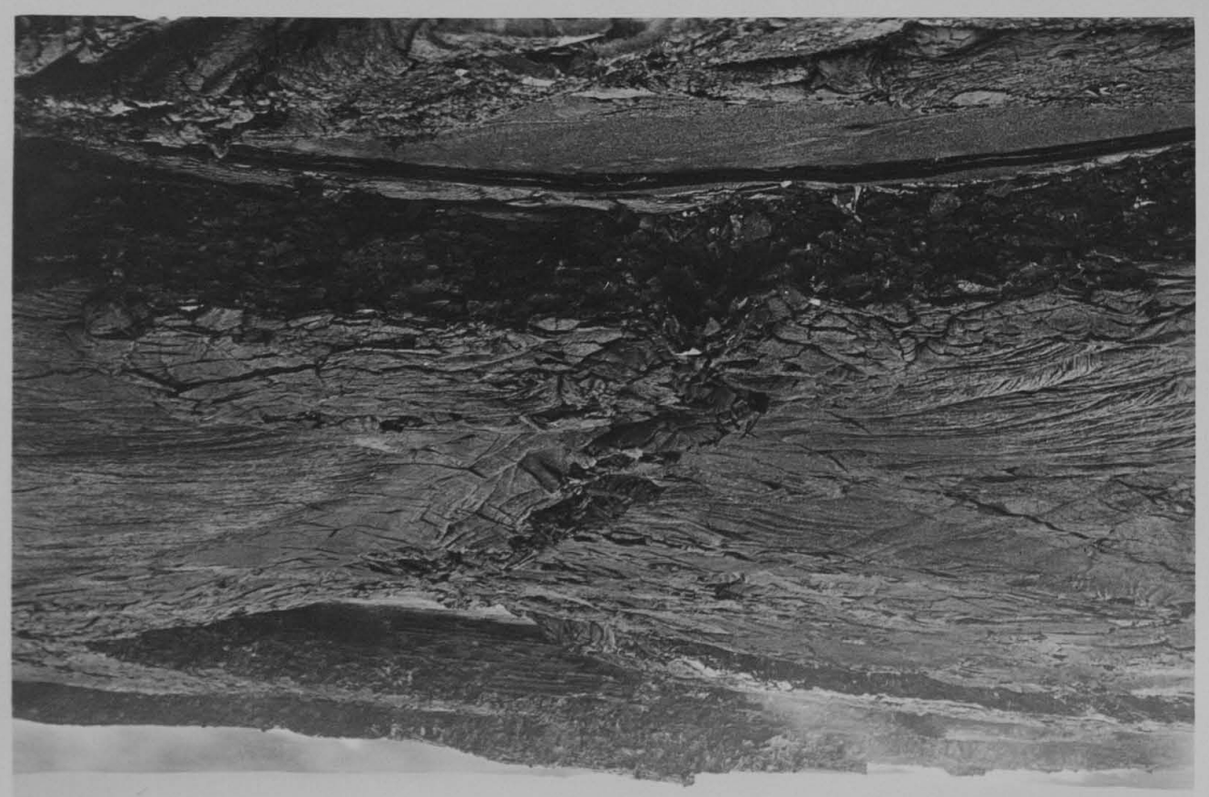
T A J

1921, Jan. 28

137

2

3



4

1

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date January 29, 1921

3-5 p.m. Lakes appear still lower and marginal sag in bench magma more pronounced between E and SE pools. Dense masses of fume rising above cascade chasm of E pond. Walls of lake 30 to 40 feet high. Crag shows little change by long-range measurement. Light SE wind so that view of SW lake was obtained.

In S channel under S saddle station fountaining pools in crust.

SW lake streaming out from W and SW dark crusts, ten to twelve large and many small fountains in SW and central lakes. W crag mass has a long point towards SW channel, and cove next SW of same. Streaming part of the time out of central lake past island in SW channel; other streaming into cove NE side SW lake. This lake large, with a flat islet in crusted E central part. Curtain grottoes W and NE. Not joined to W pond. Valley between full of debris.

Central lake much bubbling; island entirely gone; W crag mass wide, much irregular crag matter SE.

W pond unchanged. A sluggish streaming toward NW chasm of main lake in N cove of W pond. This cove extends into a pronounced valley between here and E lake, with anticlinal pressure ridge along its bottom.

E pond has 15 to 40-foot walls. Island on NW side nearly covered. Occasional break-ups at N end. Torrent and cascade larger into SW chasm. Glow in talus NE end NE crag mass.

Collected numerous blisters in spatter splashes along rim of E lake on E side.

SW rift cones continue to glow and fountains rumbling far down inner pits. Pink, green and yellow soluble salts on crack in new flow over rift zone.

Experiments. Prepared and took to hut $\frac{1}{4}$-inch pipes and a terminal $\frac{1}{2}$-inch pipe, iron, the latter 8 feet long with sixteen $\frac{1}{4}$-inch holes filed into its sides 6 inches apart. End capped and reducer to connect with 100 feet or more $\frac{1}{4}$-inch pipe. Terminal pipe galvanized; $\frac{1}{4}$-inch pipes black. Also took glass bottle and rubber cork and bucket.

Plan to immerse perforated terminal in lake and collect gas under water at other end of system, by natural pressure or pumping.

Conditions today not right for experiment.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date January 31, 1921.

9:30-11 a.m. SW pool 40-foot walls, slight development of new spatter margin. Streaming to SW through channel from central pool and to NE into S crag chasm. Latter now an open crack. Streaming E in S channel. Heavy crust E part of pool, afterwards broke up. The cove on W side SW channel destroyed by a toppling over of W point crag against the crag next SW, shutting off the inner part of the cove as a live pond in the jumbled W crag mass. This mass has broken down along a fault face passing ENE-WSW through the breached W central cone remnant, with down-throw on the S. Bubble fountaining in two areas E and W sides of open part of SW pool. Streaming to NE in the pool from dark crusts W and S meets the streaming SW from central lake without any commotion, the current merely bending to W bank. W pond as before. E pond shows same cascade and slight spatter rim. SE lake streaming from NW end. Island in SW channel of central lake smaller. Ponds and NE crag look a little higher.

SW rift cones both rumbling and glowing. Ground around them steaming from heavy rain and making some sulphuric acid and much decomposition along cracks.

Note. A remarkable thing about the lower cone is that with fountains below, orange heated interior, five flaming orifices 6 inches to 3 feet in diameter, with slowly dripping beautifully formed large stalactites inside (see photos), and shaft 20 feet across, fountains 40, more or less, feet down, the gas rising is transparent as water, dancing with the heat and "boiling" the air, but does not condense in the slightest degree. All about are the small jets of visible vapor through cracks, and in spite of the dense volumes which this rift made at the time of the red solfatara and up to the moment when the lava flowed out, there is no visible vapor column over the vents of the cones although there is a large chamber below.

If we compare this with the dense masses of hot vapor now rising above the cascade chasm, of the E pond, also containing fountaining lava and flaming gas, the contrast is marked. (Compare photograph of a few days ago). The cascade chasm is destructive and probably attacking the rock: the cone pit is constructive and lined with its own glaze. Probably both give access to air. What is the difference of the gases?

T A J

40

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Monday Date January 31,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
	(NW station 8 feet back in line SE station.)							
10a.m.	NW	W	0					
	W	N	0					
	W	Lava W lake NE point	R 10 02	-6 53	+03	514	62.6	
	NW	same	L 95 52					3 ft.
	W	Summit NE crag	R 43 57	+3 24	+03	765	46	
	NW	same	L 86 51					
								R H F

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date January 31,1921

t	sta	subject	no	pl	scr	stop	ex	cam
11a.m.	W of S saddle	SW station	1		8x	f/16	2	Stereo Kodak
	"	SW channel	2		"	"	"	"
	"	S "	3		"	"	"	"
		Near view lower rift cone looking SSW	4			f/7	1/50	"
		Near view stalactite window lower cone	5		8x	f/16	2	"
	N of NW sta	N floor sag	6		"	"	"	"

T A J

1921, Jan. 31

1

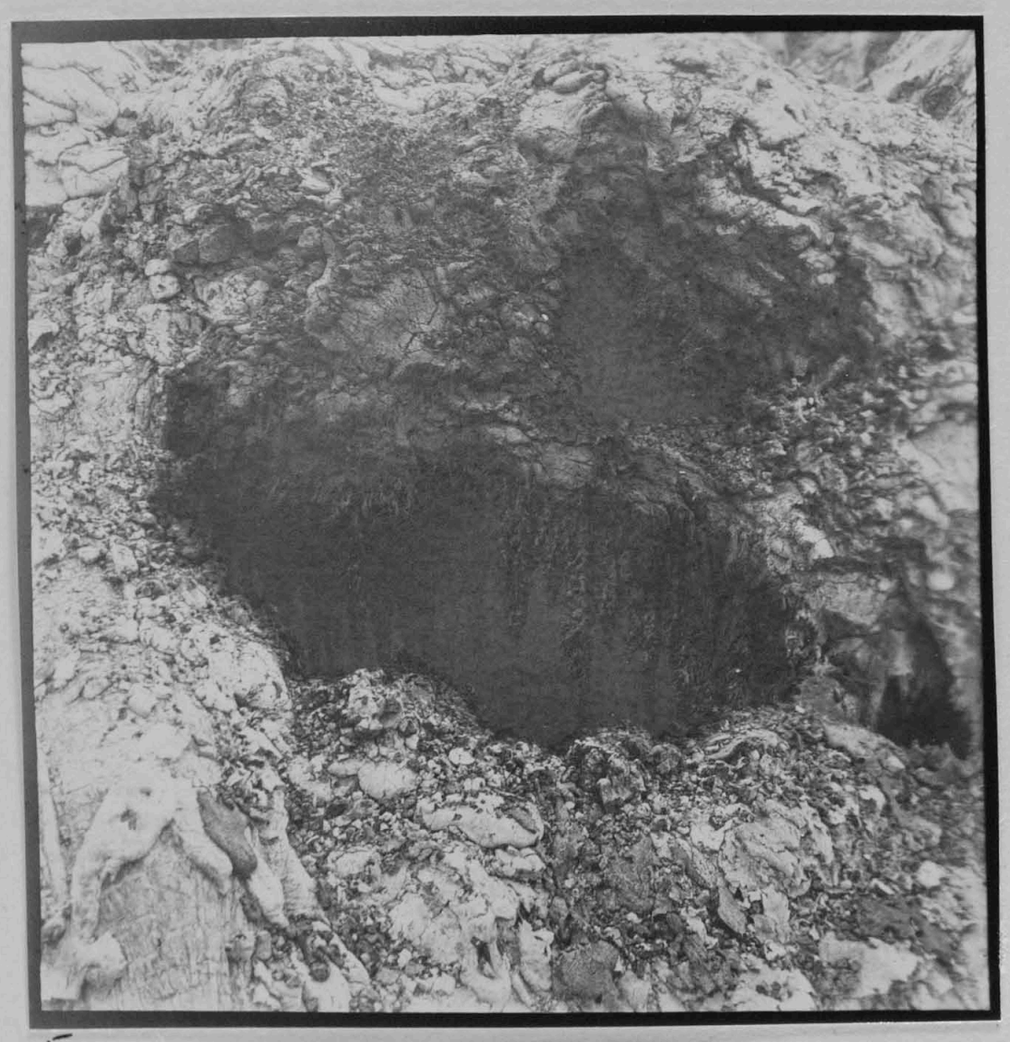
2

3

Tag

1921, Jan. 31

4



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JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date February 1, 1931
 Wednesday " 2, "

February 1. Crag rising and fume thinner.

February 2.

10-11 a.m. Lakes higher, crag higher, more fountains and ballooning skins, inner cliff 10 to 30 feet. Island in E end SW pool submerged, new islet formed in W central part SW pool. Rapids pouring SW in SW channel, meeting outward streaming from margins SW pool, streaming into chasm in S crag mass (S chasm) from SW pool. Streaming E in S channel. Blowing cone forming W end SW pool. Central lake fountaining vigorously and streaming N from a skin just N of SW channel. Streaming thus appears to be various from several centers. Noises of high gas pressure, puff and plash, and new spatter grottoes forming.

Cascade still pouring from E pond to chasm and making a fume column. Fountaining in SW cones higher, about 25 feet down, and the transparent fume rising, some of which is the blue gas.

In evening the spray from fountains in central and W pools again visible from H.V.O.

2 p.m. Experiment I. (See preparation January 29).

Returned to pit with Finch, Suga and I.P.J. and was helped also by A. Lancaster. Took pipe outfit to lower SW cone, screwed together 80 feet and thrust terminal in small SW window in cone and immersed it so that terminal upper joint was at least 10 feet below boiling fluid, which swept it southwestward. The other end of pipe was connected by rubber tube to glass tube and end placed under water in bucket. Bubbles slowly came through for ten minutes but the perforated terminal did not admit any gas under pressure. After the first ten minutes, for another ten minutes, collected slow bubbles over water in a bottle, hardly more than the air in pipe would account for. The system did not get hot outside the window.

The pipe hanging inside the cupola swung like a wet rope and shifted below and became swollen and mottled, bright orange glow. At no time was there any sign that the opening of the pipe released a pressure sending a gas stream through the pipe.

After 15 or 20 minutes the bubbling entirely stopped amd the observers at the cone window reported that the pipe had fused off below.

The pipe was withdrawn and about 20 feet of what was in the cone was recovered. It was covered with a vesicular, magnetic, blue gray scale showing castellate subcrystalline structure, apparently some form of magnetic oxide of iron. The color is much like the coating on the wormy type of cavern stalactites.

The gas in the bottle was not inflammable and appeared to be only the air expelled from the pipe, about $\frac{1}{4}$ litre. Not preserved.

Experiment II.

The end was again placed hanging in the summit orifice of the cone, 20 feet down vertically inside, without touching the liquid lava, and no gas came through to the end immersed in water.

Immediately on withdrawing red hot pipe from the cone, a smouldering flame was noticed about the end. On blowing through the far end a jet of flame was produced.

This was tried again, immersing 10 feet in cone and on withdrawing pipe and blowing through it slowly a spear of orange flame came out, dying away to a red flame.

This appears due to the reaction $3\ Fe + 4\ H_2O = Fe_3O_4 + 4\ H_2 + q$, calories. This reaction (Preuner, see Von Wolff p. 116) takes place on falling temeprature and gives maximum results (86%, $H_2O : H_2$) at 1150° C.

This is the flame effect observed with Horace Johnson in May 1917 in blowing through the upper end of a perforated pipe after immersing it in lava. It is clearly not the gas of the lava, as the vesiculation of the scale on the pipe shows a gas evolved by reaction with the pipe.

Experiment III.

A cloth was burned on the end of pipe in the transparent gas above the cone and in other orifices hereabouts, but no nucleation effects were observed.

In the evening the weather was calm and the fume from pit very thin and brown by transmitted light, going up straight and condensing to shreds and then to billows of vapor 2000+ feet up. The next morning a similar cloud showed a sharply defined bottom without shreds, and at an elevation and form like other cumuli in the vicinity but higher and with more rapid boiling up, and harder outlines.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Wednesday Date February 2,1921

t	sta	subject	no	pl	scr	stop	ex	cam
10-11 a.m.	W of S saddle	Center	1		K1	f/22	½	Cirkut
	SW	"	2		"	"	"	"
		Wind SW.						

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Thursday Date February 3, 1921

3 p.m. Experiments to determine temperature at SW rift lower cone. Seger cone fragments made into a cocoon in black iron wire gauze inserted in capped end of ½-inch galvanized iron pipe.

Battery of each:

1110 degrees
1150 "
1190 "
1230 "
1290 "

Experiment I. Temperature 6 inches within window on NW side of cone. 4 minutes exposure. Wind NE. Cocoon loose inside cap, 2 feet of pipe exposed to flame. Tip just within orifice. Pipe laid obliquely along a narrow orifice. Iron cap and thread covered with gray oxide, remainder white oxide of zinc (yellow while hot). The zinc gave yellow-green flame. (1290° nearest to cap.) Temperature about 1200° C.

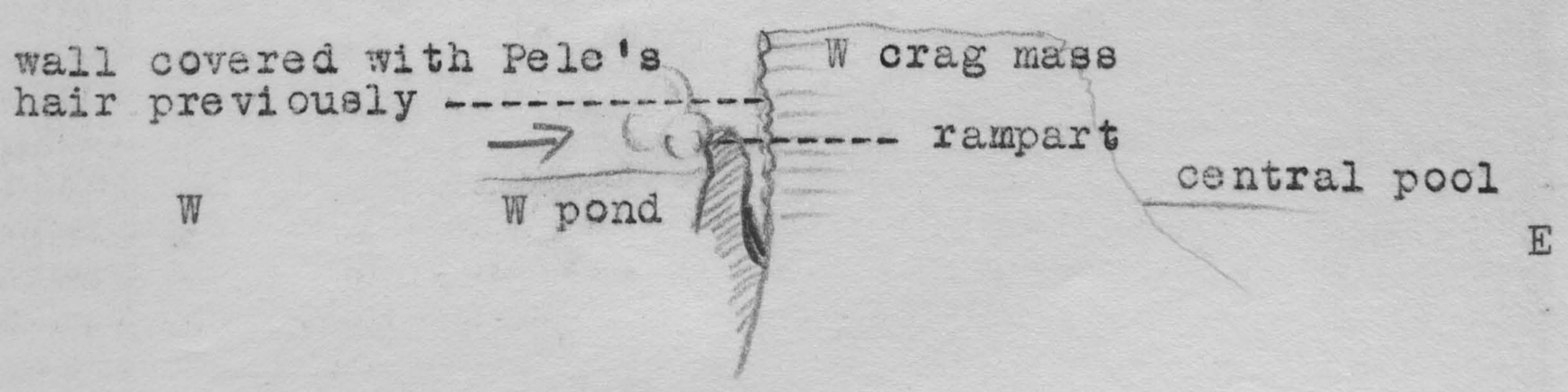
4:40 p.m. Experiment II. 4 minutes inside. 4 meters of pipe inside inclined at an angle of about 70° with lower end of pipe on a ledge about 3 feet above liquid and subject to splashing, especially when first put in. Lava on pipe when cooled snappeed off with something like Prince Rupert drop effect. Temperature about 1100° C.

Temperature hence higher at window. And neither 1100° or 1200° is nearly sufficient to fuse pipe. Hence the dripping on pipes and wasting away due to acid attack and not to fusion. Color bright orange seen in daylight

5 p.m. Circuit of pit to W and N. Rising strong.

SW pool as before, torrent from central pool and streaming various in SW pool; W central cone locality again spurting; dark crust with outward streaming around W and S shores; walls 20 feet high; balloon skins.

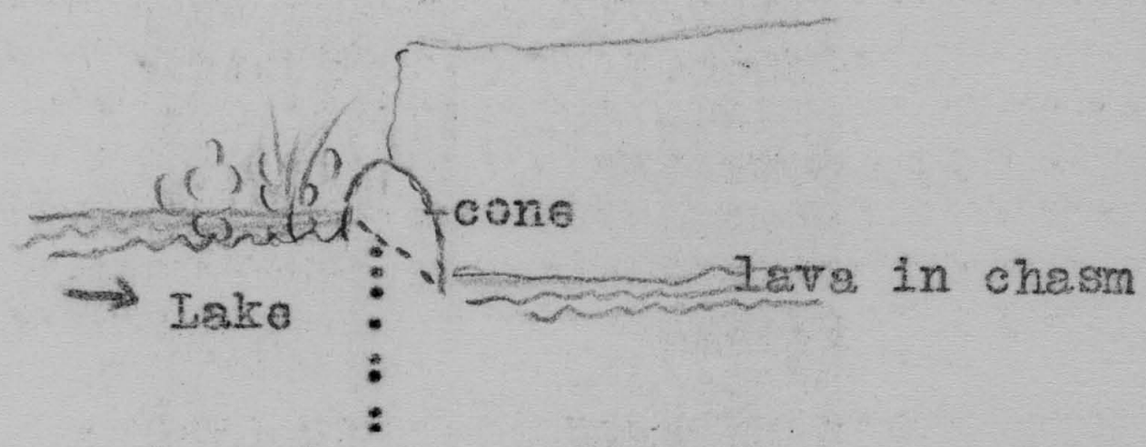
W pond 10 to 20-foot walls; increased ballooning and fountaining; liquid crusted at S end and connected through to SW pool; at N end liquid follows N floor sag valley half-way to E pond and toes there making out from both E and W ponds. Rampart built at SE edge pf W pond under the cliff there and leaving a crevasse between the rampart and the cliff, a very curious arrangement, thus:



Main lake fountaining abundantly and connected through to SE arm, with one or two islands SW and E of center. NE crag rising. NW chasm from main lake at lower level than W pond and making new spurting cone, and floored with a new crusted pudding. NE chasm toward E pond has a cone at edge of lake with a 2-foot open pot splashing.

E pond streaming northward and to cascade locality. Entrance to cascade blocked by a cone, and spurts of lava shot out of chasm behind the cone, the chasm with lava in it appearing to be deeper than the lake surface and still to hold lava at a lower level. This arrangement, like the rampart chasm SE side of W pond, appears to be defying the laws of gravity.

Chasm section:-



E pond walls 20 feet high.

SE pool receiving strong torrent from SW pool through S channel. This current meets the usual streaming from NW in the SE central region of the pool. Walls about 20 feet high.

Fume from pit thinner, calm weather lets it rise in a long stem and condense high up (2000 feet ±) with shreds of vapor first and large cumulus above.

General condition a pronounced recovery both in the SW cones and in the lakes and bench magma, the lakes gaining on the inner cliffs.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date February 5, 1921.

4:00 p.m. Lakes all higher and crags higher. Lakes building spatter ramparts. W and SW pools abundant small fountains, larger quiet spaces center and east and more marginal grottoes. Inner pool margins 5 to 15 feet high. West central cone agaln spurting in occasional spasms. Rampart along W wall of E pond. Smoke from cascade chasm and from crag areas. Island larger and higher in SW pool, about same place as December island.

Fountains central and west visible from H.V.O. Fume thin.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

 Day Sunday Date February 6, 1921.

3:00 p.m. Lakes with 5 to 10-foot walls. Crags rising. Abundant bubble fountains and large fountains; grottoes, blowing spiracles and divergent currents. Balloons in skin. Fume thin.

SW pool has island 3 feet high, island lower than yesterday. Cones building at W end, current out of central pool, rapid stream flowing east through S channel.

All the lakes show contraction of area due to spatter heap margins developing, where dark flat crusts edged with bright lines were before. This is the process whereby, in a lake like the E pond, the shores begin to build inward. They were previously enlarged by collapse and submerged talus. Over this submerged talus a dark skin appeared. With the rising this becomes a spatter edge and the under-lake profile must thicken the crust downward, though the rising lake retains a strong overhang supported by the gas pressure and the liquid. The great increase in fountaining and open streaming incandescent areas, concentrates the radiation to smaller areas, where the loss of heat is much more rapid than in the larger areas more protected by crust. More gas is visibly escaping, the "turn-over" is more rapid, the accumulation of epimagma is more rapid, possibly fountain temperatures are higher: under such conditions do the lakes deepen or become shallower? If deeper, this accounts for the ingrowing shores, as the energy supply is limited.

At the south side of south channel large spatter heaps developing: here there was inward fall of the whole marginal bench redently. The island in SW bay grew where the currents from NE and W encircled a quiet area; built up the bottom?

SW rift cones. Lava splashing out, only 10 to 15 feet down. One large orifice at SW base of upper cone, several holes as before in lower cone. Noted that the stalactites in upper hole of lower cone showed feather pattern suggesting the "dendrolith" of 1920 aa flow.

West lake covered with fountains; streaming from W dark crust to S and E.

East lake covered with fountains; streaming S and W.

Strongly hissing spiracles W end SW lake, N end W lake; NW end of NW chasm from main lake, on outlook slope of rising NW escarpment, is a spire shaped like a peacock (see figure on next page) 9 feet high, hissing loudly, flaming and glowing at tip; hissing spiracles NE chasm; and at chasm entrance of former cascade locality SW side of E lake.

E and W lakes making dribbling overflows on N floor from the N ends where the streaming is southward from crusts which are continuous with plateau-like extensions. Edges of pools here indefinite slag heap slopes. The streaming is away from the overflows.

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Sunday Date February 6, 1921

The peacock gas mouth E of W pond. Looking south.

T A J

Forenoon. Viscosity test of lava inside lower SW cone. Screwed cylinder of 3-inch inside measurement, on 1-inch pipe, and thrust same in lava, submerged hole of cylinder one meter. Hole 1½ inch diameter, circular, and in middle of end of cap on cylinder. Lava 3 feet below orifice of cone, swirling and incandescent.

First test. Attached wire inside, extended through the handle pipe (20 feet long), to cap held within hole by outside strip of steel supposed to soften by heat and allow a pull on the wire to pull the cap inward after submergence of apparatus. This test failed because the wire when heated parted and the cap remained in place.

Second test. Removed the cap entirely and thrust cylinder with open hole into lava. Allowed the cylinder to remain submerged 4 minutes.

On withdrawal lava had penetrated cylinder one-third its length, end of lava inside a round pahoehoe "toe", densest lava at narrow orifice of entrance. Finch notes herewith gives measurements. Lava stuck to iron very tight.

Note. This experiment would have been better if cylinder heated to redness before immersion.

T A J

Data of experiment:

Lava that entered 1½ inch hole leading into a 3-inch galvanized iron pipe submerged 1 meter in liquid lava in the cone over the Kau rift crack; exposed 4 minutes.

	lb.	oz.
1. Material near toe	1	2.5
2. Next to toe	0	12.0
3. Next to orifice	0	7.5
4. At orifice	0	10.0
5. Miscellaneous powered material	0	5.5
6. Loss	0	1.0
	3	6.5

Volume of lava that entered tube -- 72.4 cu.in. or 1169 cu. cm.
Dimensions -- 10¼ in. long by 3 in. diameter.
Weight -- 3 lb. 6.5 oz. or 1656 gm.
Relative density -- 1.4

Estimated viscosity:

Approximate equation for coefficient of viscosity --

$$v = \frac{\pi \rho r^4}{8 K}$$

Where v -- volume entered in 1 second
ρ -- pressure difference
r -- radius of orifice
K -- coefficient of viscosity

$$\frac{1169}{240} = \frac{104\pi \times 13}{8K}$$

Whence $K = 109$

H_2O = .018 at 0.0° C.
Glycerine = 8.3 at 20° C

Assumptions:
Lava entered tube uniformly during the four minutes; orifice was 1 meter below surface during experiment; density and volume are correct; that the equation for capillary tubes will hold for the 1½ inch orifice in a liquid such as the lava; that the factor 1 (length) may be disregarded.

R H F

4:30-6:30 p.m.

SW lake same, several flaming cones in W crag mass area.
W lake has circular cove of bright concentric parting skins N end, bombardment of E cliffs which are 10 feet high.
Peacock cone quiet, tip changed in shape.
Fresh flows from E and W ponds on N floor not quite meeting.
Central lake seen from N edge, various streaming, abundant fountains and balloons.
E lake rapid streaming S, many marginal fountains, banks built in NW, E and S, bombarding cliff W, hundreds of central fountains, very hot, glow above crack at cascade locality.
SE lake receives river from S channel. New spatter banks, large cone with lifting lid E corner, later blew open the lid. Flames.
Flames everywhere, pale bluish. Immense ballooning skins. Several crag peaks and pinnacles S end of NE crag summit.
Crags rising rapidly.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date February 8, 1921

10 a.m. NW escarpment crag has risen 7 feet or more. Lakes rising rapidly. E pond only 2 to 3 feet below NE overflow rim of December.

11 a.m. W pond overflowing N, and SE pool overflowing its new ramparts SE. W and E ponds have long slag heap slopes which nearly meet on N floor. Hot fountaining, balloons, cones, spatter margins. Rims 5 to 10 feet.

SW rift cones spattering out and the lower one has built on W side a new cone of driblets and filaments with a short flow from it into the tunnel window SW. Flows about cone, only a month old, discolored with fresh white, pink, yellow and orange salts, some tasting of alum. Lava rising in cone seals windows.

Lakes rising continuously, almost no sinking spells, high pressure, roar of many fountains and blowing orifices. High flinging fountains. Long coves of central lake in NW and NE chasms. Small pots out in N extensions of E and W ponds. SW pool 1 or 2 feet below SW ledge.

West and central pools in view from Observatory in morning, and in the evening E pond also came into view , with the central cone spouting.

About 6 p.m. the lower SW rift cone burst open and vented a flow which covered several acres on top of the December flow. Seen as a brilliant display from Uwekahuna, just as on the first night of the Christmas flow.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date February 8, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10 a.m.	SE	S saddle	0					
	Hal. S	same	0	+3 33	+03			
	(Roberts)							
		(Hal. S, ground level, 3708.7 feet above sea-level)						
	N	NW	0					
	Hal. S	Base upper rift cone	L 65 56	-0 11	+03			
	" "	" lower " "	L 76 56	-0 34	+03	1214	-7	
		(Ground elevation 3705.7 feet)						
	" "	S summit NE crag	L 6 54	+4 40	+03			
	SE	same	R 86 27	+7 19	+03	591	+75	
	N	same	L 64 48	+6 02	0	763	+81	
	Hal. S	E limit 1921 flow	L 137 43	-2 08	+03			
	NNE	N	0					
	N	NW	0					
	SE	Tangent older bank SE pool.....	L 7 46					
	"	" inner middle bank SE pool.....	R 4 11					
	"	Tangent rampart S channel (older bank ends here going W)..	L 0 23					
	"	S end S plateau	R 12 17					
	"	N " " "	R 66 01					
	"	E corner SE pool (30 feet away).....	R 45 20					
	"	N peak NE crag	R 96 27					
	NNE	same	L 87 04	+9 50	0	472	82	
	N	same	L 70 55					
	SE	Tangent W side E pond	R116 53					
	"	" SE end " "	R134 18					
	"	" upper floor against pressure ridge S.....	L 24 26					
	"	Tangent upper floor against E rim	R147 25					
	NNE	N end E pond	L102 35	-3 23	0	230	-13	
	N	same	L 94 37					
	N	NW	0					
	NNE	Summit N floor triangle	L 69 55	+0 55	0	432	+05	
	N	same	L 65 15					
	NNE	Summit new NW crag	L 60 33	+4 23	0	504	+38	
	N	same	L 53 40					
	NNE	NE corner central lake	L 86 03	-2 08	0	337	-13	
	N	same	L 80 13					
	NNE	NE corner W lake	L 33 20	-1 48	0	476	-15	
	N	same	L 38 57					

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Tuesday Date February 8,1921

t	sta	subject	no	pl	scr	stop	ex	cam
10a.m.	SE	Balloons SE pool	1	W P	8x	f/8	1/5	5x7
	NNE	Looking SW; NE and new N crag, peacock cone, E pond overflow in foreground	2	"	"	f/22	1	"
	N	W pond and NW crag	3	"	"	"	"	"
							T	A J

1921, Feb. 8

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1921, Feb. 8

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Tag

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date February 9, 1921

):00 a.m. Visited the new flow from SW rift cone and took photographs.

Cone a horseshoe open with heavy flings of melt; stream 5-foot wide sluice-way with built-up sides, runs down 300 feet steeper slope, then flattens and broadens to a festooned river. Field below has much upturned shell material and extends half-way to W cliff of Kilauea and some distance east also.

When visited at 4:30 p.m. the sluice had arched itself across 50 feet below cone and the cone was covered partially with a cupola. In evening the gushing was stronger and the crust destroyed, and later replaced in course of half-hour.

Lakes all very high, crags higher. Hundreds of fountains on E and W and SW lakes, scores of them on central lake. Centripetal streaming marginal lakes, various in central lake. Rushing fountaining torrent with high rampart streaming NE in NE corner central lake at N base of NE crag. Sluggish cove in NW gorge with splashing fountain in its end. New flows on N floor from E and W ponds, which poured out yesterday afternoon 2-3 p.m.

Growing ramparts. Flaming cones sometimes spurting in W crag mass. Island in SW bay has tilted over northeastward with uplift of its paste pedestal on SE side thus:-

Streaming in SW arm to E and to W from large crust area in E part, the W current bending to NE side of pool, another current coming out of central lake and a third coming out of dark crust on W cove of SW bay. The east stream pours rapidly through S channel.

SE arm nearly blocked by platform across narrows on central lake side. Large rampart E side with a depression behind it containing hissing and flaming cone. Ramparts along SE shore.

Fresh uplift of the sag valley and pressure ridge between E pond and SE arm.

Balloons very large migrating towards island westward in SW bay. Other balloons in all the pools. Gas pressure very intense E and W ponds which appear higher than central lake.

Glow in high talus NE corner NE crag.

Experiment. Tried to find place for immersion of viscosity cylinder in lake. Baffled by intense heat, lack of protecting ramparts, gas from blowing mouths, insufficient length of pipe.

Necessary to have protected conditions and a proper slope to put cylinder in and pull it out.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Wednesday Date February 9,1921

t	sta	subject	no	pl	scr	stop	ex	cam
10a.m.		Flowing cone uphill 50 feet distant	1	W P		f/6.3	1/200	5x7
		Stream and cone	2	"		f/8	1/35	"
		Stream looking down where it changes from a sluice to a festooned river	3	"		f/8	1/35	"

T A J

1921, Feb. 9

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1921, Feb. 9

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JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date February 10,1921

10 a.m. to noon.

Experiment

875° - 970° - 1010°- 1050° - 1090°

Used Orton Seger cones in porcelain tube wired on end of ¼ inch pipe. 48 feet of pipe. Immersed 8 feet of tip (porcelain sealed with Portland cement) of pipe over rampart SE end SE pool. Left for twelve minutes and pipe found frozen to rampart by splash. Fumes bad. Had to abandon attempt.

SE pool. Streaming from S channel and from central lake. Fountains numerous, large and small. Large ramparts SE? SW and E. Peninsula blocks separating pool from central lake. Depression 2 to 4 feet, few pulsations, large hissing cone in E corner. S crag plateau 12-foot cliff over pool.

E pool. Violent fountains, scores of them, streaming from N and S to SW tube where bank glows. NE station 35 feet above lake. Ramparts NE and SW. Streaming 6 to 9 miles an hour where fountains are most numerous and largest.

W pond like E pond. Both very brilliant at night. Streaming from N, S and W to E. Maximum speed where are maximum numbers of fountains.

Central lake currents diverge from quiet place in center as though welling up there. Torrent with violent fountaining in NE corner.

SW pool many fountains and much fume.

SW rift cones building up a ridge on each side of flow, flow extensive encroaching on SW heap. Two flows from source cones to SW and to SE. Cone hissing and making spiracles, orifices closed.

Blowing cones in W crag mass. Peacock cone dead.
Pit very brilliant in evening.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

JOURNAL

Day Friday Date February 11, 1921
Saturday " 12, "

Feb. 11.

3-4 p.m. Conditions stationary. Flow from SW cone more shut in. Lakes high and SE cone hisses violently. Hundreds of fountains, intense heat, rapid streamings. No more overflows in pit since the SW cone made a vent.

Note very great heat <u>above</u> lakes looking down from marginal cliffs showing intense radiation. Very little heat at margins or behind ramparts. Agrees with Daly's doctrine of maximum radiation at surface.

Brilliant at night.

6:30 p.m. Remarkable conjunction Venus and moon, with former on S tip of crescent.

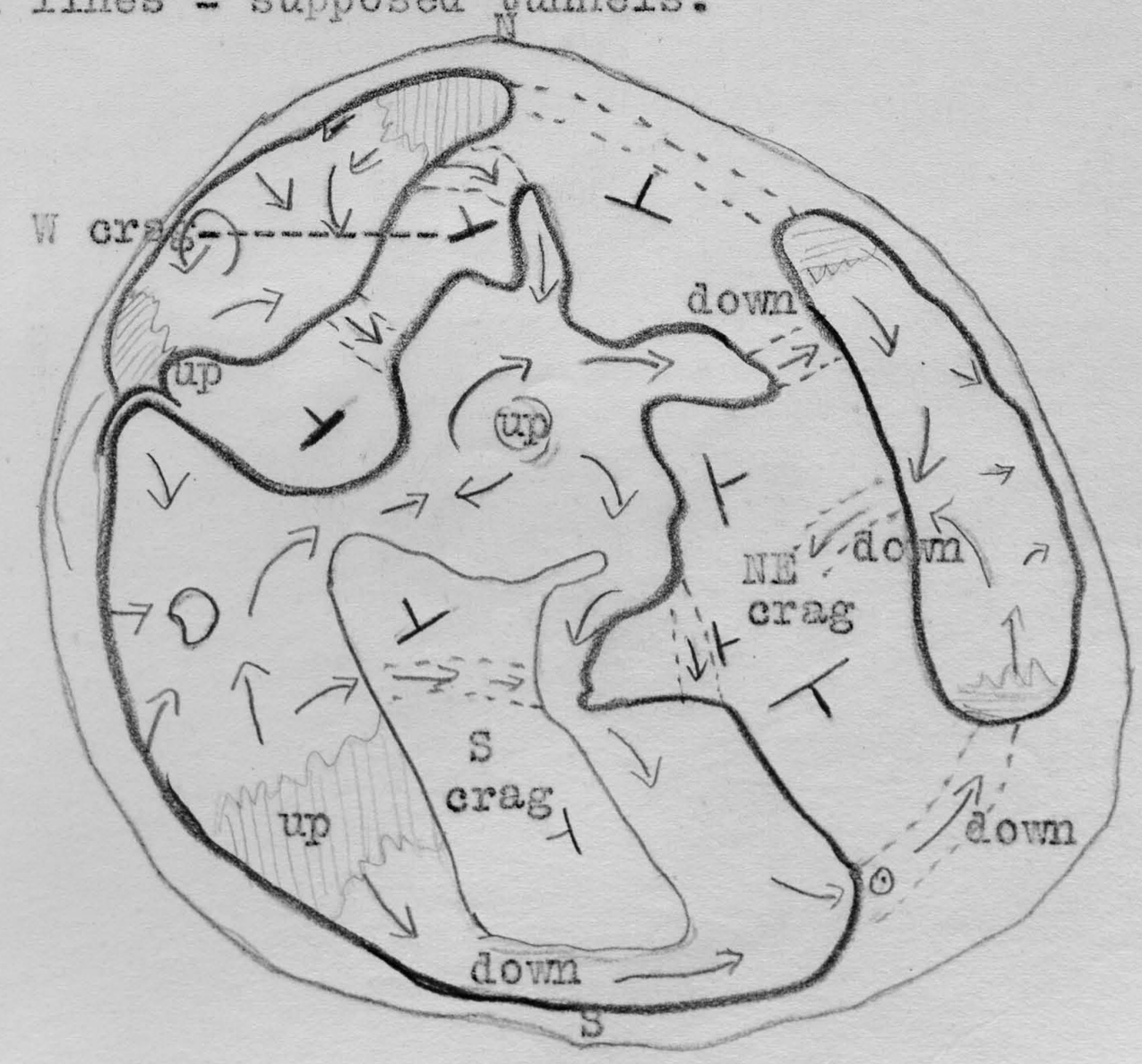
Feb. 12.

10-12 a.m. Conditions stationary. SW flow now in tunnel in upper part. Flowing toes to S. Area covered much the same as December flow but smaller as yet. Not flowing fast.

Streaming very rapid and tunnels now very well proved as indicated in diagram of Halemaumau. Brilliant at night. Crags stationary. Central lake currents radiate from quiet center. Current from SW pool meets current to SW from central lake. Rush of E and W ponds 6 to 7 miles per hour; maximum fountains -- maximum speed.

Streaming centrifugal in center and centripetal in margin pools.

Dotted lines - supposed tunnels.



At night more red and orange and less yellow than previous night.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

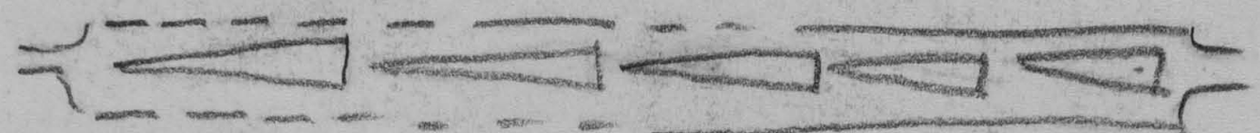
JOURNAL

Day Sunday Date February 13, 1921
Monday " 14, "

Feb. 13.
3-5 p.m. Fume on summit Mauna Loa very definite blowing northward. Wind here NE.

8 p.m. From Uwekahuna pit appears same. Very intense luminosity. Large flame at lower SW cone and glowing area of flow confined to small area immediately SW of cone. No open flowing.

Feb. 14. Prepared two Segar (Orton) thermometers in wire netting as follows:-



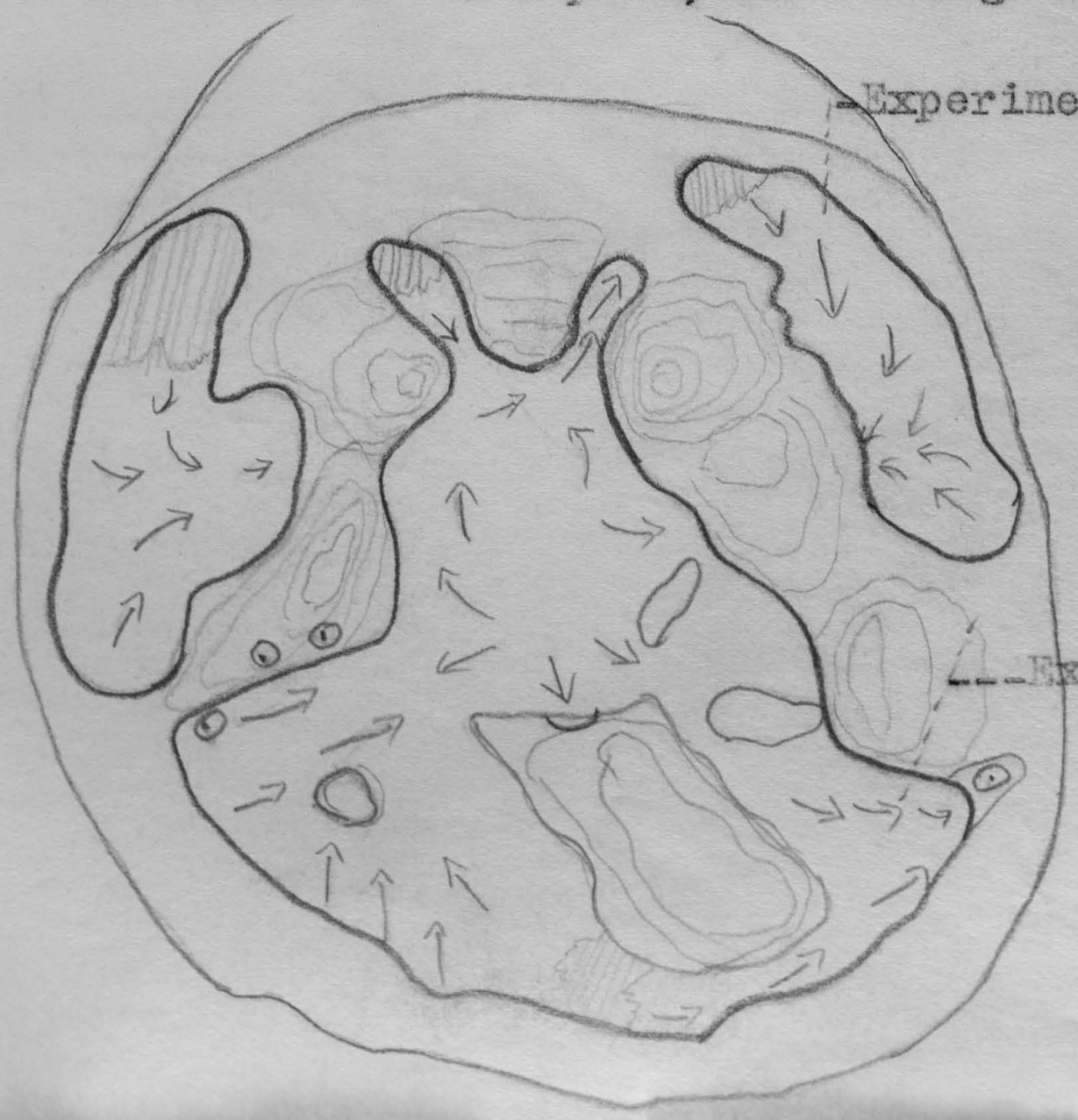
Cones each 1 inch. Cocoon 6 inches long. To be placed in porcelain insulating tube 13" by ½" internal diameter. Walls 1/8 inch thick.

2-3 p.m. Pit appears stationary. Noisy blowing cone on W crag mass between W pond and SW bay. Blowing cone E corner SE pool continues noisy, and orifice 5 inches across making clouds of Pele's hair. Balloons in all the lakes. SW island small. Very hot fountaining and streaming. Directions continue same. Quiet patch in center as before.

The SW cones have open orifices flaming; flow is wholly in tunnel; does not appear to be strong. Can be seen a few feet down in an oven cone on lower side of main cone.

By measurement from H.V.O. lava slightly down. No sign of change at pit.

The lift of NW and W crags has tilted all westward and lifted E and SE sides of W pond, increasing whole crag mass.



T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Monday Date February 14, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
2-3p.m.		Newly covered flow tunnel SW	1			f/32	½	Stereo Kodak
		Window flow cone SW	2			"	"	"
		Flow cone spiracles SW	3			"	"	"
		Balloons SE pool	4			f/8	1/50	"
		From E end SE pool to central region	5			f/11	"	"
		Fountaining of E lake (against sun)	6			f/7	1/100	"

T A J

1921, Feb. 14

1921, Feb. 14

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Tag

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date February 15, 1921

11:30 a.m. Experiment 1.

Six men to help. Used the Seger thermometers prepared February 14. Placed 100 feet of 1-inch pipe with rope on end on cliff NE side of SE arm and wired the porcelain container on end of pipe. Immersed 1 meter in NE side of pool where streaming was outward from bank. Lost first thermometer by breaking of pipe where it bent at a threaded joint on edge of cliff. Had several such mishaps. Recovered second thermometer, however, after 7 minutes immersion. Porcelain broken on breaking away lava and found the cocoon within in good condition. All the five cones appeared softened and swollen and blistered and black (1190°C the highest fusibility). Apparently it is a very hot lake.

3:00 p.m. Experiment 2.

Using the viscosity cylinder with open hole in end. Ten men to help. Forty feet of 1-inch pipe and rope on end. Thrust out over low rampart, with streaming right to left at NE corner of east pond. Streaming about two to three miles per hour.

Heated cylinder over lake for 15 minutes. Then immersed 1 meter for 4 minutes. Cylinder carried along bank by the current, bending the pipe. Puller out successfully, however, and inspection at upper end showed lava had reached clear through (after removing the clotted exterior mass).

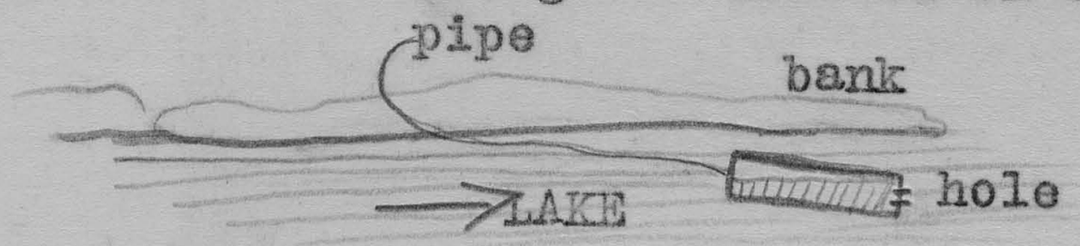


Diagram shows how current was related to the aperture in cylinder, and upright shading shows how in general the lava in cylinder lay.

On removing the lava piece by piece by hammering on the outside of cylinder large gas vesicles were found and great irregularities in the pahoehoe which had flowed slowly as a "toe" through the aperture and into the cylinder.

Cylinder 67 x 7.62 cm.
3051 cu. cm.
55 cm. of length filled by lava.
This was arrived at by estimating piece by piece equivalent section of cylinder.

Halemaumau

West pond lower on its W bank. Fountaining still vigorous but slightly diminished. Violent hissing continues at E cone. No marked differences in streamings. Nothing new at SW flow. E pond currents meeting from N and S and moving to SW bank.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date February 16, 1921

9:45 a.m. to 12:30 p.m.

SW desert crack inspected. No movement at marker.

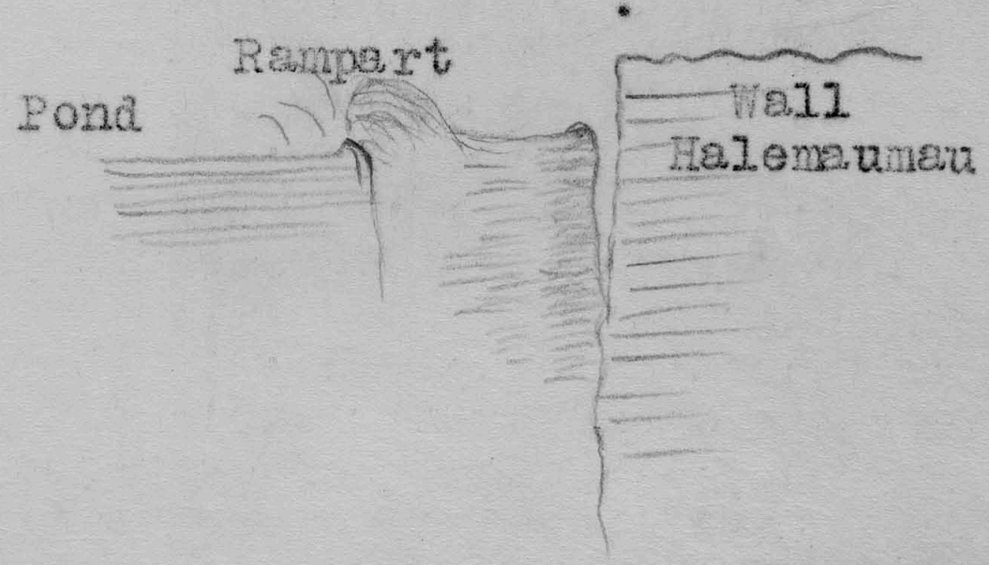
Flow inspected. Semi-aa flow at few places, shark-skin lava only type moving; schollendomes. Motion mostly to the S. The new lava has reached nearly to sand valley on W side of January lava.

Cones SW. Glow window and spiracles, large orifices on summit main cone and at side of upper cone.

SW lake. Streaming E and W from skin on E part. No changes. Fountains not large.

W lake. West bank four feet above lake, N banks show no change, E bank a high cliff lifted with greatly increased tilt westward of NW crag mass. Hissing large cone between W and SW lakes. Two crag scarps dip W at high angles as part of SW shore of central lake. Spatter rampart has fallen in NE corner of W lake.

E lake. E bank of lake appears higher. This arrangement of E and W ponds looks as though the inner ring of crags were settling on their outer parts and rising in their central parts; the wall-crack chasm between the rampart on E side E pond and the Halemaumau wall is 3 to 4 feet wide.



Heat and size of fountains in E pond less. Banked Pele's hair in eddy SE end E pond.

SE pool. Hissing E cone, large explosive fountains where the rapid torrent comes through S channel from SW pool. Balloons.

Postal Rift cavern. Explored cavern with torch to lower roof window at bend in tunnel. Not hot, slightly warm. Found worm stalactites with red surfaces. Floor yellow brown variety of aa. No considerable amount of sulphates.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

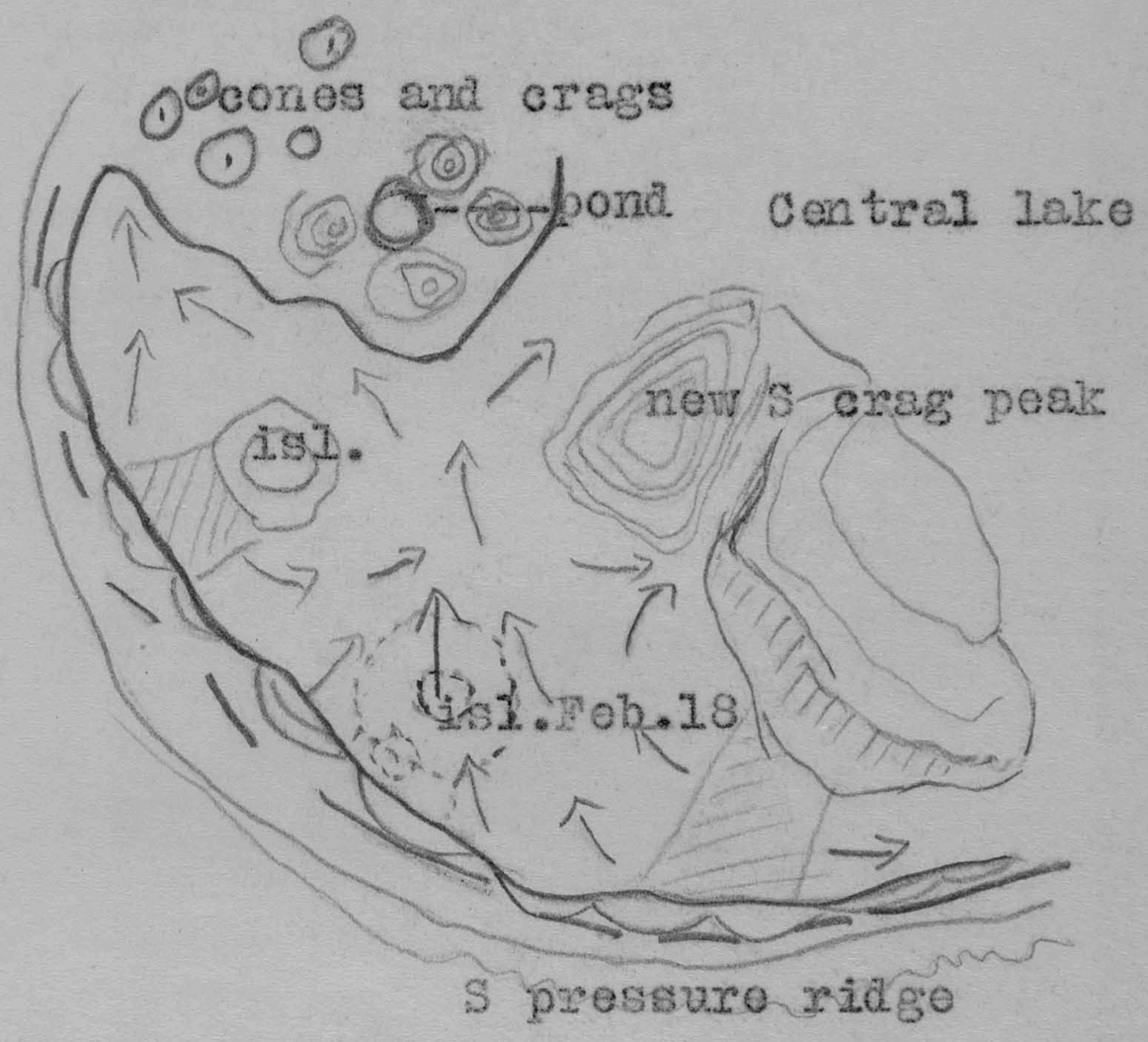
Day Thursday Date February 17, 1921

2 to 4 p.m. Lakes higher. W end S crag has lifted and tilted N; 20-foot face S. Wind SW -- complex of four small crags and five cones seen in southern part of W crag mass. Island SW higher with platform around it. Abundant fountains of bubble and fling (swan) type. Balloons abundant.

E cone hot and hissing. Currents from W and NW in SE arm.

E pond currents from N and S. Fume thin.

SW pool streaming E and W from crust in E part. Ramparts along S and SW with gaping wall-crack behind. Streaming around island as in diagram.



W pond higher and many fountains.

Central lake quiet in middle, centrifugal streaming.

NE crag shows several caverns one above the other on its SW face.

Upper SW rift cone rumbling with open windows at S base, Ground much altered and covered with sulphates even on January flows. Exterior of cone feathery dun colored accumulations.

Lower SW rift cone shows large cone with double or treble domes, noisy fountaining within, evidently over large active cupola chamber. Next to this SW is a smaller cupola with an open window in the NE side of its summit where one can look in and see a quiet orange hot pool of frothy lava slowly drifting off through a low-roofed tunnel to SW. The pulsations of the surface come from the larger cupola. The surface trembles and looks like beaten white of egg. A few bubblings break the surface and the noise is like a brook babbling. The current is very slow, in spasms forward, in the intervals coming almost to rest. The liquid surface 4 feet below window. Interior of roof hung with mammellate and smaller glowing stalactites. No fountaining whatever.

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

 Day Thursday Date February 17, 1921

SW flow has swollen whole surface of new heap with schollendome hills for acres, nearly up to level of source cones. To SSW found shark-skin lava and bright smooth silvery pahoehoe both advancing in different plaves within 100 feet of each other. Most of the live heaps are snaky and blistering shark-skin types, very hot. Aa tendency not so noticeable as yesterday, and the number of live areas greater.

Comparing the whole heap with Colle Umberto I. at Vesuvius, there is no slightest question but that the hill here is swelling en masse. There are no fresh flows on top.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Friday Date February 18, 1921
Saturday " 19, "

Feb. 18.
3 to 7 p.m. General situation unchanged. SW wind. SW island appears shifted SE. Flows to SW all sharkskin type so far as seen.

SW flows. Visited several sharkskin areas welling through schollendomes. Found a blister with second small blister on inside of skin of first blister. Shows development of gas from lava to last instant of freezing.

Note. In all the flows on Kilauea floor, no cases of explosion in caverns except in NE section 1919 where vegetation was present. This year the December flows on older 1894 flows, on 1918 flows, and the February flows on the December flows, give no explosions where there is no vegetation.

SW cones. Same as before; quiet lava flowing in lower cone; other cones hissing, flaming and rumbling.

SW lake. Island appears nearer SW bank and farther east. Ring pot in crust between it and bank. Streaming to NE and NW, and E through S channel. Blowing and flaming cones N of pool (W of central lake) and isolated fountaining pond.

Central lake as before.

W lake full of fountains; crusts breaking away from W shore; curtained caverns under cliff on E side; remarkable purple evening coloring to skins on lake, against the gold of the fountains, like a royal purple satin robe covered with golden spangles.

Lakes 3 or 4 feet below banks, and 10 to 30 feet below rim of Halemaumau.

Feb. 19.
10 to 11 a.m. No observed changes in cones or flows. Fountaining in lakes becoming somewhat smaller. N crag higher.

Bright lines in central lake. Some high pressure in E cone. Rapid torrent E in S channel and many small fountains in E lake.

The peacock cone N end of NW crag has fallen.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Sunday Date February 20, 1921
Monday " 21, "
Tuesday " 22, "

Feb. 20.
11 a.m.

Abundance of fountains. Lava 5 to 6 feet down -- lower -- in SW rift cone window. Streamings and hissing cones, etc, quite the same. Lakes slightly lower as seen from H. V. O., crags the same. Fume thin. SW island in same position and higher. A spatter bank on S side central pool protruding as a peninsula into the lake. Rampart shuts in central pool on the SE, no connection open with SE pool. Latter appears lower.

Rumor that Japanese found live lava at Mauna Iki not verified by careful survey with field glasses from Uwekahuna. No smoke or heat vibration. Clear seeing.

Feb. 21.
11 a.m.

Window cone SW becoming dark.
Island SW pool higher, lake lower. Some increase of fume. No marked changes.

Feb. 22.
2:15 p.m.

Lakes down, more smoke, and crags slightly down.
Window cone of flow dark and the tunnel seen to be shallow (4 to 5 feet) and to emerge at the large well under the main cone. This well has new window with grape stalactites; boiling pool within violent, 10 feet below ledge leading to tunnel.
SW pool streaming from the S channel westward. Lake 4 feet below rim. Crags W have subsided with lake.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date February 20, 1921
Tuesday " 22, "

t	sta	pt	hor	vert	lev	dist	elev	h. i.
Feb. 20. 11 a.m.								
	W	S saddle	0					
	NW	(8 ft. NW of) to N	0					2 ft. above NW ground
	S saddle	W	0					
	Hal S	S saddle	0					
	W	Lower SW rift cone	R 80 00					
	W	E tip island SW pool	R 14 22	-1 42	+05	685	-33	
	S sad.	same	L 22 01					
	W	Mon. SE flow heap; base of	R 87 07	-1 59	-02	1146	-39	
	Hal S	same	L 92 31	-0 51	00	1485	-22.2	
	W	N summit NE crag	R 305 40	+5 00	+07	785	+67	
	NW	same	R 65 10					
	W	NE pt. W pond	R 268 34	-3 27	+06	509	-32	
	NW	same	R 52 42					

Elevation flow heap 3687.7 + h.i. (5')

W station 1 ft. higher (3728) than NE (3727)
SW pool -32
W pond -31
NE crag +68

Feb. 22. 2:15 p.m.								
	Hal S	S saddle	0					
	"	SW flow heap	92 33	-0 51	00			

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date February 23, 1921

Glow at night less. W lake no longer visible H.V.O.

2:00 p.m. Fifteen foot walls around lakes. Crags 2 to 5 feet down. Streaming again E and W from crust at E end SW pool. SW island appears a little more out in lake. Big balloons NW part of SW pool where currents meet from four directions. Big black stalactites on banks.

Island in central lake where quiet place was with lines of fountaining, straight, NE and S of it. Big spatter grotto NW side of W crag pot. Quiet fountaining noises. Many bubble fountains. Streaming from N, S and W in W pond.

8:00 p.m. Visited Uwekahuna. Lakes visible there, not at H.V.O. Too foggy to see Kau Desert. Lakes roaring and making much fountaining. Notable increase in perceptibility of roar at a distance, where all noises are focussed into one, contrasted with gentle swish of fountains when heard in detail near by. The crags near by cut off sounds of all but nearest lake.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Wednesday Date February 23, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
2 p.m.	S sad.	SW pool	1			f/16	1/5	Stereo Kodak
	W of S sad.	S channel	2			"	"	"
	Edge of pit	SW rift	3			"	"	"
	SW rift	to S crag	4			"	"	"
	" "	" NW crag	5			"	"	"
	S of W sta.	SW pool	6			"	"	"

T A J

1921, Feb. 23

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1921, Feb. 2

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date February 24, 1921

11:50 a.m. Circuit of pit E and N.

Crag masses sinking, breaking away from marginal bracket of floor; irregularly subsiding floor in different places.

SE pool. Streaming and fountaining as before. Currents from NW and from S channel. Inner cliff 12± feet high on wall side, 25 feet high on S crag mass side, 15 to 20 feet high on NE crag mass side. Grotto cavern E corner. The E corner blowing cone has broken down and is sending up clouds of white fume.

E pond. Twenty feet down. Abundant fountaining. Streaming to S and against SW chasm, where curtained grotto shows, but no cascading. Marked bracket overhang (photo) on E side, and the rampart half-domes have fallen. NE corner block seen to fall. Strong settling of bench magma N and S ends of pond. Spasms of fall and rise.

N floor area sags toward E pond; large block broken down between NE cove of central lake and E pond, so that space between the two lakes is small. Triangle crag N side of central lake split on the NW cove side.

W pond fountaining much less and streaming slower. Deep notch open between it and central lake. Bench all fallen away on NW crag side. NW crag remains high. Streaming continues eastward. New marginal construction as though liquid were rising.

Central lake. Small round island, triangle of crust around it, line of fountaining on S side and line of rampart on NE side. N moving current on W side, streaming as before to NE cove, but slower. Fountaining less. Rampart along SE side. Rock falls heard.

SW pool clear of crust, but streaming E and W from E part. Large balloons W end. New ramparts in places. Fountaining diminished. Walls 12 or more feet high.

W crag pot connected through to central lake as a cove, N of the small crags making the W shore of SW channel.

The new crag of W side of S crag mass tilted up steeper, with chasm between it and the large flat S crag mass plateau whose surface dips S, and which separates the SW and SE pools.

SW rift cones about the same. Great quantities of white, pink, yellow and red soluble salts about cracks near the upper cone, sulphates. Blue and white fumes.

Fume from pit increased. Rate of sinking of lakes appears diminished.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

SURVEY RECORD

Day Thursday Date February 24,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11:50 a.m.	NNE	N	0					
	N	NW	0					
	NNE	Summit NW crag	L 58 16	+5 43	0	519	52	
	N	same	L 50 17					
	NNE	N summit NE crag	L 86 10	+8 22	0	469	69	
	N	same	L 70 19					
	NNE	W side E lake	L 114 58	-5 18	0	390	36	
	N	same	L 88 43					
	N	NE point W lake	L 23 01	-5 44	0	390	39	
		(distance last survey)						
	Hal S	Mon. SW flow heap		-55	0	1485	24	
		(Heap has subsided therefore 2 ft. in two days)						

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Thursday Date February 24, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
a.m.	S	Overhang of E lake		film				Kodak R H F

1921, Feb. 24

RHJ

JOURNAL

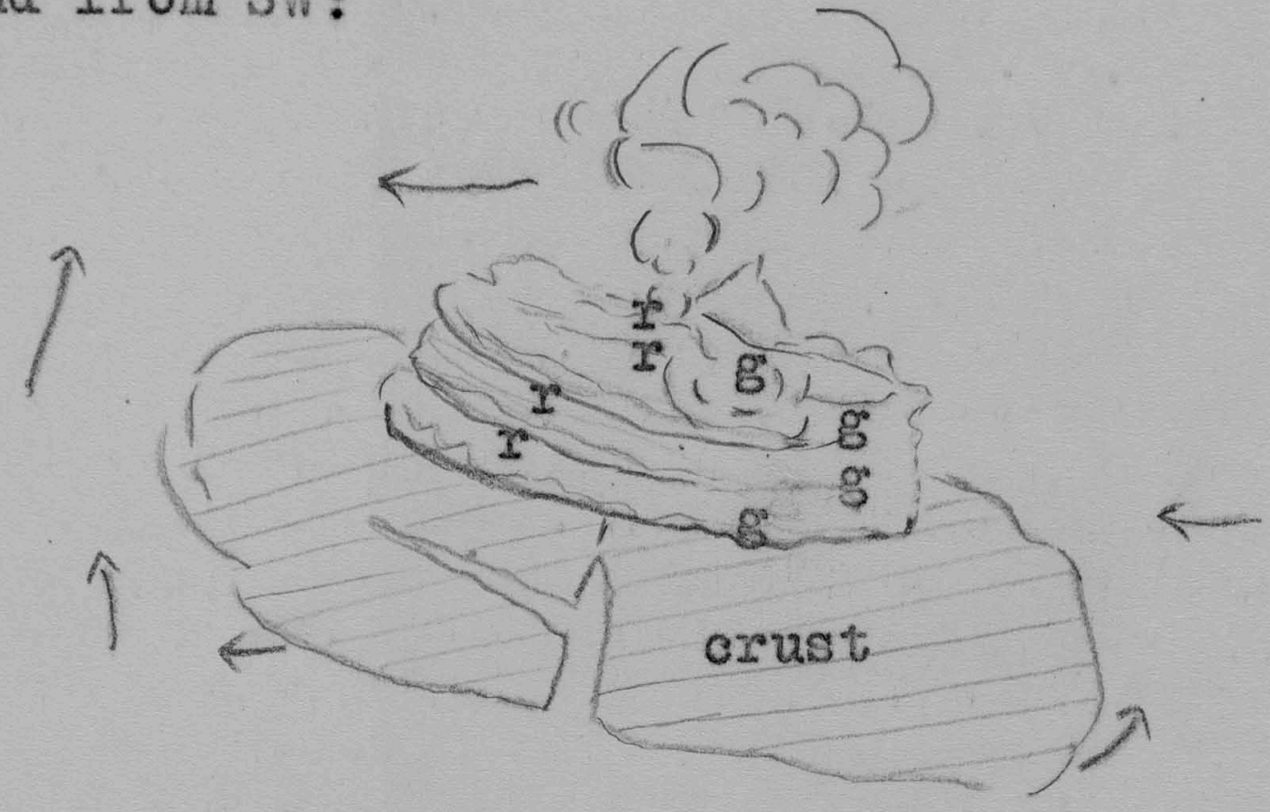
U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Friday Date February 25, 1921

3:00 p.m

The lakes show bubble fountaining and ballooning but appear rather higher than yesterday. An inner ring of crags appears to be settling, for their cliffs above the lakes are lower than the outer ring of bracket cliffs under the bench bracket of the Halemaumau wall. E pond fountaining most intense of any.

SW island from SW:



g -- glisten
r -- red "dry" rock, broken, stratified

Found SW island in a new position 50 feet more to the WNW than when seen yesterday and nearer to the SW channel. The S crag peak appears also to have moved. The currents are E and W from E end SW arm as before, with occasional subsidences and breakings-up of crusts. The general drift of currents is in the direction in which the island has moved. A remarkable feature of the movement is the presence of four shoreline zones of glistening glass on the face of island, with "dry" rock in between, as though the island had been lifted as a slab back of an encasing shell which separated it from the lake; and as though each lift had been comparatively sudden, with spells in between when the lake "wetted" its shoreline with the usual black spatter. The dry rock is red-brown, stratified, plane-parallel lava, very much compacted. It appears thinner bedded than the loose, slabby pahoehoe of the benches and may be compact, lake-bottom material.

Dense fume over the chasm SW of E pond and over the crack leading N from E corner SE pool. No avalanches heard. Bright glow cones seen last two nights on W side central lake.

9:00 p.m.

Spurting cone seen in NW cove of central pool. Here there is fresh pahoehoe heap extending out into the N floor, where this cone has been recently flooding over the somewhat subsided floor.

General situation does not appear like a rapid subsidence, but the gas pressure has dwindled for the present.

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

 Day Friday Date February 25, 1921

The two SW rift cones continue to rumble and splash 20 feet down, with marked feathery stalactites in the upper cone and grape stalactites lining the inside of window of the lower cone. Chamber inside shows two wells side by side, chamber 20 feet across.

T A J

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PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date February 25, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
3 p.m.	Near SE sta.	S crag mass	1			f/16	1/5	Stereo Kodak
	End SE	pool looking to central pool	2			"	"	"
	WSW	Small cove W of central lake	3			"	"	"
								T A J

1921, Feb. 25

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JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date February 27, 1921

From Uwekahuna.
Clouds on the desert. Mauna Iki very dim. Abundant vapor along the rift crack but not at new places, and no fire. Comsiderable vapor at a bushy locality W of Cone Peaks and farther down in same direction. Some vapor from W side of Cone Peaks.

5:30 p.m. Halemaumau.
Central lake about 15 feet below a belt of bench on N side of S crag peak. Island in central lake has mushroom overhang. Few fountains and some clear pieces of bright-line surface near island.

SW pool appears to be 40 to 50 feet below SW bench,

W crag mass more tumbled and broken with a high pinnacle S of NW crag.

NE crag has been settling rapidly and its SE extensions have sunk and lowered the sagging and broken floor between E pond and SE pool.

All the marginal lakes now too low to be seen from Uwekahuna. Chasm looks as though it went through from NE cove to E pond. Abundant fume from W, S and E crag masses. Much white vapor from SW rift and hot fume from comes. Noise of fountaining from pit faint. One rock fall heard.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Monday Date February 28, 1921

10 a.m. Island in SW pool from S saddle station:

Walls of lakes appear about 50 feet high. Fountaining greatly diminished and glow and heat of lakes has diminished with it.

SE lake far down, very smoky E corner.

Pressure ridge between SE pool and E pond has become a depression 20 feet below the remnant bracket of floor against the E side of Halemaumau.

E pond 50 feet down and streaming quietly into cavern at chasm SW. N end of E pond and inner part of N floor has slumped and is tumbling incessantly, great craggy blocks 20 to 50 feet down. Chasm through to central lake but not continuous liquid in it. Hot air vibrating over broken bench magma. Valley of down-tumbling between the NW cove of central lake and E pond.

Central lake. NW cove has a new large cone at its outer end with pile of pahoehoe about it. Much has fallen from N cnd NE crag. Quiet surface to lake.

W pond streaming as before eastward, but fountaining small. Walls 40 feet. Large castellate crag next S of NW crag.

SW pool streaming out to central lake ahd E as before through a greatly narrowed S channel with an island in channel. Lake 60 or 70 feet below S pressure ridge. SW island has mushroom overhang; island 25 feet high.

Much of the overhang has fallen in different places as on E side of E pond.

Crags and lakes are going down more or less steadily. Tilt in seismograph cellar has changed from SW to strong NE as though rising might be resumed about the middle of March.

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL - 2 - Day Monday Date February 28, 1921

2 p.m. From Uwekahuna.
Examined desert in clear light. No blue smoke whatever.

The SW rift cone windows less bright, lava 40 to 50 feet down, rumbling.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Monday Date February 28,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10a.m.	NE	NNE	0					
	NNE	N	0					
	NE	Chasm SW side E pond (lake level)	L 82 26	-23 33	0	175	-76	
	NNE	same	L 118 45	- 6 11	0	612	-66	
	NE	Summit NE crag (N)	L 49 59					
	NNE	same	L 84 31	+ 4 41	0	474	+39	
	NE	Summit NW crag	L 42 10					
	NNE	same	L 55 41	+3 58	0	481	+34	
	NNE	Tangent breakdown edge N shelf	L 16 50					
	NNE	Tangent N end W pond	20 20					
	NNE	Tangent N end NW crag mass	33 30					
	NNE	Cone inner end NW cove	42 50					
	NNE	Tangent SE side NW crag	57 50					
	NNE	Tangent E corner N triangle block	78 20					
	NNE	Tangent W face NE crag (line of middle NE chasm)	81 35					
	NNE	Tangent N end E pond	85 00					
	NNE	" SW side E pond	117 10					
	NNE	" E " " "	133 00					
	Hal S	Monyment SW flow heap		- 0 51	0			

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

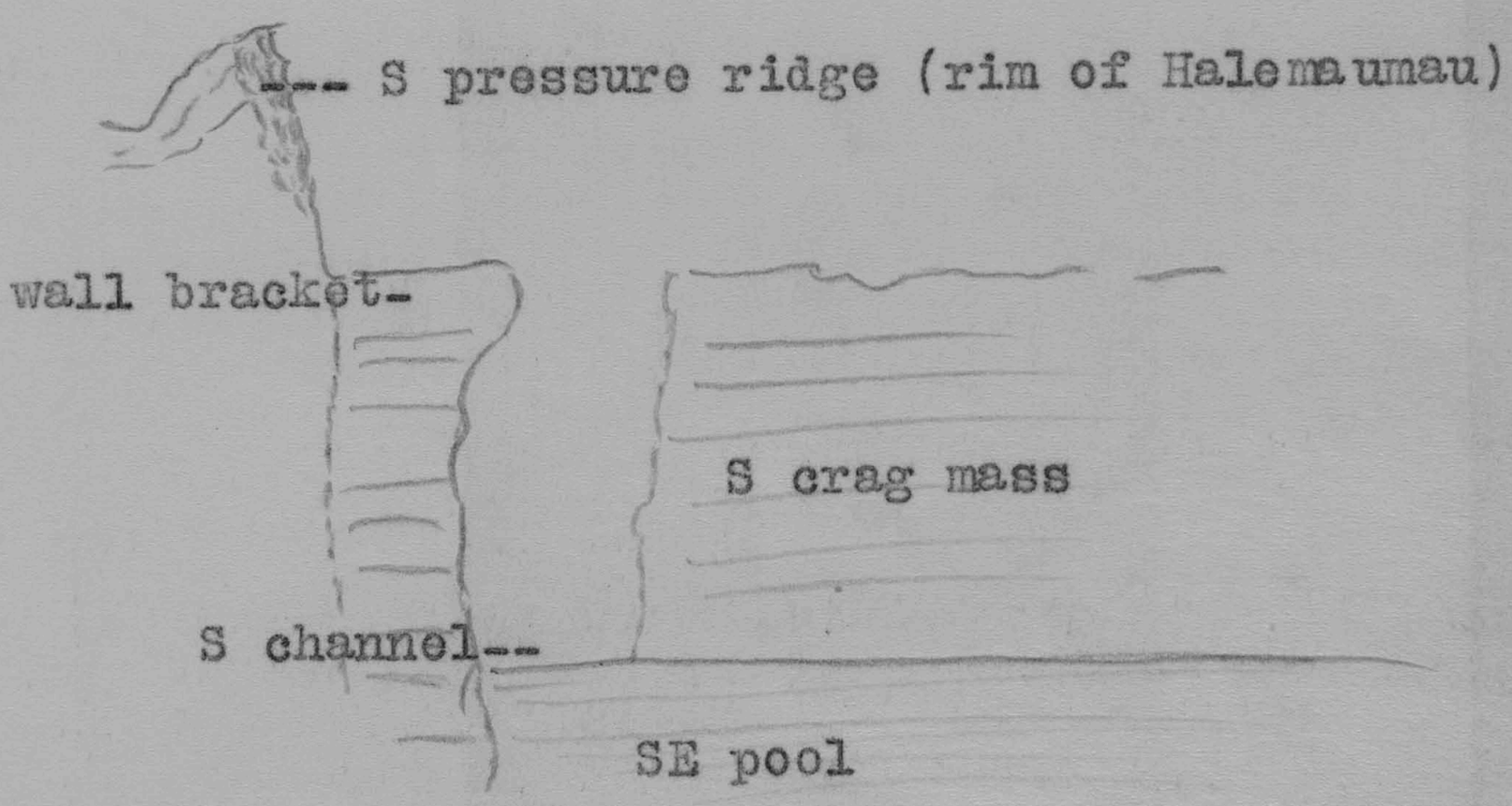
JOURNAL

Day Wednesday Date March 2, 1921

Pit at night as seen at a distance much dimmer.
Crags lower, fountaining less, bright-lines and slow streaming. Crags NE and NW still show above rim.

5:30 p.m. SE pool appears 80 feet below SE station. Streaming to E cove, now a large embayment with the whole wall bracket broken away. Inner bench magma down 30 feet along wall valley E, bracket of bench making vertical wall above. NE crag mass has both tilted in and sunk en masse. Dark areas of crust in SE pool in region of islands at SE narrows, from which streaming proceeds. S tabular crag mass has lowered until its top is level with the floor of wall bracket.

Sketch from SE station:



E pond has 80-foot walls. Some of wall bracket has fallen. Streaming from N and S bending to SW cove. Chasm extending SSW has partly fallen away as it was parallel to wall of pond. Even spatter shorelines in very vertical wall on NE side of pond. These entirely mask whatever the real underlying structure is. Over SW cove of pond (where the cascade was in January) a shaft niched into the wall leading to smoking patch above. Chasm connecting E pond with NE cove of central lake is filled with debris. One fall seen W side E pond. N floor at N end E pond a series of about five steps broken down. Extreme heat of fresh breaking of bench magma here has ceased to show and something near adjustment is reached. N floor stable across N end of pit, corresponding to former N shelves. Tumbled slope from N floor to N triangle crag, the edge of N floor remnant following curve of inner main pit.

Central lake. Climbed down and out to edge of central lake, seeing through to SW pool. Streaming from island in center, to N and to SW, out from SE arm and from two W coves, into NE cove. Twenty or thirty fountains, few

large ones. Island a mushroom and low. Bright-line pattern in broad golden bands, streaming much slower than before. NE cove has stalactite grotto; moderate bubbling, no rapid rush.

NE crag. N face of NE crag has fallen away revealing a remarkable breccia at the core, large and small subangular bowlders in an earthy-looking matrix, possibly oxidized aa. Cross section of the spatter veneer shown at edge of break, about 2 feet thick. More even-bedded pahoehoe layers about 40 feet of top of section.

Island in SW pool large and broad of base, 40 feet high, leaning S. NW cove has slumped down 15 feet below the cone at its outer end.

W pond. Walls 80 feet high. Streaming slow to the E. Tunnels revealed in N and NE walls, glow in cracks in bench above.

SW rift cones very brilliant; thin flames; beautiful "grape bunch" stalactites. Bright yellow heat in interior of lower cone. Can look through to entrance (dark) of outlet tunnel from window in NE side and see worm stalactites hanging, glowing, in roof. The heat of cupola appears much greater than on February 28: high NE wind is blowing and cannot now hear the lava below. Lava is certainly lower. The rise of temperature must be due to the oxygen supply pressed through the rift crack, now wide open underground, from NE to SW, and increasing oxidation of both gas and walls. The flame is very lean, and the color is almost yellow-white, dazzling, in interior of cupola. Everything favors the production of an air draft, showing that the temperature of cupolas varies with meteorological causes, and the oxygen supply must greatly affect the iron glaze on the walls. Strong SO_2 to leeward of cone.

Note. The fume to leeward of pit at all times is most disagreeable and sulphurous when most hot. A cool air on face means relief from SO_2. This may indicate exothermic reactions continuing after the streams of gas leave the pit. Perhaps this accounts for the heating of the gas columns to such heights that the water vapor all diffuses on a dry day. The particles in the fume may have the property of taking up moisture instead of nucleating it while the temperature is high enough. They certainly nucleate the low temperature moisture vents in the floor of Kilauea, and the gas distinctly makes visible vapor when it cones through cracks in bench magma.

Mauna Iki. Alec visited Mauna Iki and reports no activity there.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date March 4, 1921

11:00 a.m. Sketch of SW island from S saddle:

Island 30 feet high; lower extension 6 feet high. Compared with February 28, the lowering of liquid in SW pool has revealed low extensions of the island corresponding to the building up of bottom flats by the currents.

SE pool. Looks 100 feet down. E cove broken back against pit wall, nearly vertical under SE station. Walls of pools mostly vertival with horizontal shore markings. SE pool current outward into pool from E cove and into the blocked S channel, there bending to bank NW side. Dark crust SE channel and streaming from it SE.

E pond. Lower than before; some alignment of fountains where currents from N and S meet and pour against SW wall.

W and N regions little changed, except generally lower. Central island same, a flat platform with low mushroom above. Remarkable sill or laccolith of massive rock in the notch between the castle crag and W crag, 50 feet long and 15 feet thick, like the Uwekahuna laccolith. Seen from the S this appears to be the filling of tunnel between W pond and central lake; goes through, and has a bottom 10 to 20 feet above central lake.

The sinking of the crags has now definitely slowed. The heat on face at edge of pit is tolerable over even the hottest places like E pond at NE station. Fountaining scattered bubblings and accasional large flings, but all viscous and crusted as compared with the high level; large crusted areas.

SW rift cones making much solfataric colored salts and windows orange red, with feather stalactites at upper cone and "grape bunches" at lower. Rumbling of lava far down. Glow looks distinctly lower color. Much irrespirable vapor (SO_3 ?) from the solfataric patches.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

SURVEY RECORD

Day Friday Date March 4, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
			0					
11a.m.	SE	NNE	0					
	NE	NNE						
	SE	Point W side E pond	L 2 57	-8 21	6	611	-90	
	NE	same	L 32 56					
	SE	NE peak (N peak NE crag mass)	L 24 01	+0 52	0	693	+11	
	NE	same	51 18					
	SE	S peak NE crag	L 33 53	+1 29	0	607	+16	
	NE	same	67 40					
	SE	Top SE end of table rock SW side SE pool	L105 39	-4 55	0	270	-23	
	NE	same	125 50					
	SE	Top cliff N side SE pool	L 43 54	-4 53	0	180	-31	
	NE	same	122 36					

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

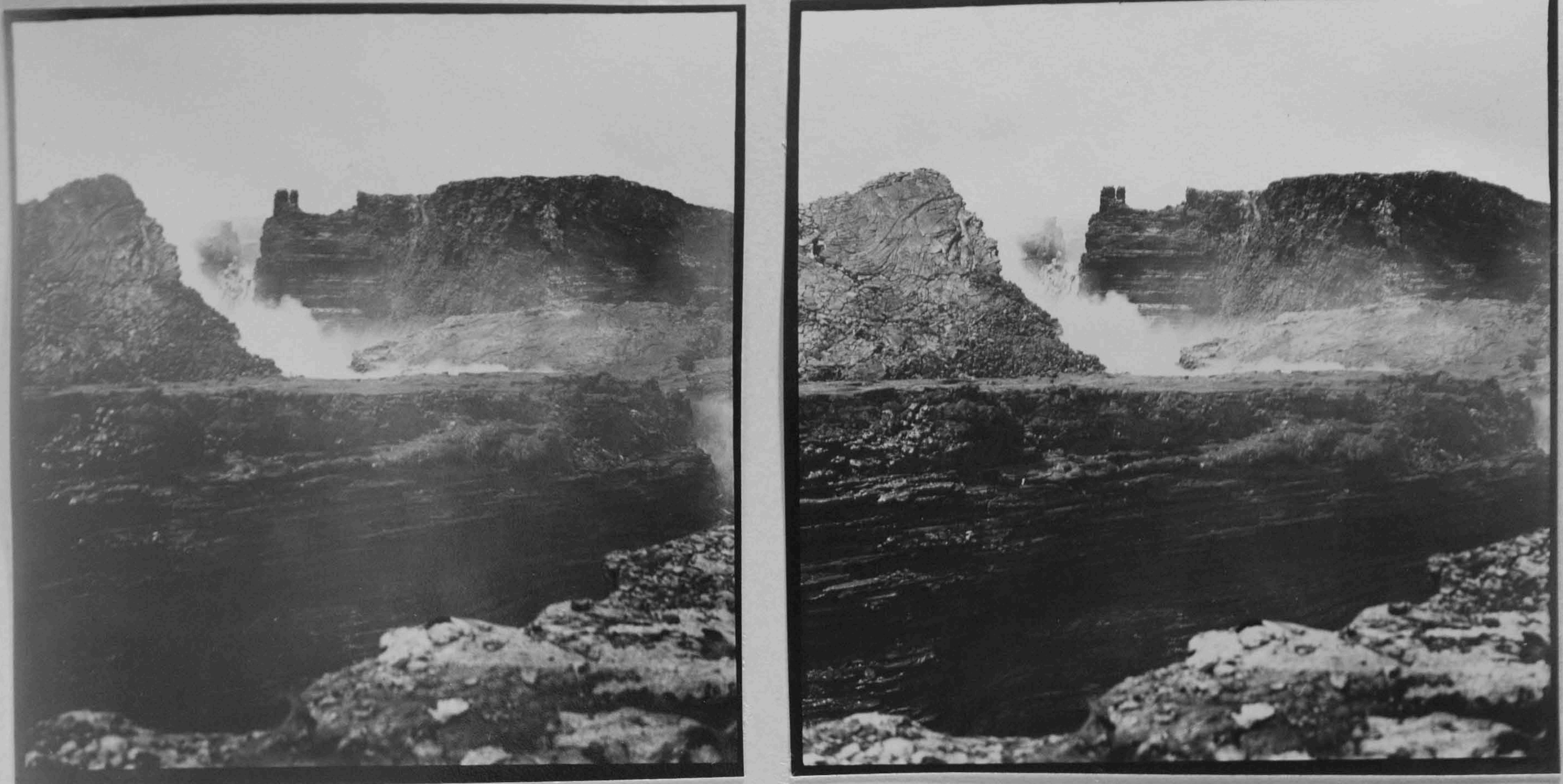
Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Friday Date March 4, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11a.m.	Bet. NNE & NE	Castle crag & NE crag	1			f/11	1/50	Stereo Kodak
	Shelf under NNE	NE crag	2			"	"	"
	Same	E pond	3			"	"	"
	"	NW crag	4			"	"	"
	W of N sta	Castle crag & W crag	5			"	"	"
	N side W niche	Castle crag (shows massive intrusion like Daly's laccolith under castle and in saddle)	6			"	"	"

T A J



1

5

6

Tag

1921, Mar. 4

2

3

4

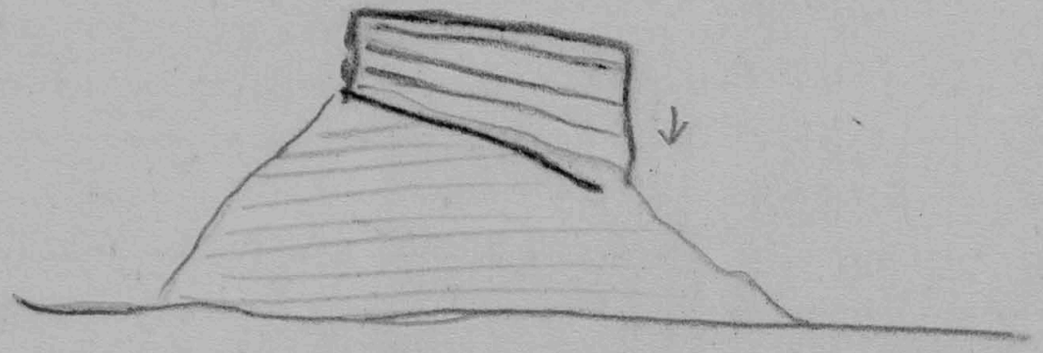
Tag

JOURNAL

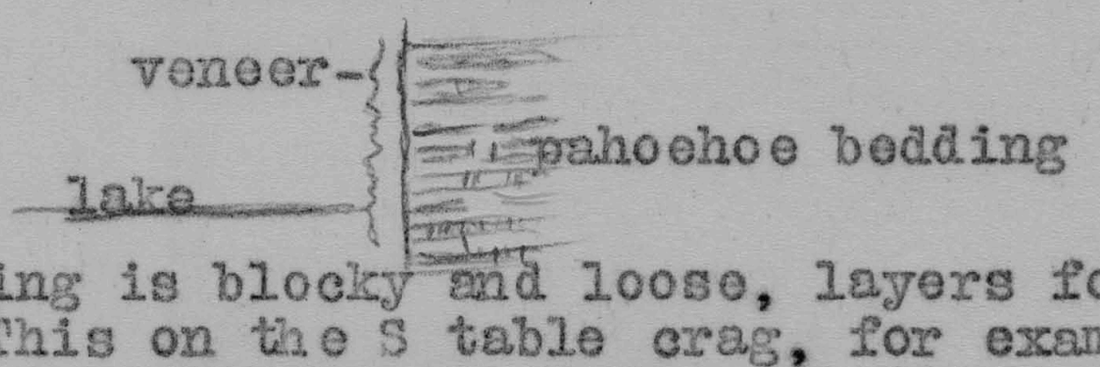
U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date March 5, 1921

10-11 a.m. SW wind. Inspection SW lake region. Level of lakes appears unchanged. Some spatter grottoes. Large crust area E end SW pool. Cracking and foundering spells. Island same. Tilted top of most of the smaller crags, with unconformable shoreline marking below (not bedding), suggests that when a cake of really bedded overflow veneer is deserted by sinking lake, it subsides differentially on the paste below, sinking most where its layers are thickest and heaviest.

Diagram of an island crag:



The shoreline marking utterly disguises the interior paste just as a pahoehoe shell does. Shoreline marking is very even and continuous and is a vertical veneer only a foot or two thick.



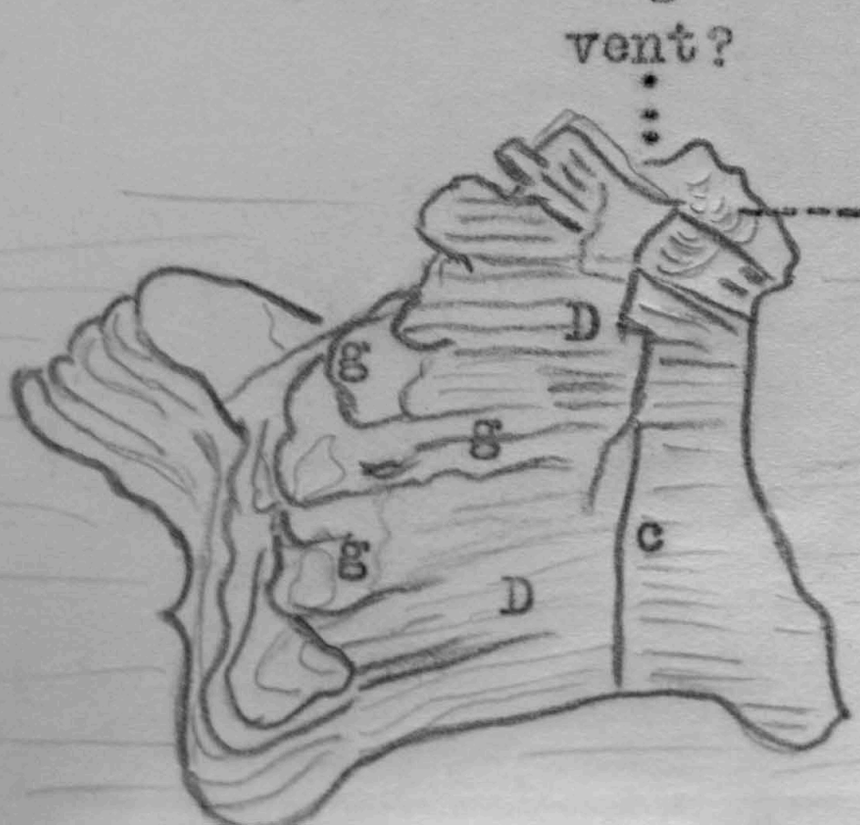
Pahoehoe bedding is blocky and loose, layers four to six inches thick. This on the S table crag, for example, forms an upper series six feet thick, underneath there is massive indefinite red rock. Remembering the coarse breccia of the broken section of NE crag, and the obscure sections sometimes seen in Halemaumau wall -- which is otherwise a section of overflows -- it seems probable that wherever lake bottom material is upheaved it is a structurless paste or breccia.

From W station W pond seen to be stagnant with few fountains and flow toward center from E as well as from W, N and S.

SW channel nearly choked, narrow stream pouring from central lake past the extension of S crag blocking the channel. Other streaming in SW pool from NW and SE sides of island to the chasm E of S crag peak.

The whole central bench-magma area now separated from the border shelf all around and lowered 40 feet or more below the border shelf. W crag greatly broken surface. Viscous dome fountain S side SW pool.

SW island looking down from SW shelf:



g -- glisten of glass
D -- dead even
c -- crack

The dead even "bedded" lines are where the lake in sinking has made a glassy edge shell and then broken it off by lowering. The glassy shore lines preserved are where spatter fell above lake and did not shell off afterwards.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date March 7, 1921

2:30 p.m. SW and SE pools no lower and noise of puffing and greater size of fountains and some spatter margins suggest that lakes are rising. Also the openings in SW rift cones larger and the noises louder. NE crag is down, showing that the bench magma locally continues to sink. Avalanche heard at W crag, which appears large and high. Both S peak and central island tilted northwestward, parallel to each other, as though a single block. SW island tilted over to NW also. N triangle block appears tilting down toward central lake. Central lake streaming W from NE cove. Dome bubble fountain E end SW arm appears to be from a source under the field of crust. Dense smoke rising from W crag area.

Collected "feather" or bearded stalactites of iron oxide at window upper rift cone. Collected jars of the solfataric salts lying over the rift zone, on the fresh January lava, which is deeply decomposed by the acid gas, strong with sulphuric acid.

The bearded stalactites, red hot, tend to form over the window, in the flame, and in contact with air, apparently by slow gradual dendroid growth making several inches in two or three days. There are gradations from black dendritic forms (when cooled) in the flame, to red at the margins and in the less hot places, and to an earthy greenish-yellow where the fire has left the surfaces to an attack by acid fume.

The salts are pink over the largest patches, vaporing cracks the source, salts two or three inches deep, white below, red-purple where most crusted and discolored by contact with air(?). These pink-white areas are edged with yellow, extending to yellow entirely along certain narrow cracks, yellow crystals in very hot holes, and green-brown in cooler places where crust is thick and discoloration by air(?) most. The gradation of color very delicate and mostly crusts over a mealy whitish or yellowish salt beneath. Bright orange waxy substance in places, and the crystals in hot cavities are orange (of wulfenite color) mingled with the yellow needles. Neither of these appears to be prismatic sulphur, unless it is an unusual form of the rhombic type.

Note. Lakes down 100 feet and no sign of a hole or tube or crack in wall of Halemaumau inside at SW rift. Therefore the lava boiling inside rift from deep down and not from a tube at higher levels, in its connection with Halemaumau; or else Halemaumau has sealed the orifice as it subsided by covering it with shore veneer.

T A J

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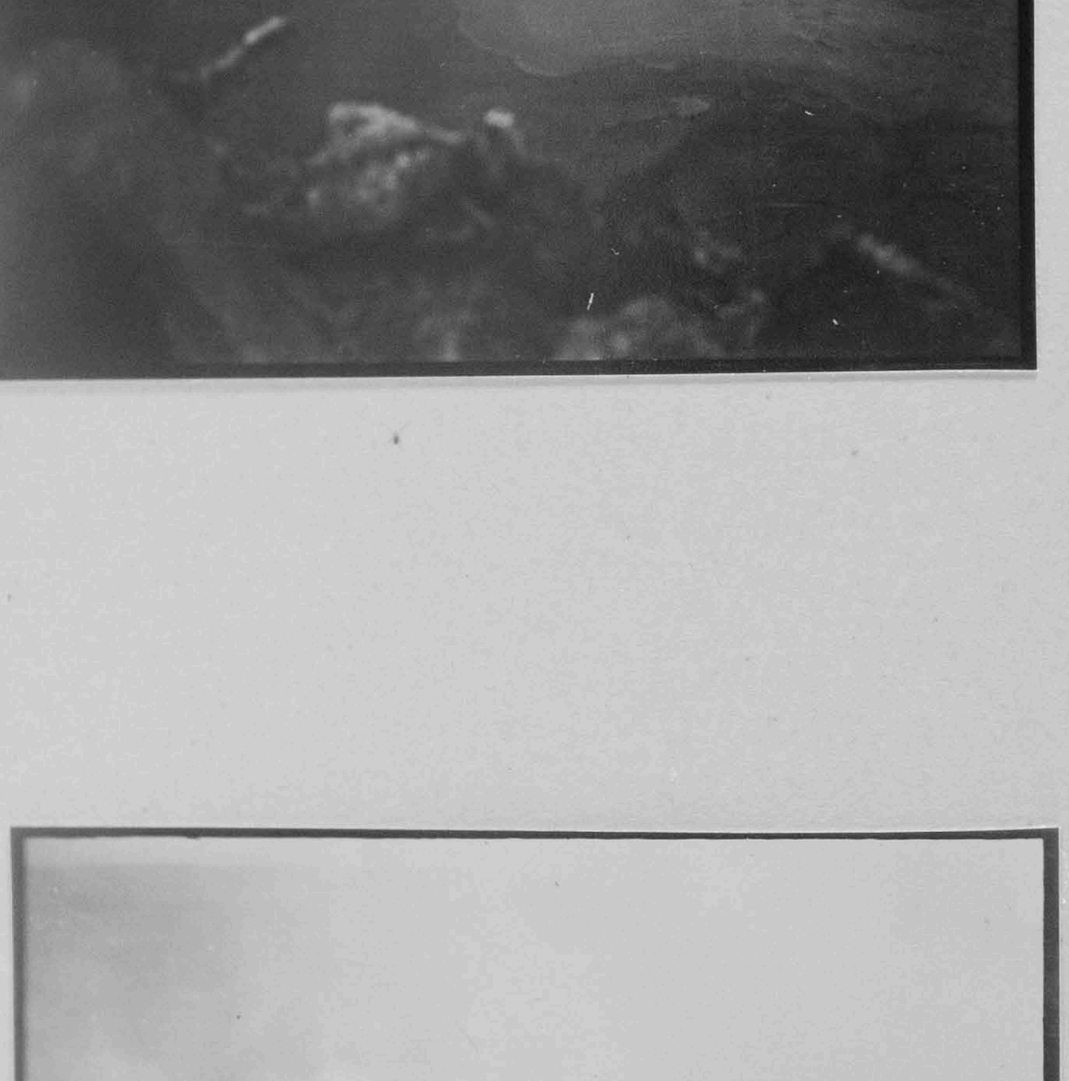
Hawaiian Volcano Observatory

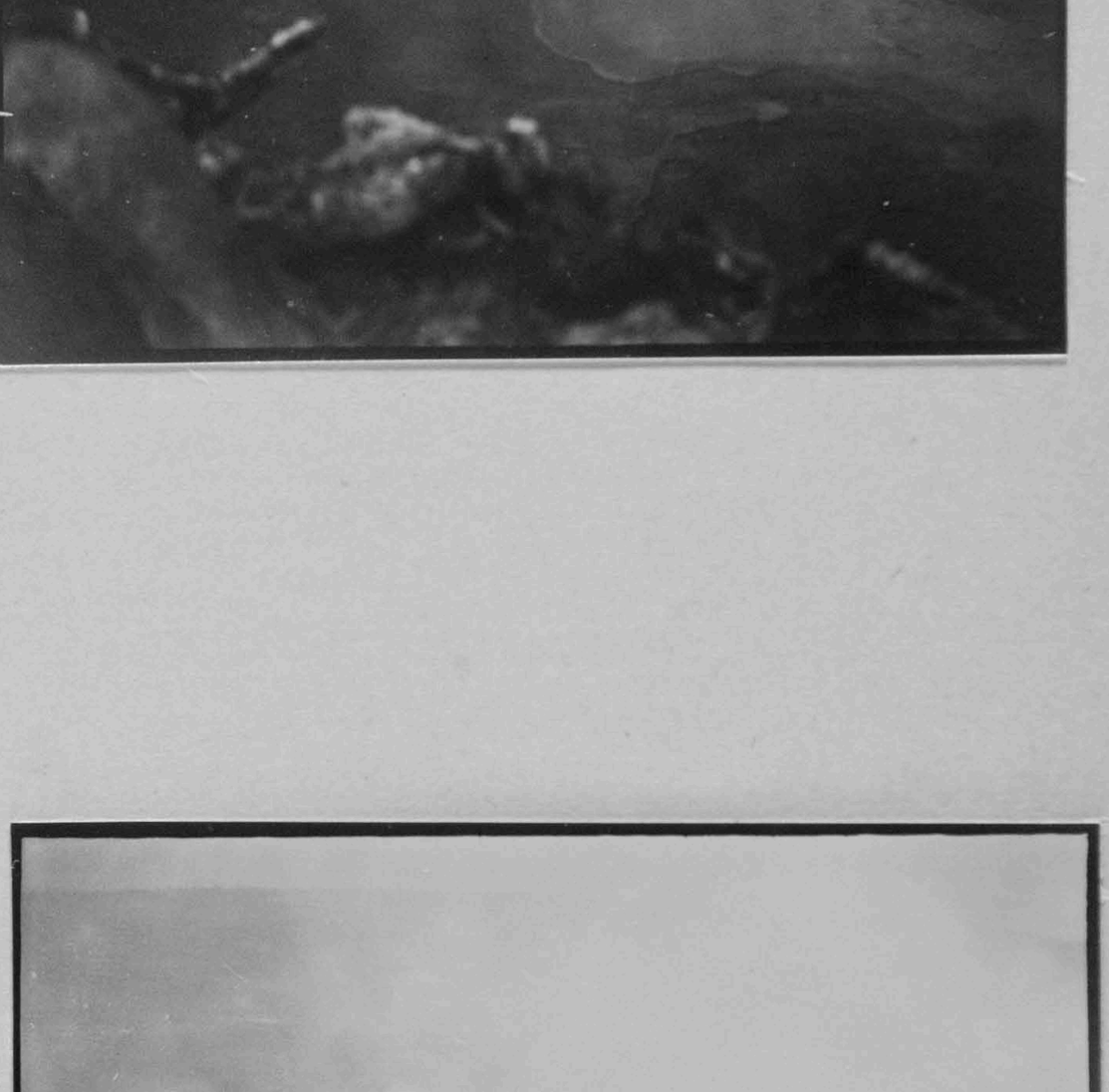
PHOTOGRAPH RECORD

Day Monday Date March 7, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
2:30pm	W of S sad.	SW island (cloudy)	1			f/8	1/50	Stereo Kodak
	"	W end S table crag (cloudy)	2			"	"	"
								T A J

1921, Mar 7





2

Tag

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date March 8, 1921

2:00 p.m. Current from W in SW arm between SW island and W crag mass. One branch moved slowly to main lake and other produced a swirl in going to the cove in S island. Large part of SW arm and most of SE arm heavily crusted. Crusts had broken up over these two arms in the forenoon and the lake level dropped a foot or two. Lava appeared to be rising slightly. One fountain in SW arm near NW base of island. Small fountains in SE part of main lake. Six or seven fountains active in W pond. Continuous activity in W crag pond which was bright; fountains small. Two fountains at SE extremity of SE arm. Current from both N and S in E lake going to old tunnel site. Small "bun" island in N part of E lake a little off center to NE.

Great volume of steam issuing from W, and from NW crag and adjacent broken floor but very little fume.

R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Tuesday Date March 8, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
2 p.m.	W	NW	0					
	SW	W	0					
	S	W	0					
	SW	N peak NE crag	66 40	-1 01	+01	825	-14	
	SW	S " " "	73 34	-0 37	+01	740	- 8	
	SW	NW crag	50 14	-0 42	00	688	- 8	
	SW	Peak SW island	128 34	-11 49	+01			
	SW	Lake NE pt. SW island	115 22	-21 06	00	273	-105	
	W	same	116 13	-11 42	02	484	100	
S sad.		same (doubtful)	5 31	-10 43	00	604	-114	

R H F

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date March 10, 1921

Pit very dark red last night.

10:30 a.m. Breach in face of NE crag showing breccia beneath. Sluggish crusts and pools.

Large cove of central lake in W crag mass. Valley between NW and SE parts of NE crag mass. Terraces in S table crag left by subsidence of SW pool. SW island falling over to E and the SE face of it has tumbled leaving nearly vertical red stratification apparently slabby pahoehoe from top to bottom. At SW narrows and elsewhere a low new platform 2 feet above lake. Dense smoke from W crag. Will now distinguish as SW crag the mass between W cove and SW pool; as S peak the tilted crag W of S table.

Central island still in place and quite large, its shoreline marks inclined N, and the mass highest toward SW. Summit about 15 feet high. Much of SE face of NW crag fallen off showing massive red non-bedded rock. The white intrusion in the saddle between W pond and central lake appears to be arch shaped with flat bottom like a broad cavern filling.

Streaming very irregular and slow, mostly SW from W side of central lake and SE from E side. Streaming SE on NE side of SW island. Two-thirds of SW pool crusted (east end).

Wrinkling skins. Black surfaces. Puddling fountains. Twenty or thirty fountains in the pit. Castle crag a narrow pinnacle seen from SW station. Noises slight plashing and puffing. Blue white fume from SW rift cones. Dense white vapor from ground above upper cone. Glow and stalactites and noise unchanged.

11:30 a.m. Strong avalanche - red dust - from W crag.

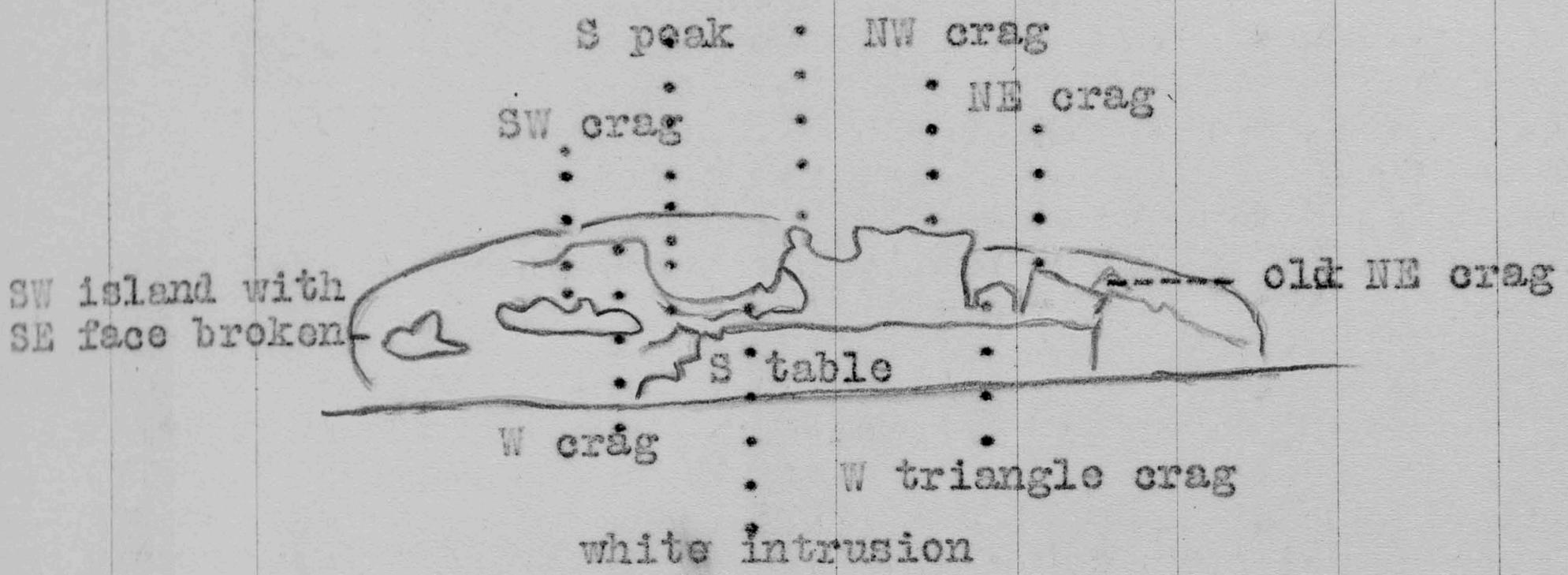
SW pool cracking and foundering. Small avalanches heard elsewhere, and earlier one was seen from SW island.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date March 10,1921

t	sta	subject	no	pl	scr	stop	ex	cam
10:30a		Brilliant day. Relative humidity 49.						
	W of S sad.	Pit (camera inclined forward)	1		K 3	f/16	½	Cirkut 8 inch



SW high ground	Pit (camera inclined forward)	2		K 3	f/16	½	"	

No. 1 partly fogged. Three pieces kept - 1a, 1b, 1c.

T A J

1921, Mar. 10

la

Taj

1b

Tag

109

1921, Mar. 10

1921, Mar. 10

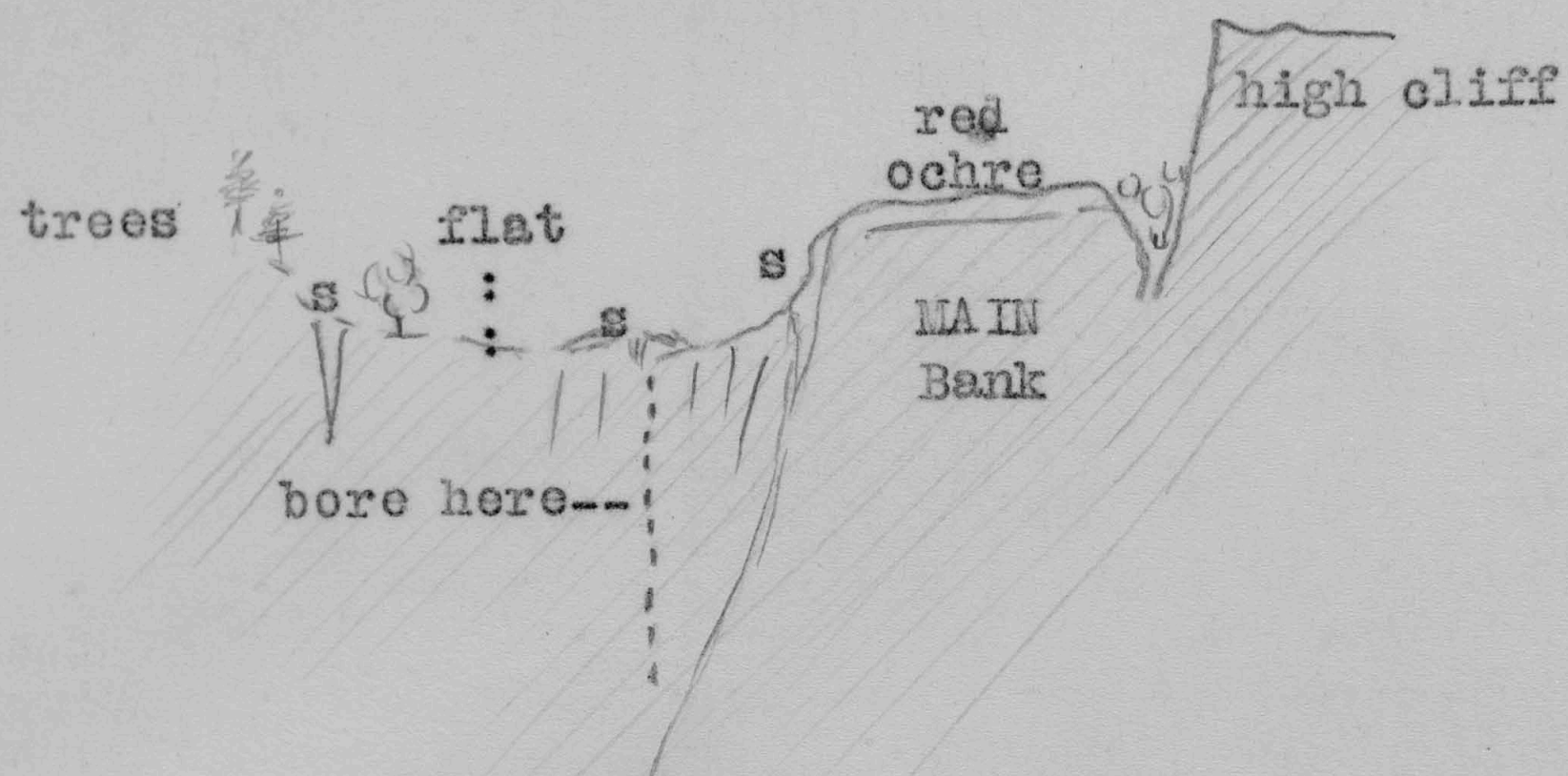
1c

Taj

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date March 11, 1921

10-11 a.m. With James Mc Candless and George Lycurgus to examine heat possibilities of Sulphur Bank. Two days ago tested four places of live sulphur with a lard-pail and one-half inch of water. Water did not boil, even when covered.
Decided best place to drill would be at foot of bank.



The sulphur is at orifices, but often does not extend inside. Much alum, looks like barnacles.

Pit brighter last night.

T A J

1:30 p.m. Fume and steam notably thinner, and much more liquid lava in sight. E lake crusted over except for a fountaining area at S end, a narrow current moving to middle of W bank and a fountaining pot at N end. Three or four fountaining pots at all times in SE arm. Fountaining area in SW part of W pond and five or six fountains at all times in main lake. Brisk SE streaming from NW part of SW arm meets a sluggish current from S and stops SE of SW island.
Large avalanche from SW wall fell into SW arm and broke up the heavy crust over S part of that arm and caused vibrations that were perceptible over 150 feet away.
Slow current out of S island cove of SW arm. Glowing vent several feet above lava near middle tunnel site.W bank of E lake. SE arm and SW arm separated.
Much steam from upper SW cone and crack adjacent and blue fume from lower cone. Orifices in both cones surrounded by brown stain.

R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Friday Date March 11, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
2 p.m.	NE	NNE	0					
	NNE	N	0					
	NW	N	0					
	W	NW	0					
	W	S saddle	0					
	S sad.	W	0					
	NE	S point NE crag	65 48	-1 03	0	490	-9	
	NNE	same	87 10					
	NE	N point	51 21	-1 22	0	480	-11.5	
	NNE	same	84 42					
	NE	NW crag	51 53	0 46	0	736	-10	
	NNE	same	57 35					
	NW	Middle W pond	107 48	29 17	0	197	-110	
	W	same	26 17	-17 06	0	350	-108	
S sad.	SW station		L 12 26					
	W	same	37 46					

R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Saturday Date March 12, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11a.m.	N shelf	Central lake	1	W P	8x	f/22	1	P
	N	E lake	2	"	"	"	"	"
	N	Central lake	3	"	"	"	"	"
	N	W lake	4	"	"	"	"	"
								T A J

1921, Mar. 12

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date March 12, 1921
Sunday " 13, "

March 12.
11 a.m. to 12 noon. Can see into lakes from rim. Crags lower slowly. New island in central lake NW of main island, and two islands in E lake, NE part. S channel and SE channel both blocked with debris, and SE pool isolated. Lakes have large areas of crust and little fountaining. Dense smoke and avalanches from W crag. Avalanche seen falling into W side E pond.

Experiment. Tested Range Finder (Hymans) at NE station on crags. Values too high. Seventeen-foot base. Difficulty with exact distance moved and precise placing of images when held in hand.

March 13.
10 a.m. to 12 noon. With Messrs. Ripperton and Kraus.

Italian Cliff. Ripperton digs into red ochre and finds Ca CO_3 inside without the algae. Believes the carbonate due to CO_2 and H_2O acting on rock and depositing. Algae make this their habitat, but the lime coating not due to the algae.

Halemaumau. Little activity. Pit dark at night. Some small rock falls. SW cones still have the glow windows and much deposition of salts. W pond streaming W. Overhang in W crag mass over the S end of massive intrusion. Large cove between SW crag and castle crag. Fume from pit rather dense, mostly W crag. Tendency to stationary bench magma.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Monday Date March 14, 1921

9:20 a.m. Crags stationary; one tumble heard near W pond. Lakes rising. This seem at N end E pond where the crust edge is built up above the valley tumble. Streaming in SE pool a small patch towards S channel, all the rest crust; but gas hissing out from under crust.

E pond streaming N from bright edge about the middle; fountain on W bank. Hotter at NE station than of late.

Central lake streaming S on E side of island.

Fume from W crag and along the rift by the cones SW. The rift opening underground may be along the W wall crack and under the W crag.

One of the islands in E lake is a flat platform peninsula one foot high against NE side of lake.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

SURVEY RECORD

Day Monday Date March 14, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:20a	SE	N	0					
	SE	NNE	R 17 03	(check on station positions)				
	NE	N	0					
	NNE	N	6					
	N	NW	0					
	NW	W	0					
	W	SW	0					
	SW	S saddle	0					
	SE	Point W side E pond	R 14 50	-9 26	+2	610	101	
	NE	same	L 13 38	-23 45	0	251	110	
	SE	N end NE crag	L 7 20	-0 37	+1	689	-10	
	NE	same	L 32 53					
	SE	NE end NW crag	L 9 03	-0 07	+1	960	-02	
	NE	same	L 20 54					
	SE	S peak NE crag	L 15 56	-0 03	+1	638	-0.5	
	NE	same	L 47 21					
	SE	SW end NW crag	L 20 43	-0 06	+1	972	-02	
	NE	same	L 33 23					
	SE	Summit castle crag	L 24 15	+0 12	+1	970	-04	
	NE	same	L 37 16					
	SE	Summit W crag	L 34 12	-0 30	+1	1108	-5.6	
	NE	same	L 43 43					
	SE	Summit SW crag(square block)	L 44 58	-3 12	+1	917	-51	
	NE	same	L 57 33					
	SE	Summit central island	L 37 11	-7 04	+1	672	-83	
	NNE	same	L 80 06					
	SE	Lake,S tip cent. isl.	L 41 31	-8 15	+1	678	-98	
	NNE	same	L 80 06ca					
	NW	same	L 51 43	-9 39	0	698	118	
	SE	Summit NW tip S table	L 48 46	-3 59	+1	506	-125	
	NE	same	L 77 09					
	SE	E summit ditto	L 89 48	-7 56	+1	275	-38.6	
	NE	same	L107 49					
	SE	Partition block SE pool andmmain lake	L 41 26			479		
	N	same	L 57 39					
	SE	Monument SW station	L 54 42	0 33	+02	1108	-10	
	NE	same	L 60 36	+ 09	+01			
	NNE	same	L 63 20	+0 42	00			
	SE	Lake, point N of E cove of SE pool	L 45 16	-37 40	+ 2			
	SW	S peak	L 22 43	-7 22	0	450	-55	
	NE	same	L 74 09	-3 41	0			
	NNE	same	L 83 30ca					
	NW	same	L 46 13	-4 07	0			
	SW	Summit SW island	L 1 19	-12 48	0	302	-78	
	NE	same	73 05	-3 31	0			
	NNE	same	L 77 18					
	NW	same	L 32 18	-4 32	0			
	NNE	Cone in N valley	L 44 12	-7 38	0	388	-52	
	N	same	L 59 30					
	NNE	Middle edge N shelf	L 21 30	-4 30	0	235	-18.6	
	N	same	L 99 53					
	NW	E side W pond	L 82 53	-23 29	0			
	W	W side SW island	L 20 23	-11 53	0	531	112	
	SW	same	R 4 07	-24 45	0	269	119	

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Wednesday Date March 16, 1921

9:15 a.m. From S pressure ridge (E of saddle).

Note. The crack longitudinal to summit of pressure ridge at S saddle, where the flow cones were in 1919, is increasing in heat and steaming so as to make saddle station useless.

Lakes up. Crags have risen for two days. SW island submerged all but 10 feet of summit. Lower benches, and partition in S channel, submerged. Puff and plash fountains in wide areas crust. Glow at night variable, not bright.

SW pool crusted, open fountains in five or six places tending to build by spatter on adjacent crusts. Small spatter cones in S channel. Fountaining pool W end, northward streaming E of island, boiling pots (two) in eastern part. Heavy crusts three or four inches thick. Big cracks in S table. Smaller peaks of SW crag mass deeply flooded.

SE pool also heavily crusted. Hissing. Has been building in a marginal platform W side and overflowing this with festooned flows. Lake appears only about 60 feet below SE station. Tumbled fuming valley depression in E pot region (between E and NE crags). The tabular crag mass between E and SE pools becoming a distinct unit. Partition between SE and central pools still high. Tails of blue gas rising all over hard crust on SE pool, inflated beneath.

Central island appears higher and tilted E.

E pond has flooded N valley half way to W pond and is making border platforms and blowing crescent cones, marginal fountains and streaming, hotter. Much of the material between the SW crack, parallel to shore of E pond, and the shore, has fallen away. The block sunk down between the E pond and SE pool has a fault plane on outer and inner sides, like a "graben".

Pounding and puffing fountains and much Pele's hair.

Central lake. Astonishing transformation in the new small islet which lay NW of the large island. This islet now an immense hill with hour-glass shape, the islet on top and ready to fall at any minute. Fully 40 feet high. The lower portion like an elephant, rounded and black with a smooth veneer on surface. Its southern portion shows shore marks of steep upturning southward, its northern portion is lower and has four promontories which make out into the lake. The whole mass has lifted bodily faster than the lake and fills a great part of the lake area. The hour-glass effect is where the stem of islet narrowed, and then below that evidently the topography of bottom widened out. The whole mass topples over toward the west. Lake quiet and mostly crusted.

New flows connect through from central lake to E pond extension through NE chasm. Blowing cone again in NW chasm.

W pond streaming W, only 4 feet below saddle S of castle crag.

The W cove of central lake connected through to SW pool.

W pond has no border cones nor blowing; only quiet streaming and a little bubbling SW side where a current from bank meets the main streaming.

Fuming of W crag greatly diminished.

Cracking and foundering occasionally in all the pools.

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Hawaiian Volcano Observatory

JOURNAL - 2 - Day Wednesday Date March 16, 1921

11:45 a.m. Central lake from NNE:

Note. This new island just where the high tabular island disappeared by collapse January 29.

Sketch from N shelf showing SW tilt of SW crag and new island and E tilt of old island:-

New island appears to be an extension of SW sector.

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3:00 p.m. Moderate streaming out of SW arm into SE arm with the final current going NW toward central lake. A large continuous fountain at N end of E lake. One blowing cone in lava at each of the cracks leading northward from main lake. Northerly and southerly current meet to the E of SW arm island which is considerably lower.

Small avalanches from N end of NE crag.

R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Wednesday Date March 16, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
9:15a		Purplish glaze, with blue-green, orange, olive and red spatter droplets, and greenish rock beneath, Pencil 4 inches long for swale. Broken cupola lining. S pressure ridge (1919).	1		8x	f/16	2	P
		Edge of glaze, cross section, showing vesiculation of glaze layer 1/16 to 1/8 inch thick. Linear vesicles below normal to glaze plane, and coarse banded vesiculation next beneath.	2		8x	f/16	2	P
		Another glaze edge, glaze layer thicker, vesicle layer below, linear vesicles below that.	3		8x	f/16	2	P
		Large glaze surface showing drip curruga-tions. In cupola the corrugations were vertical, top was to the right of slab. Color purplish red.	4		8x	f/16	2	P
		Concentric vesicle lines in rock of driblet cone: the convexity is toward a lobe or botrioidal excrescence covered with glaze when in cupola.	5		8x	f/16	2	P
		Detail of Pele's hair among rocks. (Pressure ridge)	6		8x	f/16	2	P

Note. This vesiculation is not distinctive of either pahoehoe or aa. It is a lava kept soft and slowly emitting its gas.

T A J

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PHOTOGRAPH RECORD

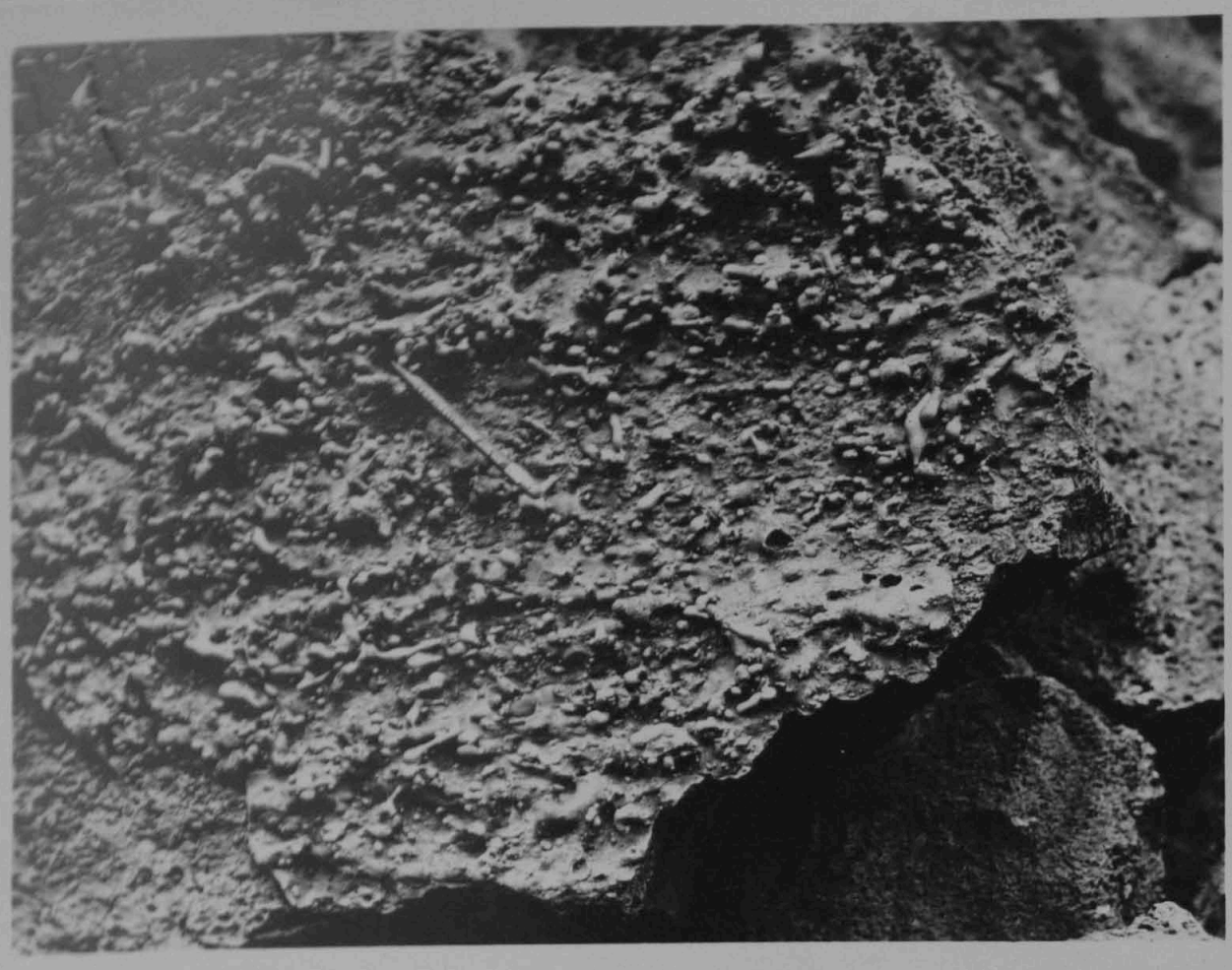
- 2 -

Day Wednesday Date March 16, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
3 p.m.		Central lake island with overhang cap from N bank of central lake	7			f/77	1/50	Stereo Kodak
		N face of NE crag from same place	8			f/11	1/25	"
		Same as No. 7 & little farther back	9			f/77	1/50	"

R H F

1921, Mar.



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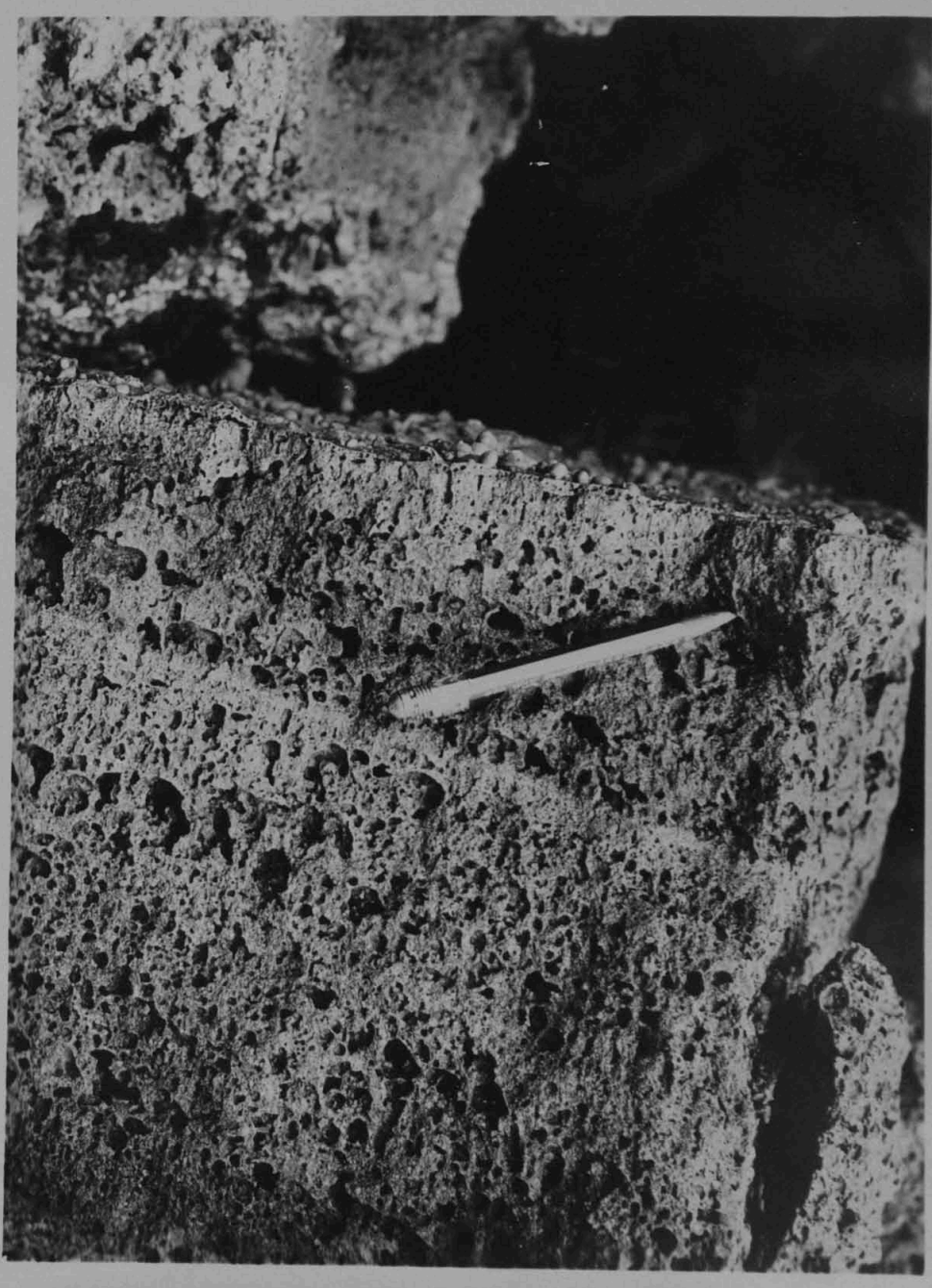

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Jay

1921, Mar. 16

4

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6

Jag

1921, Mar. 16

JOURNAL

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Hawaiian Volcano Observatory
Day Thursday Date March 17, 1921

to 6:30 p.m. No essential visible changes, except that crags went up 10 feet in twenty-four hours, (4 feet this morning 9 a.m.-1 p.m.) and are rising now with incessant small rock falls.

SE pool crusted heavily, 40 feet below SE station. Slight cracking and foundering occasionally, hissing flames through crust and at edges. Pool has risen a few feet. S table crag tilting nrothwestward, bench at lake edge higher SE end; big falls of bank at NW end making a cove of SE pool in the partition tumble separating pool from cental lake. Islet in NW end SE pool lifting and showing raw wall.

Active area E end SW pool with streaming to a grotto under S pressure ridge.

E pond dull; some cracking and foundering with fountaining about 6:30 p.m., border fountains and fresh platforms of overflow.

Central lake little changed; the new island has lost a shell of rock from NW side of its summit mushroom. Abundant fountaining in southern part and in SW pool.

General situation a very rapid rise of bench magma, confined gas under crusts in slow rising lakes.

12:30 (after midnight) a rapid rise of lakes with breaking up of crusts bringing the fountains in view of Volcano House plainly by 2 a.m. March 18. (Report of several observers).

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JOURNAL

Day Friday Date March 18, 1921

5:00 a.m. The fountains of W, central, E and SE pools in plain view from H. V. O. and brilliant glow seen beyond in SW region. Crags high, the E, NE and NW crags making strong profiles, the NE mass higher now in its S peak.

6:00 a.m. Pit overflowing its NE lip.

6:45 a.m. Reached pit. Flows seen pouring down NE slope from Halemaumau close to hut, and others from a large standing dome fountain spurting through summit of lower SW rift cone. Rift near upper cone fuming. Pit roaring with fountains as in July, 1912. Fume thin and glow brilliant. Evident that a very rapid rise took place in night, the liquid following the rise of crags yesterday. This quick equinox movement accompanied in Hilea and Kona by several felt quakes lately.

SW lake, S channel and SE pool seen from S pressure ridge: numerous large fountains and ballooning skins; level only 3 or 4 feet below SE station; no island in SW pool; cliff of SW side S table only about 6 feet high and table tilted to W. Crags lifted high above pit rim, rising of lakes now in progress and rapid. SW pool level with rim of pit SW side.

7:00 a.m. Lava broke over W end of S pressure ridge and cascaded rapidly making a flow to S. This was followed by sucessive cascades at higher parts of pressure ridge for a length of 50 feet, and the lava advancing was thin shelled and with aa tendency in the cracks, the margins of flow forming semi-aa.

7:15 a.m. Reached the fountaining SW cone and crossed the rift in dense fume. Wind NE. Got on N side of rift and photographed the "artesian" fountain which was 10 feet across and 6 feet high, the cone still rimming the fountain on W side. Streams pouring down slopes both W and E. Area above covered with deep soft yellow salts, and fresh pudding of flow heap all around cone. Upper cone glowing as usual.

Roar of fountains from W pond region.

Returned by S side of the SE flow from pressure ridge which had advanced a hundred yards. Passed between this and the longer S flow from rift, which was already clear across the S flows of January, its front a half-mile from the source. These two flows threatened to merge and so cut off the NW region.

Found lava within one foot of overflow at SE station; and from NE station, about 10 feet above lava, saw that the whole region N and NNE of pit edge was flooded, and overflowing N of NW station and northeastward around the hut and down the slope W of Volcano House trail.

The several lakes were marked only by fountaining areas, not so hot as the December fountaining, more of the large fountain type with areas of skin between. The crag masses stood as islands.

7:30 a.m. Monument of N station surrounded by lava and NNE station submerged; all the flats E of NNE station a standing pool, and a flow moved southeastward over the hot crack locality and close to the hut. The streaming in E pool was southward, from the edge of outflow northeastward. Large fountains were increasingly clustering in the SE pool region. The castle crag had changed shape and the N peak of NE crag

had slumped. Nothing left of new island in central lake.

:40 a.m. Flow was surrounding hut and at 7:45 it caught fire and fell in about twenty minutes. This branch of flow progressed only a few feet beyond hut location and the hut trig station, hillock back of hut site, was not overflowed.

8:15 a.m. There were big fountains near SE station with irregular streaming from S channel and central lake and in E pond the currents increasingly tending to meet in E corner of SE pool. Here a rampart began to build. Lakes reached adjustment to outflow about 8:30 a.m.

9:00 a.m. The SE rampart cauldron had assumed character as a sinkhole, with line of enormous fountains across SE pool in SW-NE direction, flinging showers of spray 80 or 90 feet, lowest level of the froth about where E cove of SE pool had been and directly under the observation flat at SE station. Fountains made a swishing sound like surf and had the quality of a more viscous form of the Mauna Loa fountains. Every now and then spurts of brown fume violently blowing came up through the storm of fountaining. Individual fountains were of the perpetual fountain type, with flings 15 or 20 feet high, but much of the time the cauldron was a roaring abyss of hundreds of fountains indistinguishable as units.

The fountaining area lowered its surface 8 or 10 feet and three torrents rushed to the cauldron from the S channel, central lake and E pool. The E pool stream sloped down as a cascade at a flat angle and made from time to time a standing wave where it joined the turbulence opposite SE station.

The SE cauldron became a fixed feature, with occasional spells of quieting down, and two other places assumed similar sinkhole characters from time to time; namely the valley separating E crag from NE crag and the N end of central lake. The former is the old E pot locality and torrents poured into it from the center and from the N. Occasionally during the day a cascade torrent would develop from the N into the central lake region with violent explosive fountaining in whirlpool fashion making a roar audible for miles. These sinkhole torrents strongly suggestive of the cauldron action at Alika flow source on Mauna Loa.

10:00 a.m. Visited hut monument and Little Beggar corral. Found hut site entirely covered up by short flow practiaclly ended. The main NE flow was pouring down 200 yards W of corral and spreading out for a mile in the Waldron's Ledge direction in a flow of broken shells (pahoehoe) with aa in between. Two streams and much divergence and distribution. Streams rapid down slope of Halemaumau dome, slower below. The rapid streams carry rafts of pahoehoe crust which whirl and break and tear, and the standing rapids and obstructing hummocks suggest Alika. Margins below a spreading paste of aa and shells, middle pushes forward as a rough pahoehoe.

11:00 a.m. Returned to S region. Showers of Pele's hair and tears and grit along pressure ridge. Torrents still rushing from W end ridge and from SW rift fountain. Flows extending far toward S bay of Kilauea.

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Hawaiian Volcano Observatory

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Field Jottings.
Estimated by marker rate of flow middle S stream 4 seconds per meter. (100 yards from cascade over pressure ridge.

Rate of NE flow W of Little Beggar on steep slope 0.2 second per meter. On flat below became semi-aa at sides and flow like first above (4 seconds per meter).

Foundry smell same as Alika.

12 noon. From H.V.O. Halemaumau seen to be a new slag-heap pool, NE crag sinking and diminishing, new edge all around N, NE, NNW and SW, protruding NW and SW station rims and NE and S rims. Violent orange fountains SE and center; brown fume.

2:30 p.m. From Uwekahuna. Intensely violent fountaining in central lake with torrent inrush from the N. Roar loud and inrush doubtless from SW and SE making of the central lake a churning sinkhole for a quarter of an hour or more. This quieted down and similar activity as seen in the morning was resumed at SE cauldron. All the time there was a cascading into the E central sinkhole from N, S and W, the yellowish fume rising pronouncedly from this place and from the other sinkholes whenever they were in action. The E central sinkhole appears to be slowly engulfing the NE crag which is getting smaller.

The W pond has a large grotto against the W crag on S side of pond. The SW pond fountaining moderately, like the E pond. Little activity seen in the NE overflow or the NW one. The latter passes back of NW station in a southwesterly direction. The rift cone fountain continues unabated making two main flows, one SSW and the other SE. The cascade flow from W end of pressure ridge also pours off unceasingly to the SE. Evidently the southeastward drainage from the SW side of the pit is to be the dominant channel of release at present.

No trace of smoke or any activity whatever in direction of Kau Desert.

6:00 p.m. Returned to pit and found all features much the same as in morning with color effects in fume and intensity of luminosity at churning cauldrons very high, perhaps 1200° C. Cascade pouring around N end of E crag mass into the E central sinkhole, above which rose greenish fume changing to salmon and rose-colored above. Same effect above SE cauldron and the downrush of torrents from S channel, through SE arm from central lake, and from E pond still steeper than in morning. Fountain fling has built rampart at SE station and made short flows a few feet back across trail; other short driblet flows N of SE station. Floods on N side of the NE station high ground have encroached still higher and are close to NE station and only about 6 feet below station. Pooled area cracking and foundering N of this region.

Passing along S side of pressure ridge, met incessant bombardment of flying grit and Pele's tears from the big fountains of the SE cauldron. Three meandering streams

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 Day Friday Date March 18, 1921

flowing southeastward from the SW sources and encroaching on terrane in automobile terminus region and the gravel peninsula, one tongue of flow moving eastward along contact between 1894 lava and the gravel. This tongue threatened the road. Another front has flowed into SE bay of Kilauea and threatens the algae locality.

8:00 p.m. From Uwekahuna. NE and NW flows barely glowing in spots. A bright flood, apparently a standing pool, extends from Halemaumau in a hook around the NE side of the high ground near NE station. Halemaumau otherwise is a circular fill of the saucer representing the pit, with gleaming lines concentric with the pit over the floors, and scintillating fountains over the pools. SE and E central cauldrons and the W crag grotto places of violent fountaining with the green and salmon colored fume rising above and the activity changing in intensity from time to time, the brilliant meandering streams from the flows from the SW sources and the unchanging mottled dome of glowing melt ever welling up at the SW rift cone are the conspicuous features of the southern part of Kilauea crater. More and more the liquid is dominating the situation and the crags are becoming islands in the melt. Have never seen Halemaumau so brilliant, large and continuous a sheet of melt overflooding its rim. Same activity continued all night.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

PHOTOGRAPH RECORD Day Friday Date March 18, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
7a.m.	E of S sad.	SE pool	1			f/7	1/50	Stereo Kodak
	W of Hal. S	cascade, pressure ridge	2			"	"	"
7:15 a	SW rift	Dome fountain (SW cone)	3			"	"	"
		SW cone fountain, looking S	4			"	"	"
7:30 a	NE	NW	5	W P	8x	f/11	1	P
	NE	S	6	"	"	"	"	"
7:40 a	NE hills	Flow by hut	7	"	"	"	"	"
7:50 a	"	Burning hut	8	"	"	"	"	"
8:15 a	SE	Near fling fountain (30 feet)	9			f/7	1/100	Stereo Kodak
9+a.m.		Violent fountaining SE sinkhole	10			"	"	"
"		same	11			"	"	"
9:30 a		General view with Alex. SE pressure ridge	12			f/8	1/50	"
		Cascade from E pond to sinkhole	13			f/7	1/100	"
9:45 a	SE rim (pres. ridge)	Central lake	14			7/8	1/50	"

2:30p.m. from Uwekahuna: (niche under trig sta) -- Wollensak-Graphic camera with focal plane graflex shutter, 16-inch. Vitax lens, built at Station.

Halemaumau	15	W P $6\frac{1}{2}$x$8\frac{1}{3}$	A	f/32	1
Desert	16	"	"	"	"
Left of Halemaumau	17	"	"	"	"

15, 16 & 17 in panorama, using Iris shutter in lens and Antinous release.

T A J

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PHOTOGRAPH RECORD

Day Friday Date March 18,1921

t	sta	subject	no	pl	scr	stop	ex	cam
6:15 p	S end NE heap	SE fountains	1a	film		U.S.4	3	Kodak No.3
	N end NE heap	NW crag	2a	"			9 min	"
		Kilauea floor S of Halemaumau looking at dome fountain from cone on SW rift, source of southern flows	3a	"			5 min	"

I P J

1921, Mar. 18

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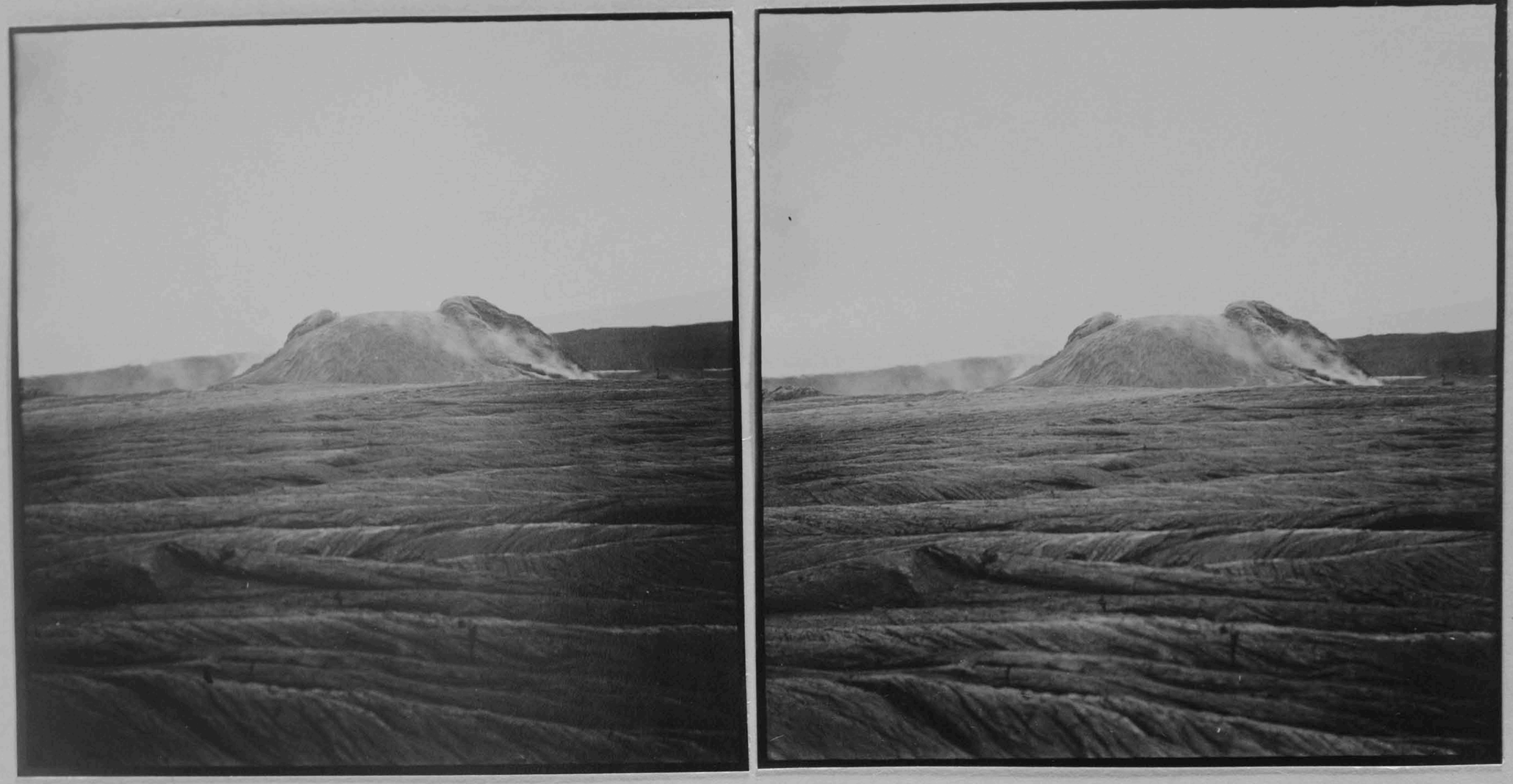
Taj

1921, Mar. 18



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Taz

1921, Mar. 18

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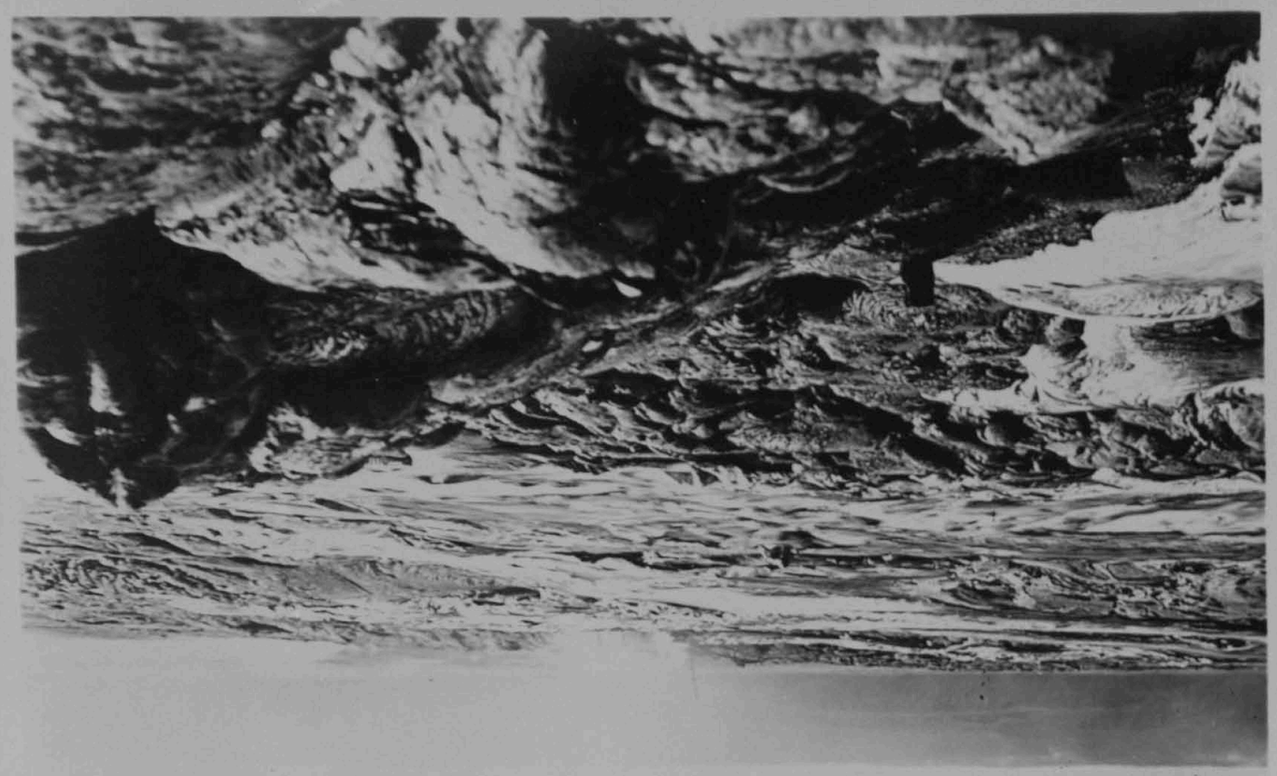

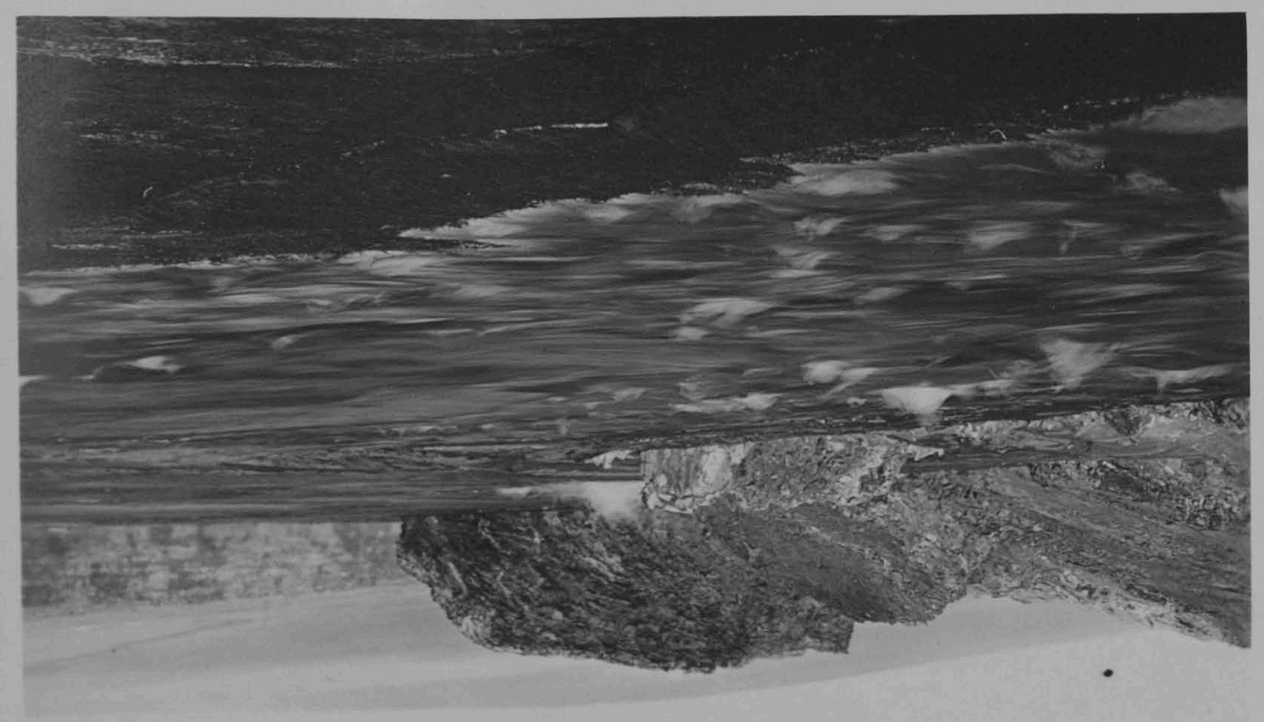

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1921, Mar. 18

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1921, Mar. 18

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J.P.J.

JOURNAL

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Hawaiian Volcano Observatory
Day Saturday Date March 19,1921

1 to 4 p.m. Bright day. Standing double fountain at SW lower rift cone, and another vent flowing just below upper cone. Cascades at W end of S prëssure ridge replaced by a long straight-topped rampart, with large fountains in grotto on lake side.

SE cauldron continuous roaring fountains. Rise and fall of the sloping torrent from E lake against bank every one or two minutes, the rise beginning with the backing up of a standing wave and culminating with excessive high-flung fountains and escape of gas.

E central cauldron similar but deeper and with three cascades falling into it from W, S and N.

E, S and NE crags now mere low ramparts a few feet above lake. NW crag high (25 feet?) but lowering. W crag mostly a group of big grotto domes. One enormous arched dome against W side of pit.

Flow filling whole SE bay of Kilauea. Shelly pahoehoe, upended slabs, river a marked stream into middle of bay, then ramifies. Flow rapidly advancing along foot of Italian cliff. Aa breakdowns at edge of the great lava heap S of the rift cones, similar to the breakdowns of Mauna Iki.

About 3 p.m. a remarkable mushroom cloud over Mauna Loa.

6:30 p.m. Flow has passed algae locality. Activity of fountaining more distributed but still intense at the cauldrons. Rift fountain undiminished; 8 feet high, 15 feet across.

9:00 p.m. From Uwekahuna.

Marked diminution of the crags. Only NW and W crags conspicuous as islands. Same circular lake with the fountaining tending to lines like travelling fountains, from center to SE and across N part of central lake area.

Halemaumau seen from Uwekahuna:

T A J

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Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Saturday Date March 19,1921

t	sta	subject	no	pl	scr	stop	ex	cam
1-4 p.m.	S of NE	SE cauldron	1	W P 6½x8½	A filter	f/3.8	1/330	Wollensak-Graphic
	"	" "	2	"		"	1/1000	"
	N of SE	" "	3	"		"	1/330	"
	"	" " (nearer lake)	4	"	"	"	1/160	"
	"	" " " "	5	"		"	"	"
	Back of NE	Mauna Loa with mush-room cloud	6	"	"	f/8	1/50	"
	Road	Italian cliff, new flow	7	"	"	f/16	1	"
		No. 4 negative broken.						
								T A J
		Ohia tree growing on face of algae cliff photographed by H.M. Albright, Mar. 29,1920. The white coating on cliff is crust of sul-phates under which the green algae live in warm water. The fila-mentous roots of the ohia tree appear to be feeding onthe algae. This vegetation was des-troyed by the lava flow of March 19, 1921.	8					

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Taj

144

1921, Mar. 19

Tag

2

145

1921, Mar. 19

3

Tag

146

1921, Mar. 19

Tag

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1921, Mar. 19

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1921, Mar. 19

1921, Mar. 19

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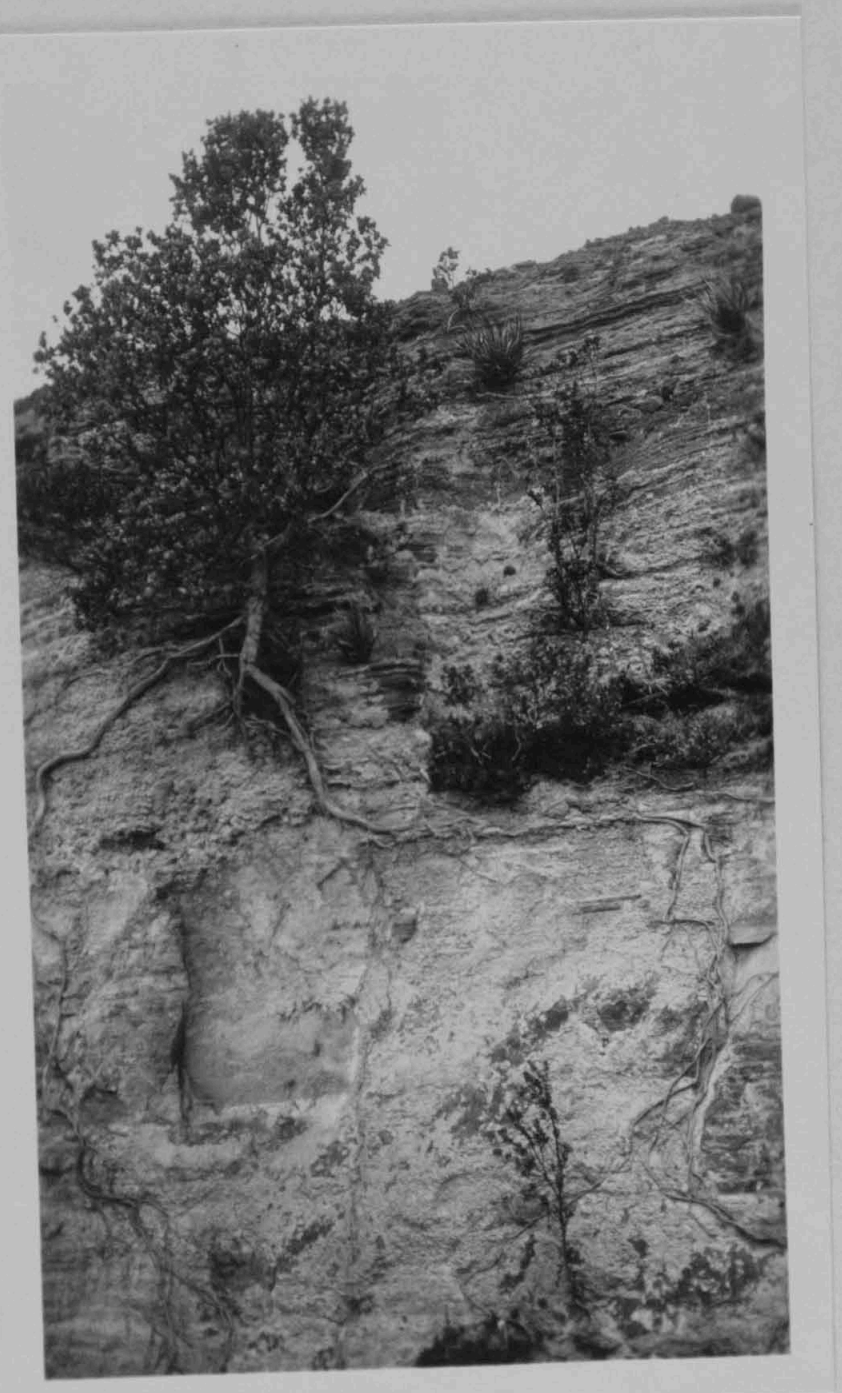
Tag

150

1921, Mar. 19



8. See photograph record of March 19.

JOURNAL

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Hawaiian Volcano Observatory

 Day Sunday Date March 20, 1921

11 a.m. to 3 p.m. Circuit of pit by E and N first time since flows.

The pooled extension of lake NE of pit is margined in places by rampart of piled slabs like the W niche of 1894 and on lake side of this rampart surface is now of flat crusts left by cracking and foundering. This area was the flat hollow back of northeastern stations. The overflow lava here is normal pahoehoe with traces of aa fringes and aa among the slabs. Beyond to the NE the previous slope steepened and here the flows became definite, pouring beyond the pool. At present a new spatter rampart has built up on the lake side of this pseudo-lake at about the site of the NNE station and the rim of pit extends in a curve following the outside of the former N shelf with depression of the present live lava one to two feet below the rim. The N shelf area is smooth skin with a bright edge from which currents stream southward.

The NW crag stands 25 feet high with upper surface dipping northwestward and highest cliff facing S. Gigantic spatter grottoes lie here and at the W crag mass with turbulent fountaining and high flings of melt. There is a similar fountain occasionally present against the NNE rampart.

The SW pool is rather quiet with a scallop of ramparts following the pit edge and occasional large fountains.

The S table stands 5 or 6 feet above the lake level.

The main streaming as before is into the SE cauldron and the E central cauldron shows itself as a center of convergent streaming only occasionally.

The E crag mass is a mere group of grottoes and low ledges and the NE crag is barely visible as an islet amid the variable fountaining of the central region.

The overflooding of the N rim of pit, except for the NW flow, has extended but a short distance in driblet flows, one such flow reaching the N edge of the Postal Rift cavern of August 1919. Other fresh lava has welled up from below in the source pit of that cavern under the remnant half-cone and solidified at the floor level of the cavern without flowing farther. The other Postal Rift cones and caverns of 1919 are mostly covered up with the new flows.

The W niche has been splashed over with new lava reaching the slab rampart of 1894 and passing beyond it in only one place. The front of the niche on the pit side is margined with an enormous half-dome 10 feet high of half-oval form.

The SW rift cones seen from here show fresh driblet flows on the NW side but nothing more, all the main flowing being away to the S and SE. The lower cone was approached to within 25 feet of the big dome fountain on the NE side, the fountain standing about 9 feet above the ground level, shelled over on its western side but standing open and fully 20 feet wide towards the SE where it feeds a steadily running torrent. I walked down to the SW flow heap monument and from that point was able to go in rapidly to the bank of the torrent over the hot lava and take a photograph toward the source fountain. The stream flattened to a festooned wider fan farther down the slope and thence spread out far and wide over the whole southern bay of Kilauea crater with a tendency to pile up on the southwestern side of that bay

and send two or three groups of fanning distributary streams towards the E. The lava is of the slabby pahoehoe type with tendency to become pure pahoehoe in the fields at its extreme front, the aa tendency of the first outrush becoming replaced with this pahoehoe tendency. The eastern end of the S bay is filling very rapidly with this pahoehoe making toes up the gravel and bowlder slopes that lie NE of the algae locality. The fill against the Italian cliff of that locality is fully 15 feet deep above the general level and not counting the deep gullies that lay along the base of the cliff.

On going to the SSW sand valley found that the lava had covered up the previous flows of December and February and extended still farther up the valley into the desert. The new lava had also penetrated the southern rim of Kilauea crater for a short distance along two gulches E of here and at the gulch leading through the ash wall at the extreme southern corner of Kilauea crater the new pahoehoe had advanced 900 feet on a downgrade into the desert and was pushing ahead in a tongue 60 feet wide at a measured rate of one meter in 9 minutes. This was the low wind gap which by measurement stood 12 feet above the previous Kilauea floor of 1894.

All this day and night the fountaining in the pit was plainly seen from the Observatory in extraordinary brilliancy with hundreds of leaping jets and fume columns greenish, yellowish and brownish of the Mauna Loa type. The upper SW rift cone sends up nearly transparent gushes of bluish gas. The flows at night showed two brilliant fanning groups of frontal streams tending northeastward, the one on the right of the gravel peninsula and the other behind it in the eastern part of the S bay. (Photographed 4x5 camera at night).

The roar from the crater is of the same order as that heard in July 1912.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Sunday Date March 20, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11 a.m. to 3 p.m.								
	NNW	W crag	1	W P		f/11	1/10	5x7 Kodak
	NW	New W niche rampart	2	"	8x	f/22	1	"
	W niche	SW rift cones	3	"	"	"	"	"
	W of W niche	W niche fill and crags	4	"	"	"	"	"
		Standing fountain rift cone	5	"		f/6.3	1/100	"
		Stream and fountain rift cone, looking N	6	"		"	"	"
								T A J

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1921, Mar. 20

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1921, Mar. 20

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1921, Mar. 20

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL Day Monday Date March 21, 1921

At 6 a.m. there was slight lowering evident at Halemaumau but this greatly increased after 8 a.m. with very pronounced change in position and volume of fume column. The fume became much whiter and denser and was transferred to a cauldron in the NE region.

9:30 to 11:30 a.m. Visited pit and made circuit by W and N.

The lava fill of S bay of Kilauea crater was now within 10 feet of top of Italian cliff.

The SW arm in pit showed quiet lava about 4 feet below the highest level of the last three days but towards the N and SE everything was changed and the lake had become a Niagara of melt pouring into northern and eastern cauldrons. The recent SE cauldron was replaced by the edge of a fall where the entire content of the SE and SW arms appeared to be tumbling in a steep shute in the direction of the E pond. The several crags were revealed as plastered black islands, mushrooms and irregular blocks protruding through the cascades that were rushing into voids on the northern and eastern sides of the pit.

Visited SW cone source and stream, the latter now two torrents about 10 feet wide and the standing fountain replaced by an oven grotto fountaining in spurts and giving vent to the flow. The upper cone was puffing up hot gas, showed a glowing vent and had considerably enlarged during this crisis. The W crag had mushroom overhang. The SW pool was rather quiet , there were fountains about the W and NW grottoes and the streaming was towards the SW wall of the pit.

At the N everything had changed. A sinking of 30 feet had left an inner edge following the pit side of the N shelf, and here there was a new cauldron with the whole content of the central and western pools pouring down as raging torrents covered with bubble fountains into a turbulent chaos beneath.

On going farther around the pit found another and deeper cauldron occupying the site of the E pond and in the course of half an hour these cauldrons shifted in height and violence, thereby changing somewhat the direction and character of the torrents pouring into them. Three or four dribbling cascades poured across the newly revealed lower portions of the NE and E crags, and the site of the recent E central sinkhole had become merely a depression in the course of the torrents that were rushing down towards the new cauldrons.

2-3 p.m. The cascade from the SE arm to the E pond made a series of about four standing waves which had moulded for themselves sinuous projection in the bench magma of the E crag, these hung with stalactites conforming perfectly with the curvature of the waves. As the greater cascades were from 50 to 100 feet wide and the fall from the central and western pools fully 40 feet, something of the grandeur of the spectacle can be imagined. The whole pit was resolved into three parts: quiet source pools SW and W, rapid torrents center and SE, gigantic cascades and churning cauldrons at the N and E. The northeastern rim of the E pond cauldron where the maximum lowering occurred showed a rounded cushion or hump on the face of the wall just below the upper rampart. On the other side of the cauldron the subsidence had revealed small

lumpy island in the central lake, a large sloping wall of the eastern crag masses and various protuberances, one of them distinctly tabular, which separated the different cascades. These had a very different appearance from the former crags as all the surfaces were bathed with fresh black lava and some of the lower ones were definitely aa.

It was now possible to climb to the top of the big rampart built by the southeast cauldron fountains against the eastern end of the south pressure ridge. This was of glistening black glass showing bright green olivines and its inner face contained a well-marked shallow grotto cavern showing that the wall end of that turbulent bombardment had been merely a normal grotto on a large scale. The pellets, tears and filaments thrown off to leeward are of all shapes from fine shot to rings, dumbbells, etc, and much of the coarse Pele's hair shows blisters and vesicles. Among this material could be found membrane fragments of transparent glass like the wings of insects. Evidently shells of blisters which blew themselves to pieces on the blobs of melt which continued to make gas while they were being thrown up.

The former Pele's Kitchen is not covered by the new flows. The longest of the northwestern overflows extends for a quarter of a mile towards the west wall of Kilauea, following the same course as the flow from the Old Rest House November 1, 1918.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Monday Date March 21, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
2-3p.m.	Back of E	Halemaumau S and W (8 inches)	1		K 1.	f/22	½	Cirkut
	N of NE	to pit (6 inches)	2		"	"	"	"
	Edge E	" " (8 ")	3		"	"	"	"
9:30 to 11:30 a.m.								
		Upstream, rift cone flow	4	W P		f/11	½	P
		Downstream, rift cone flow	5	"		"	"	"
		Near view rift cone source	6	"		"	"	"
	E of S saddle	SE station	7	"		f/8	1/50	"
	S saddle	SW station	8	"		"	"	"
	N sta site	N cauldron	9	"		"	"	"

T A J

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1921. Mar. 21

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL Day Tuesday Date March 22, 1921

In the night the glow prior to midnight very brilliant on fume cloud rising from NE cauldron. Roars could be heard waxing and waning. After midnight this roaring stopped.

10:10 a.m. This morning liquid lava high again and bombardment of SE rampart was again in progress as on Sunday. On reaching auto terminus it was seen that SW-rift cone was again making large dome fountain and the renewed flow was running down the NE face of a slag heap in direction of roadway. The front was close to the lumber pile and toilet and advancing about 2 feet per minute.

Assisted Norton, Vicars and a number of casual visitors, who helped, in moving the lumber to the road where a truck was sent for and it was carried away.

The progress of this tongue of the flow was slow and at 4:30 p.m. about 15 feet from the road. The mechanism of progress has been the filling of the entire southern bay of Kilauea crater with a high crescent-shaped lava heap that tends to spill over northward both in the bay and out on the main crater floor. Yesterday this heap had been so high that the lava had backed up close to the source cone and so was forced to spill northward down the slope of the heap. If the flow goes on this promises to cover the gravel peninsula.

Halemaumau was found streaming from N, NW and NE sides straight across the pit rapidly to the churning cauldron SE with the formation of large spatter domes all along the south and west walls of the crater and against the remnants of the crags. There was much bubble fountaining; and grotto fountaining was pronounced about the western crag masses; a roaring torrent poured from the center through the SE arm. The building up of grotto rampart has progressed along the S pressure ridge from both E and W, promising to submerge entirely the ridge under the new rampart.

Up to 5 p.m. the streaming mechanism was about the same, but at that time the NE cauldron again asserted itself for three-quarters of an hour, then went out of action and the SE activity was resumed. This recurred at 6:05 p.m. and again reversed.

Between 5 and 5:30 p.m. recurrent rumbles of short period could be heard on a quiet toom near the observatory; seen to come from the pit.

Flow across road at 6:15 p.m.

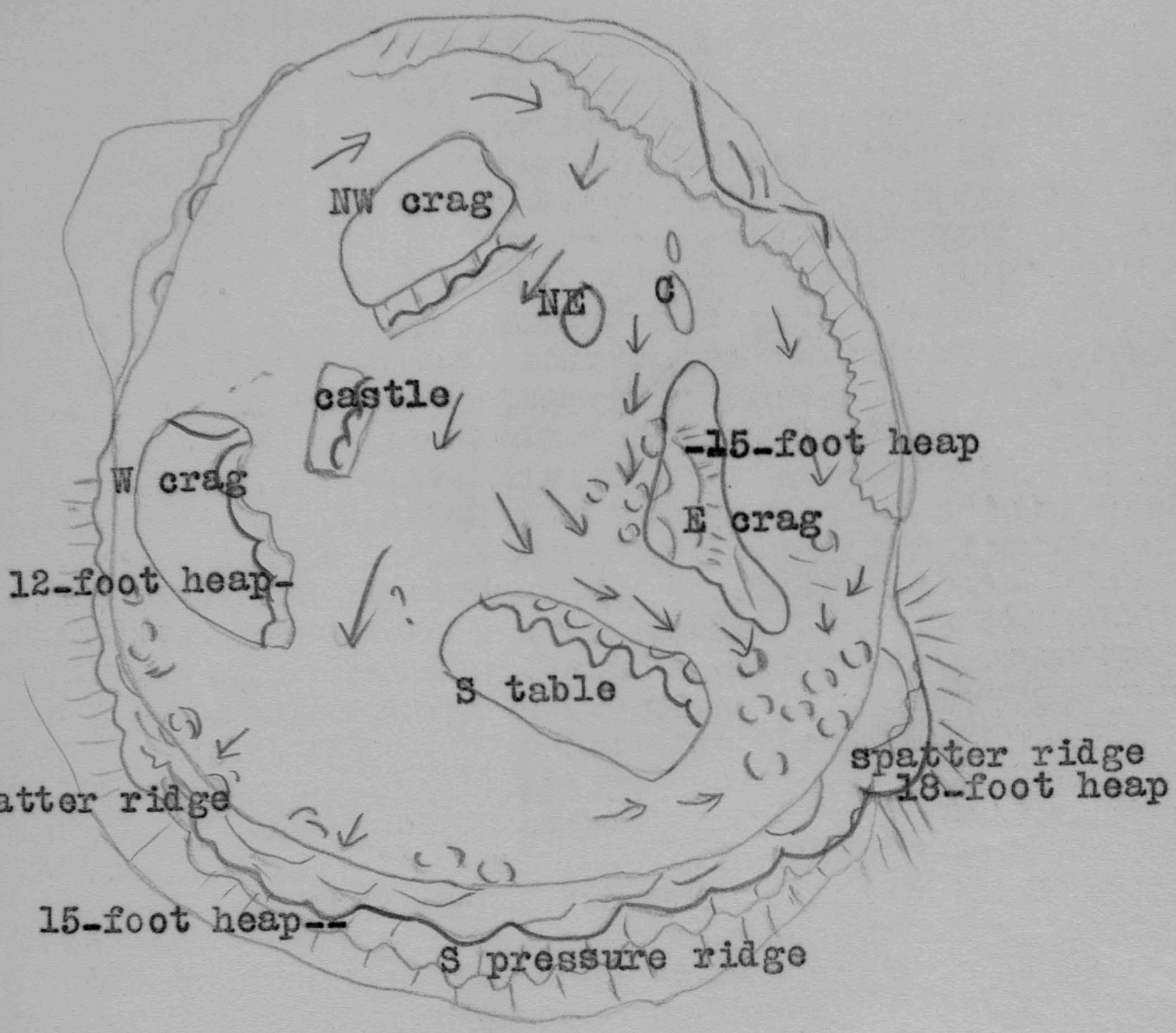
In the evening the pit continued brimming full with the large fountains NW and SE, scintillating leaping fountains elsewhere and the flow continuing to push across the road.

T A J

(Sketch Halemaumau next page)

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date March 22, 1921

Halemaumau at 10:30 a.m.



T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Tuesday Date March 22, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
3 p.m.	From S	end NE heap to SE fountains		film			snap	No. 3 Kodak I P J

1921, Mar. 22

DPJ

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date March 23, 1921

In morning flow in road direction less vigorous. Streaming from NW and NE to center and SE and SW. SE cauldron in action but ramparts mask it. Many fountains middle and SW. Boiling up gas at SE nearly transparent but enough visible to show typical hard cauliflower outlines, rapidly expanding volutes: these condense above to pale brown fume which has quite lost the cauliflower shape. In forenoon liquid nearly overflowing at N.

In afternoon down one foot, and the activity of SE cauldron diminished, replaced by roaring travelling fountains across pit NE to SW and violent grotto activity, especially west. Shifts of level so that SW and center appear to become cauldrons. Cascade seen pouring from W between the remnants of NW and castle crags to the center; also from NE to center.

2:40 p.m. Tornadic whirlwind formed over a cauldron at the central lake end of SE arm, showing spiral and clockwise motion, loud roar. Carried blocks of skin up 40 or 50 feet. Long dust and fume column 125 to 150 feet high, fountains carried up in flame-like swirls, developed breadth of 800 feet and hour-glass form, migrating to NE rim of pit where it became black with debris.

4:30 p.m. Desert flow has gone 814 feet beyond former 900-foot mark and stopped. Nearly cold pahoehoe. Total 1700 feet.

On returning from desert flow crossed new lava of S bay which consists of broken escarpments and pressure ridges in the center with aa tendency and wide fields of flat pooled lava around the sides covered with groups of big blisters from 6 inches to 2 feet in diameter.

At the pit found that a cauldron had formed under the S pressure ridge where the place of upwelling and dark crust had been, in the SW arm. The churning mass was now 30 to 40 feet below the pressure ridge with torrents rushing down into it from E and W, the streaming from the E pond diverging at the SE arm, one branch going down into the cauldron directly and the other passing around the S table to join the river flowing through the SW channel. The northern margins of the pit were quiet and from an edge of crust there started the streaming which cascaded in a succession of falls and rapids across the center and the eastern parts of the pit.

The building up of spatter ramparts has progressed so that all the crags are covered with them except the top of the NW crag, and the profile of the S pressure ridge is changed to that of a long smooth-topped rampart overriding the jagged ridge at the ends and slightly inside of it in the middle, leaving a few saw-tooth remnants of the ridge still sticking up.

The whole eastern brink of Halemaumau for 200 or 300 yards back was covered with fragments carried over by the whirlwinds, some of them 5 or 6 pounds in weight, consisting of shreddy coarse lava folded and twisted and many cigar-like strings and irregular pieces and light shells, the tendency to a single twist being prominent. This material is totally different from the glassy rampart splashes and consists partly of papery crusts and partly of the central fountain flings.

5:30 p.m. About this time a strong whirlwind started in the SW caul-

dron region and migrated back and forth over the hot rapids carrying up fragments 600 or 700 feet and carrying up the fiery material in what appeared to be drawn-up streamers of red flame. Whenever the whirlwind migrated over a crag or the brink of the pit it became blackened with lava particles. Motion was clockwise. This one after action for about 20 minutes with very loud roaring noise expended itself in the region of the SW cones, ending by increasing the diameter of its spirals and gradually thinning. The fine grit during this whirlwind fell half a mile or more to the SE and the larger fragments seen falling were red hot and pasty. As the whirlwind crossed the flow at the standing fountain, it caught up the lava producing spurting fountains. Single fragments on W brink weighed over 40 pounds.

The flow is now building a long slag heap covered with live lava S from the rift cone, the standing fountain being semi-incrusted and the lava spilling over on several sides without making strong progress in any direction. The S bay has entirely ceased flowing and shows slumping around its edges. On the live slag heap occasional spurting fountains occur. The flow at the road covers three-quarters of the distance from the terminus to the gravel beginning at the terminus end and is banked up against and lies over the lava of 1919 extending a few hundred yards beyond the road to the NE and consisting of normal pahoehoe. It was red hot inside but passable. The trail over the 1919 lava beginning at the terminus monument and the upper comfort station are still untouched.

During the evening and night the lake as seen from Observatory was extraordinarily brilliant, lighting the whole Kilauea crater, the thin fume column rising straight in calm air and the continuous roar is like that of July 1912. It grows very strong at times with staccato explosions probably due to a deepening of the cauldrons and greater intensity of cascading. In the quieter intervals there are times of backing up in the cauldrons. So far as could be seen the SW cauldron continued dominant.

Spectroscope on pit in evening from Observatory. No flame detectable by removing slit. Brilliant spectrum from violet to red. Looks like lines when slit put in, could not prove it visually -- too dark an image.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Wednesday Date March 23, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
6 p.m.	ENE	S cauldron	1	W P		f/3.8	1	Woll. Graph. 5x7
	"	Central river	2	"		"	1/25	"
	S pres. ridge	S channel grotto	3	"		"	"	"
	"	SW torrent	4	"		"	"	"

Nos. 3 and 4 in hand.

T A J

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1921, Mar. 23

1

2

Tag

1921, Mar. 23

3

4

Tag

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date March 24, 1921

9:30 a.m. From Uwekahuna SW pool seen to have become a broad cauldron 7 or 8 feet below the general level, and E, N and W regions furnishing quiet lava which cascades across center, between the W crags and between the E and S crags, with standing waves and large roaring fountains in center, to the SW pool which is all boiling and churning and margined by ramparts 15 or 20 feet high. Margins at NE 3 or 4 feet high.

Brown sulphur fume and flame almost incessant from the center. Thin brown fume from the cauldron, blue from SE, whitish from the upper rift cone, white and blue from the live flows, white from the usual vapor jets of Kilauea floor.

Nothing unusual in the Mauna Iki region; vapor jets along the rift.

Both SW cones erupting lava; large flat slag-heap pool S from them where the whole S flow has backed up. Lower cone sending streams NW, SW and E; upper cone sending stream E.

Tendency to whirlwind near W crag; occasional swarms of crust shells go up in air. Weather calm with drift from S. Glassy grit falling at Uwekahuna.

Roar about 10 a.m. augmented, pools lower, NE crag remnants appear in center as round knobs leaning downstream to SW, occasional crashing noise as though crags breaking.

Tip of flow (across road) from road to eastward not more than a quarter mile, easy to go around it.

The crags have small platforms built about their bases. The W crag has accumulations W of it constricting channel. The S table top is lower in its W half than its eastern. W, NW, E and S crags are still of considerable size and may be slightly higher.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Friday Date March 25, 1921

Last night and this morning thunder showers.

11:45 a.m. A quiet spell with large fling fountains and rising lake, cauldron disappears.

12:15 p.m. SW cauldron restored in full activity. Occasional fountaining in SE corner. Crag islands continue to hold their own by building of spatter. Whirlwinds around W pond and many vapor spouts on Kilauea floor.

3:00 p.m. Roar from crater continues loud. Rushing into SW cauldron, large central fountaining turbulence; N. NE and E quiet source region. Three NE islets overturned southwestward with current, with caps tilted to SW:

Fountaining all over SW pool and around SW rim, sometimes lines of travelling fountains. General character quite like July 1912. Level of rim 1 to 10 feet high NE, 8 to 20 feet high SW. Spasms of sinking with crags in relief.

For the last two days much falling grit, droplets, Pele's hair, etc at Volcano House and vicinity; calm air, drift from SW. High fume column, cloudy weather, some fog and rain, dense clouds of steam from fresh flows.

SW rift today flowing slowly, cones mostly crusted.

Evening. Roaring noise less. Centripetal streaming, central and SW fountains.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Friday Date March 25, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
3 p.m.	Uwekahuna to Halemaumau		1	W P	F	f/32	60	Woll. Graph.
	"	" "	2	"	K3	f/45	3	"

T A J

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1921, Mar. 25

2

Fog

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date March 26, 1921

3 to 4 p.m. Today the pit quieter. Many big fountains. Two of the small NE islets have disappeared.

Flowing to S wholly in tunnels. Summit of lava heap near the rift collapsing and making a serrate ridge in profile, found on examination to be an elongate elliptical breakdown or sink. No aa outflow found at the S. SW and W covered with rain steam. Cones not visible on account of steam.

Lowest place in lake under S rampart; here a conflict of currents from E and W. Rampart 20 feet above lake. Violent fountaining, many large fling fountains, border fountains all around SW and W. Wide stretch of open lake from NE to SW with bright lines and some bubbling. Some rush to a cauldron NW of E island.

S table now a dish on account of the building of marginal spatter ramparts 10 or 12 feet high. Lake margin 4 or 5 feet high N and E.

Swift streaming from E and W pools, around E and NW crags and across the lake to SW. Other streaming from E pool to SE arm, divided current to S channel and through SE arm to center.

Enormous perpetual fountains SE sometimes. High flung grotto fountains SW ramparts. Ramparts have been growing. The cinder beds along S side of S rampart -- former S pressure ridge -- becoming deep like ash, black and glassy, with individual olivines slightly coated with glass to be found among the droplets and shreds.

Evening. This evening the pit bright but neither the roar nor the light as great as before. NW crag continues to subside each day a little.

NOTE. This period of activity showed marked changes rapidly in light and heat at circular orifice of pit, other conditions being constant. Radiation reached a maximum for same orifice. Did colors of spectrum of melt change? Are photometric methods in any way applicable? Same exposure on same plate same atmosphere? Given depth lava surface and numbers of fountains?

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date March 27, 1921
Monday " 28, "

March 27.
9:00 a.m. Glimpses of pit showed the lake low, only the middle showing the fountains against the SW wall which appears more than 20 feet high.

2:30 p.m. Same type of activity but lake lower than yesterday; 13 feet down NE, 18 feet under the SW ramparts. Streaming NE to SW, the sources E and W pond sites; meeting point of currents in SW arm, bombardment SW rampart. Spells of rising and falling. Occasional sinkings in center with travelling fountains, violent blowing fountains sending up brown fume. Large overhang grotto on face of W crag, SE side. Crag masses all lower. Currents irregular locally making whirlpools.

6:30 p.m. Uwekahuna. Slight glow in flows of S bay. Otherwise the flows appear to have stopped rather suddenly.. Pit very brilliant. Streaming to SW, travelling fountains. Remarkable lilac coloring to fume. Many fountains; banded bright-line pattern.
No glow at SW rift cones seen from here.
Desert perfectly clear. No sign of flows in desert.

March 28.
10 a,m. to 12 noon. The lake appeared 50 feet down with even spatter lines marking stages of lowering. SW island has reappeared as a small knob. Large grottoes W side of E crag, W end of S table and N side of W crag. Space between remnant of castle crag and NW crag filling up with spatter. Lake turbulent with scores of fountains but not hundreds. Meeting currents across SW pool; occasional inrush to W side of E island. Fountainihg continuous in W crag vicinity and along SW wall. Large fountains in E pool. With the lowering, crags beginning to emerge and a low shelf at the lake level on the N.

8 to 10 p.m. Occasional strong cascading into E central pot and rather strong rushing currents to a point W of SW island. Grotto forming on W side of E pond. Very large and brilliant deep cavernous grotto in N face of W crag. Currents from W pond seen to change from flowing eastward as a cascade past the N end of NW crag to a current in the opposite direction during a rising spell. During a sinking spell large whirlpool developed in NE central area with rotation counter-clockwise. Very even bright-line pattern of streaming southward and westward from northern and eastern sides of pit.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date March 28,1921

t	sta	subject	no	pl	scr	stop	ex	cam
		Pathe Moving Picture apparatus, loaned by Wm. Aldrich, Honolulu. Heliar 2-inch lens. 200 feet of film as follows:						
10 a.m. to noon.								
	South saddle	fountains SW	1			f/8		
	"	E central grotto	2			"		
	E rim	Near fountains	3			"		
	"	Panorama	4			"		
		(Opening 80, two turns per second)						
8 to 10 p.m.		Same apparatus, 400 feet film.						
	South saddle	SW fountains	1	(100 feet approximately)				
	"	Panorama, slower	2	(75 "		"	)	
	"	Cascade into central sinkhole	3	(50 "		"	)	
	E rim	Near fountains, partly slow	4	(50 "		"	)	
	N rim	Streaming and spatter NNE corner	5	(50 "		"	)	
		W crag grotto and W pond, very slow	6	(30 "		"	)	
		Central whirlpool	7	(20 "		"	)	
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date March 29, 1921.
Wednesday " 30, "

March 29.
3:00 p.m. Lake 65 feet more or less below rim and only summit of NW crag visible from Observatory. SW island appears much larger and new island flats are visible in SW channel and at S end of E pond area. Inrush to E central pot as before, spasms of rising and falling, sixty or seventy fountains and occasional lines of travelling fountains. Fume continues thin. The wall veneer has not yet begun to fall away.

March 30.
8:45 a.m. From Uwekahuna. Active grottoes SW side still plainly visible in Halemaumau. Last night strong roaring and bright N central light at 3 a.m. as though cauldron developed. Pit very bright. Now from Uwekahuna with SW wind, E and S crags plainly visible, dense smoke W lighted with glow below, roar moderate, fountain flings.

Blue fume from the two rift cones and from four places in the flow area S of the rift cones. Blue fume again developing at the NE postal locality (near hut stone).

W end of S crag higher now than the E end and appears to be dominant crag of the pit.

Very hot whirl over the bright western glow, evidently a hot place.

Vapor at the usual places along the desert rift.

9:00 a.m. Noise increased and many fountains developed along SW edge. Appears no more than 50 or 60 feet down, perhaps higher than yesterday.

Whirlwind with noisy blasts developed at E central pot throwing up black fragments. Crashing noise, something between an explosion and a puff.

Fume as a whole still thin.

T A J

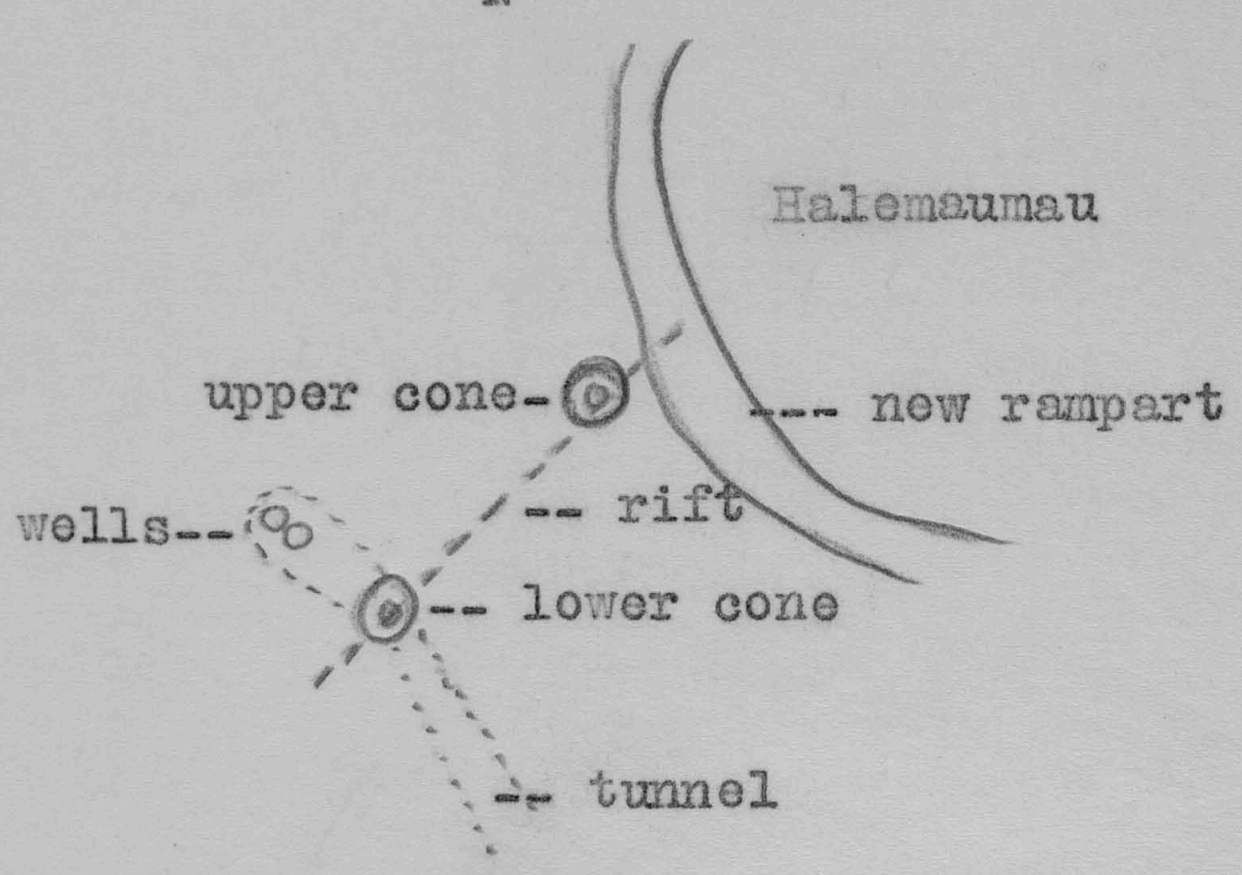
U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL Day Thursday Date March 31, 1921

Roaring from time to time last night.
This morning clusters of Pele's hair were falling as far as Crater Hotel.

2-3 p.m. Visited SW rift cones and found upper one with many heavy stalactites inside a large summit opening, cherry red glow, hot gas rising. Beginnings of colored salts depositing, with acrid gas. All the old salt deposits covered with fresh lava.

Lower rift cone was a slight eminence with summit opening 4 feet across. Looking inside downward to the NW one could see a large chamber below for 40 feet of depth. This cavern was 15 or 20 feet wide with two wells in its western bottom area, each 5 feet across, brightly glowing and hung with stalactites. These separated by a partition hung with stalactites. Immediately under the opening of cone is a tumble of rocks and a tunnel with opening 8 feet high leading to the flow SE; the cone is thus over the beginning of the flow, and the source wells are farther NW, and aligned across the rift, thus:



The ground around the two rift cones is nearly horizontal and the region to the SW all filled up level. Blue fume rising from vents in the flow to the S. Ground all around S and SW sides of Halemaumau deeply filled with glassy cinder and Pele's hair, including blister shells and membranes of glass; deposit in places 2 feet deep.

High new rampart all along SW rim Halemaumau inside of old edge and mostly burying old edge; wall-crack fuming back of this rampart all along S and SW, hot gas and steam rising. Abundant steam S and SSW.

Lake 100 feet down at S, 90 feet SW, 70 to 80 NNE. Much fountaining in lines; small cauldrons with cascades into holes surrounded by spatter humps E of center and at margin ESE (a little N of the SE cauldron). Line of travel fountains leading to S end of W pond from center. Streaming mostly eastward, some motionless areas with bright lines. Spells of sinking. Two islands W of center, large island

Hawaiian Volcano Observatory

JOURNAL

Day Friday Date April 1, 1921
Saturday " 2, "

April 1.
5:30 a.m. Smart earthquake felt.
More fume from pit which is comparatively quiet.

10:00 a.m. Lake lower, cascade into E sinkhole, many hot fountains, some lines of travelling fountains. Crags more in relief and enlarging their basements at the expense of the dwindling lake. Former castle crag and NW crag are one; W crag against W wall; E crag enlarged northward; new E central island equivalent to old NE crag. This and the central island have points extending southward. S table crag surrounded by high cliffs again. Lower tumbled shelf N being revealed wider as lake subsides.

Fume from pit thick in morning, thin in afternoon.

April 2.
10:30 a.m. and 9:30 p.m.

Lake and crags appear lower. Small islands in pit enlarging. Currents various. Many lines of fountains, whirlpool near W crag. Hole receiving cascades SE. Crags standing in greater relief. Fume increasing. Roar still audible at Observatory. Veneer of recent rampart material has fallen during day and made talus SE, due to undermining and jar of the cascade.

Glow in SW rift cones appears as though lava in the rift were higher. Glow much brighter in upper cone, bright yellow, with tiers of large grape-bunch stalactites. Glow brighter in lower cone; cavern from this cone southward has broken down 100 yards away from vent, making a channel and showing a tube, dark. Rumbling noise in upper cone, which shows at night a large blue and yellow flickering flame.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Friday Date April 1, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10-11	a.m.	For location SE station. New stone heap SE station. Set up rod NE station.						
	Hut stone		0					5 ft.
	NE	NE	0					
	NE	Hut stone	0					
	SE	" "	0					
	Hut stone to SE station (5 ft. above ground)		L 31 26	+1 25	+01			
	NE	to same	R 94 10	-0 22	00	412		
	"	S tip central island (lake level)	R171 18	-8 32	00	852	128	
	SE	same	L129 09	-8 07	+02	860	123	
	NE	Summit S crag	R137 51	-3 30	00	803	49	
	SE	same	L160 59	-4 36	+02	579	47	
	NE	Summit N crag	R185 37	-3 48	00	878	58	
	SE	same	L117 50	-3 13	+03	977	56	

Distance new SE from Hut stone -- 787 (SE is 19.5' above Hut stone)
" " " " NE -- 414 (SE is 3.0' below NE)
Elevation SE -- 3723

T A J

Vault containing first Hilo seismograph.

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date April 3, 1921

3:30 p.m. Lake appears lower and more smoky. At 9:30 a.m. heavy avalanche E taking down most of E inner shelf out to old wall. Cloud of red dust. Much of former crag topography restored as the lake subsides faster than the crags which had been drowned. E pot-hole and cascade destroyed by the long new talus from avalanches. E pond again separated off, the E crag mass having extended itself northward. Lower shelf N composed of a smoking jumble.

Former NW crag and castle crag, now a single north crag mass, joined to wall N. Cascade from W pond pouring through gap towards center of pit between W and N crag masses. Central lake rose and this cascade stopped. Fountaining in central and SW regions is slowly diminishing and large areas show bright lines and streaming with slowly parting crusts.

SW island against wall of pit, a large mass. The former S peak again restored as a low mass separated from W end of S table crag by a narrow channel. Two central islands and one SW of center. E central crag has two peaks corresponding to the N and S peaks of former NE crag; between this mass and the E crag is the E central pot where the recent cauldron and cascade played, now narrowing to a small well.

Upper SW rift cone glowing brightly; lower one less bright than before inside, the wells becoming cherry red.

Bright glow from pit at night, noise still faintly audible in still air from Observatory.

Cascade under SE face of W crag most of the time.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Monday Date April 4, 1921

10:00 a.m. During survey at new NE flat station ground trembled and level bubble changed. Marginal shelves and ramparts cracking away. Two avalanches NE. Old W and NW stations preserved. SW station buried under rampart. S saddle station has rampart in front of it. Old SE station buried under rampart. NE station preserved. Old NNE station under rampart. Old N station flooded and buried. Old upper N shelf shows its outline backed by a slight marginal ridge, and the new pit follows its inner margin.

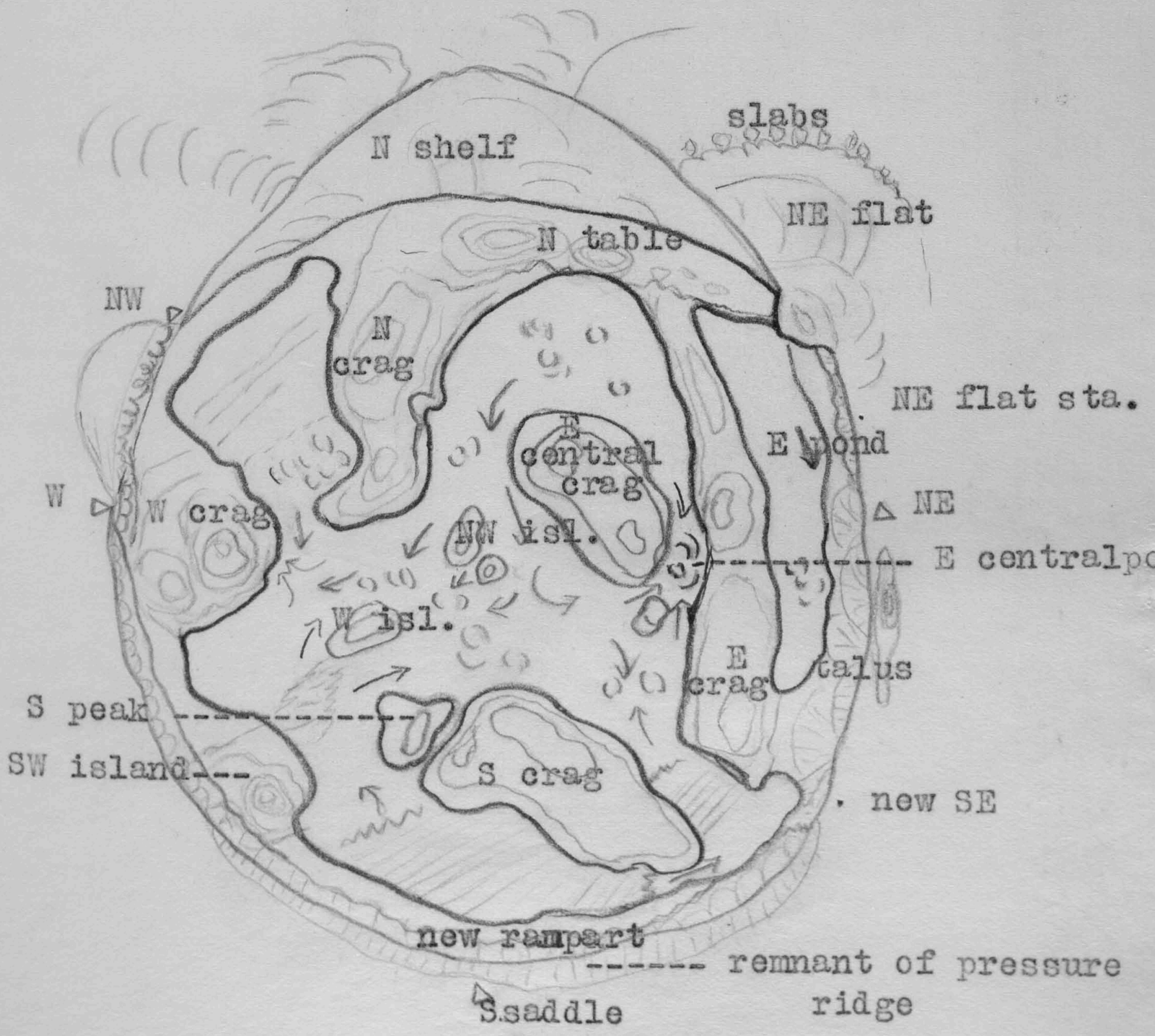
SW cones sending up transparent cauliflowers of gas. Fume in pit diffuse but troublesome, heaviest smoke at N tumble.

Fountaining diminishing. Streaming various. Much dome fountaining and some perpetual fountains. Bubble fountains and whirls. Islands enlarging. Cove elevated above lake in SE face of NW crag mass. Cascades into E central pot again, in place of the E wall cascade which was stopped by the avalanches.

Curved break, like a pit, in the W side of NW crag mass, making a cove of the W pond.

S channel under S wall of pit and SW arm becoming crusted and SE arm very sluggish. Streaming eastward and westward from center.

N



T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

SURVEY RECORD

Day Monday Date April 4, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10 a.m.								
	NE	NE	0					
	flat	NE flat 3723 ft. above sea level (NE -3.8 ft.)						
		" " 152 ft. from NE						
	New	NE	0					
	SE	NE flat (ground at)	L 8 05	-0 32	+02			4.4 ft.
	"	NE (h.i. above ground at)	0 00	+1 27	+3			
NE	flat	New SE (ground at)	R 22 03	-0 19	+3			
	" "	S end E crag	R 32 43	-9 52	+3	564	-98	
	SE	same	L100 51					
NE	flat	Summit S crag	R 64 30	-4 25	0	845	65	
	SE	" " "	L104 57					
NE	flat	Summit E central crag (old NE peak)	R 93 00	-12 29	+5	516	-114	
	SE	same	L 59 39					
NE	flat	S point central isl.	R 92 33	-11 34	0	754	154	
	SE	same	L 75 00			757		
NE	flat	Summit Nw island	R100 52	-8 30	0	783	-116	
	SE	same	L 70 32					
NE	flat	Summit W island	R 84 32	-7 19	0	627	-78	
	SE	same	L 89 40					
NE	flat	Summit central isl.	R 96 11	-10 36	0	709	-131	
	SE	same	L 70,41					
NE	flat	Summit W crag	R104 52	-4 08	0	1044	-75	
	SE	same	L 74 37					
NE	flat	Summit NW crag (S) (castle crag)	R111 49	-5 00	0	785	-69	
	SE	same	L 63 05					
NE	flat	Summit NW crag (N)	R121 19	-5 26	0	771	-73	
	SE	same	L 56 26					
NE	flat	Summit N tumble	R143 44	-5 02	0	593	-51	
	SE	same	L 38 13					
NE	flat	Summit SW peak (W end S table)	R 71 06	-8 13	0	830	-119	
	SE	same	L 97 04	(about)				
NE	flat	N knob E crag	R 92 45	-18 19	0	284	-94	
	SE	same	L 38 21					
NE	flat	Summit Sw island	70 17ca			1102		
	SE	same	L110 25	-6 17	+7	843	-84	
NE	flat	Lake N end W island	R 89 25	-10 19	0	844	153	
	SE	same	L 81 43					
	"	S saddle stake(ground at) (elevation 3734')	L142 09	+1 21	+7	531	+6 above h.i. =5	

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Monday Date April 4, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
4:45 p.m.		Z. A. lens						
		Upper rift cone stalactites glowing. 30 feet away	1	W P	F	f/16	10	6½x8½
		Same	2	"		f/32	1	"
		Lower rift cone interior	3	"	K2	f/16	5	"
								T A J

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Tag

189

1921, Apr. 4

2

Jag

190

1921, apr. 4

1921, Apr. 4

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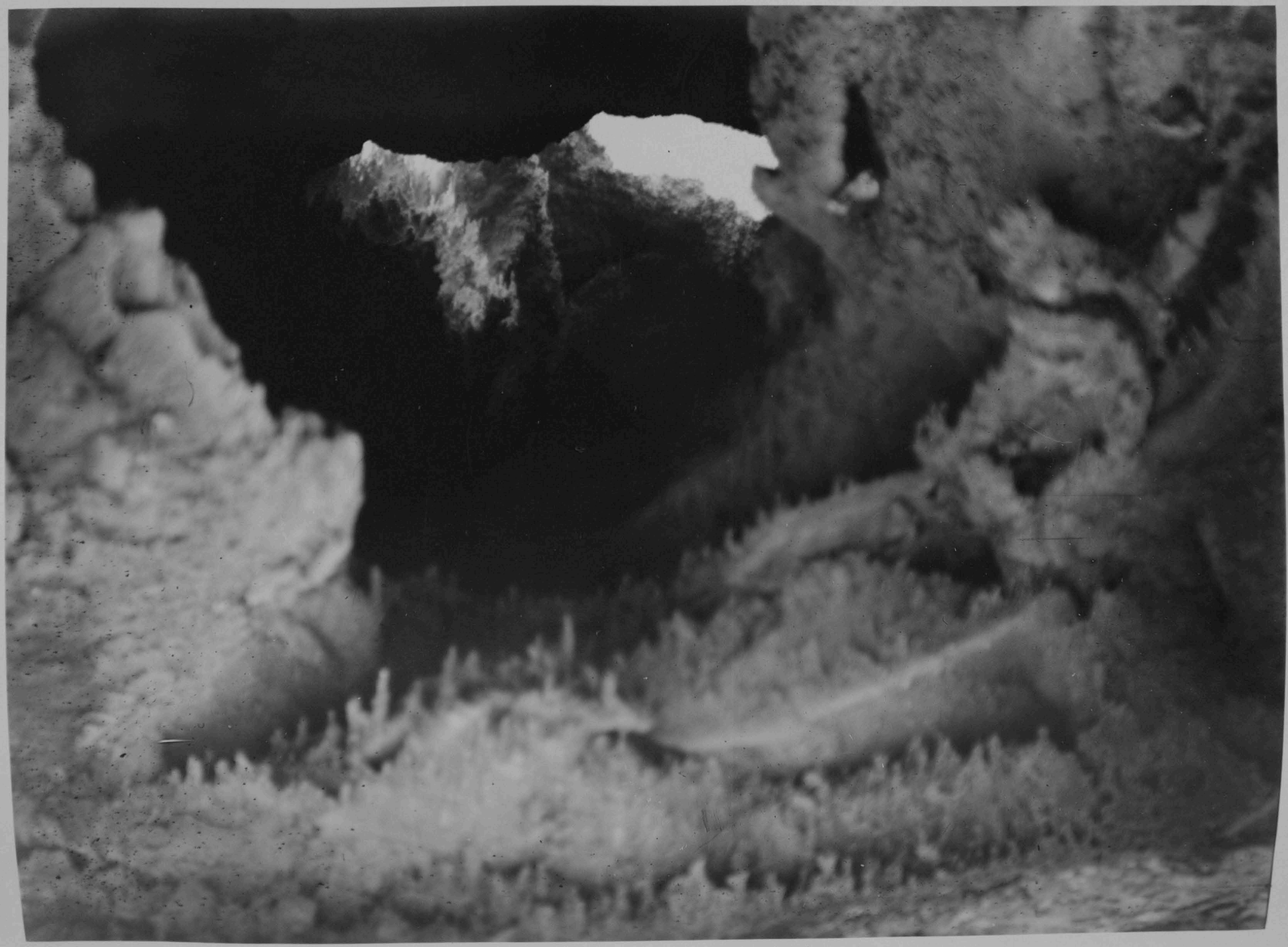

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Wednesday Date April 6, 1921

9:15 a.m. Map Notes.

Large talus W and WSW, upper rampart has fallen.
Extension of SW island against wall S.
Platform accumulations and a corner of E crag westward at N end keeping SE arm fairly uniform width.
SW arm crusted except a few border grottoes.
Islet off W end of E central crag.
S side S crag widens at base.
Vertical angle SW rim to talus edge of lake SW 44°.
Point building out from W corner S crag.
SW arm a raised shoal between SW island and S crag and thence southeastward.
Inner shelves N and promontories all the way from W pond to E pond, just under upper edge of pit.
N cove of lake a narrow affair now, with flat platforms extending S from N tumble.
NW crag, S summit a swollen mass apparently unstable as seen from N.
Wide talus and platforms SW.
No channel visible now, only a cove, between E central cove and E crag mass on N side.
Small cascade still pouring into E central pot S side of E central crag.
Streaming NW in SE channel.
Whirlpools and multiple fountaining in center.
Hot skins and much fountaining W of center.
Dense fume from wall cracks and crags, makes seeing very difficult.
Upper SW rift cone still glowing inside but less brightly.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date April 6, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:15 a	NE flat	NE	0					
	NW	W	0					
	NE flat	Summit W crag	R104 34	-4 43	0	1044	-87	
	NW	W end W island (lake level)	L 44 10	-16 06	0	595	-172	
	NW	S summit N crag	L 62 43	-15 49	0	313	-88	
	NW	S " S "	L 50 12	-5 01	0	955	-84	
								T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date April 7, 1921
Friday " 8, "

April 7.
4:00 p.m.

Finch and Hines report little seeing; rainy; one fountain in SE arm; streaming to center from SE arm.

Glow at night redder but still bright. Fume white from pit, recalls 1912 conditions.

NOTE. During this period after the high level, the open cracks back of the line of edge ramparts in rim of Halemaumau SW make crackling noise like burning wood, and the spatter droplets reheating snap like Prince Rupert drops in the deep banks of glass cinder.

April 8.
7:00 p.m.

Seeing fair by night light. Little seeing in daylight owing to fume.

SE arm bubbling, dark crust edge in S channel. SW arm crusted, streaming E.

E pond streaming S to cascade into hole under the SE talus.

In center trend of streaming eastward. About thirty fountains in whole pit. Bright-line pattern. Islands large. Some rush of currents to a sinkhole W of SW island.

Banks seen falling in at S crag. Glow cracks in fresh lava NE rim Halemaumau.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date April 8, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
6:20 p	SE	Hut stone	0					
	"	E pond SW point	L 85 27	-28 40	0	325	-178	
	"	N point W island	L137 07	-12 23		852	-186	
		NE flat 4 feet toward center of pit.						
	NE flat	to NE	0					
	" "	SW point E pond	R 50 01	-33 19	0	283	-193	
	" "	N point W island	R 91 31	-11 48		885	-183	
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date April 10, 1921

10;00 a.m. Fume from pit slightly less than Friday.
NE rim has fallen away where glow cracks were. Fume dense from crags and taluses. Large taluses and benches N, W and SW.
SE corner boiling, S end E pool cascading. Bases of crags and islands enlarging at expense of lake areas. Some sign of new spatter margins around islands.
Thirty fountaining areas. Streamings slow to SW, to central crag, to SE arm. SW arm a raised floor 4 feet above lake. Narrow isthmus between W pond and central lake. Lake appears stationary. Best seeing west.
Upper rift cone and stalactites still bright glow.

Avalanche dust S reported seen at 8:40 a.m.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date April 10, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
10 a.m.		Large blisters on fresh flow in S bay Kilauea (scale 1 ft)		W P	8x	f/16	1	P T A J

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1921, Apr. 10

Taj

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date April 11, 1921

5:30 p.m. Fume dense but appeared slightly less after nightfall and glow brighter.

SW rift cones continue to glow inside without much change. Lower cone shows glow in the eastern of the two inner wells. Very faint glow in the western. Upper cone even brighter than previous day, and flaming, with slight roar of fountains below.

SW bay in Halemaumau shows no apparent change in level. Pattern of polyhedral skins and streaming divergent from centers in the several pools. Conflicting currents with travelling fountains.

Center island has a hook to the E at its N end. Channel wider between it and NW island. Dark crust between W island and W shore.

Streaming toward center in SE arm meeting current from center. Streaming to NE in NE arm. Streaming out from a shoreline crust in many places. Streaming to marginal grottoes on all sides of W pond.

Partition 12 feet high between W pond and central pool. Platform of SW arm valley begins E of S peak, that is, opposite W end of S table crag. W of here the S bay has a curved shore against a wide series of talus promontories along base of SW wall of pit.

Grottoes noisy and blowing showing a new gas pressure, but no marked new shoreline platforms. About fifteen fountaining patches in pit, fewer in number but more intense, with much "rosette" gold pattern in skins.

E pond has reversed streaming and stopped cascading. Streaming N to grottoes built across middle of pond, isolating southern half. A glowing pot in crag on W side of pond. N of the new middle partition, a narrow pool against wall of pit, streaming towards wall and building there a spatter edge.

E end of SE arm streaming out from bank and towards NW, reversing previous streaming.

All of this activity suggests the beginning of a new gas pressure.

T A J

200

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date April 12, 1921
Wednesday " 13, "
Thursday " 14, "

April 12.
5:00 p.m.

New rampart at S saddle, and east and west from there for 200 yards has fallen in making large talus all along S bottom.

From SW lake looks lower and activity much the same as before.

SW rift cones the same.

From E the E pond seen streaming into a hole over wall-crack farther N than former cascade.

SE arm fountaining.

Pit more fumy.

April 13.

Pit more fumy in forenoon.

In evening and night fume slightly thinner and glow less red.

April 14.

Fume appears a little thinner.

Afternoon.

Returned by pit from trip photographing rift chasm, Kau Desert.

Red glow in stalactite chamber upper cone SW.

Interior of pit visible from NW, smoky elsewhere. Level and action appears the same. Spit built W from NW island. W island becoming attached to SSW shore. Streamings and conflicting fountains. Little visible of E pond.

General impression is that lava is a little lower and pit smokier.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Thursday Date April 14, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
3:15 p.m.		Looking along great rift chasm NE. Kau Desert.	1	W P	8x	f/22	1	5x7
		Marker and small cracks looking SW	2	"	"	"	"	"
		Upper part of rift looking N	3	"	"	"	"	"
		Middle of chasm looking SW	4	"	"	f/16	"	"
		W side chasm looking south	5	"	"	"	"	"

T A J

1921, Apr. 14

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1921, Apr. 14

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1921, Apr. 14

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Jay

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date April 16, 1921
Sunday " 17, "
Monday " 18, "

April 16.
9:00 p.m.

Fume a little thinner.
Golden rosette patterns on lakes. Streaming W in SE arm, N in E lake, out of S cove of SW bay, into hole in wall at W crag, various with conflict and lines of fountains in center, various in W pond, out of center to N coves meeting currents from the ends of coves.
Isolated pool NE under wall. Partition 5 feet high between W pond and central lake. Elsewhere level appears the same. Fewer fountains and those small. New N shelves have been formed 50 or 70 feet down with abutments NNE and NNW by the recent subsidence.

April 17.
Afternoon.

Trip to Coan locality E of old Halfway House, 1868 flow of Kilauea, to collect specimens. Found about five areas close together along crack, blow-cones in and on crack just as at upper locality of 1919. Aa and pahoehoe at largest cone. Aa facies in one or two places, most of area a rough pahoehoe.
See letter F. A. Danforth, U.S.G.S. Topographic Engineer, April 4, 1921.
Investigation as to 1855 origin of so-called 1868 flow at ball-lava locality.

April 18,
10:30 a.m.

Lakes appear a few feet lower and partition between central lake and W pond 12 feet or more high. Fountaining and streaming activity sluggish. Islet between the E spit of central island and the E crag mass. Shoreline terraces of lowering levels SW. Flat island shoal W of NW island. Fume dense. SW rampart has fallen in, but large blocks of the high rampart ridge still persist SSW, SE, NNE, NW and W, with wall-crack broken through their back slopes.
Stalactite grotto and well of the two SW rift cones still glowing, less brightly.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date April 19, 1921
Wednesday " 20, "
Thursday " 21, "

April 19.
9:00 p.m.

Lakes brighter with appearance of upwelling and pouring out into pit from several central and western pots and from under SW bank. Effect of rapids from crusted narrows SE to center. Many currents with golden pattern of swift stresming ih several places. Fountains bubbling and lines of fountains center to SW.

Large flame banner, very lean gas, over upper SW rift cone, very bright stalactites.

April 20.
6-7 p.m.

Fume dense. Some rocks heard falling.

Streaming out from E sinkhole into E pond and SE pool. Line of fountains conspicuous radial from center across SW arm. Streamings various. Fountains mostly small. Lake appears lower.

Upper rift cone grotto very bright and flaming.

NE postal rift area making blue smoke and hot enough to scorch cards.

April 21.
6:00 p.m.

Lakes appear rising (?) because increasingly crusted. Large crust W pond with streaming E and W from it. Long crust across central lake to WSW side of pit with streamings N and S from it. Fountains small. Eight small puddles in crust in different places. Crust across SE channel, streaming SE and NW from it. Streaming out from E sinkhole (talus under SE station).

Large block of veneer under NW station at base of wall has fallen making talus NNW.

Upper rift cone bright.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date April 19, 1921

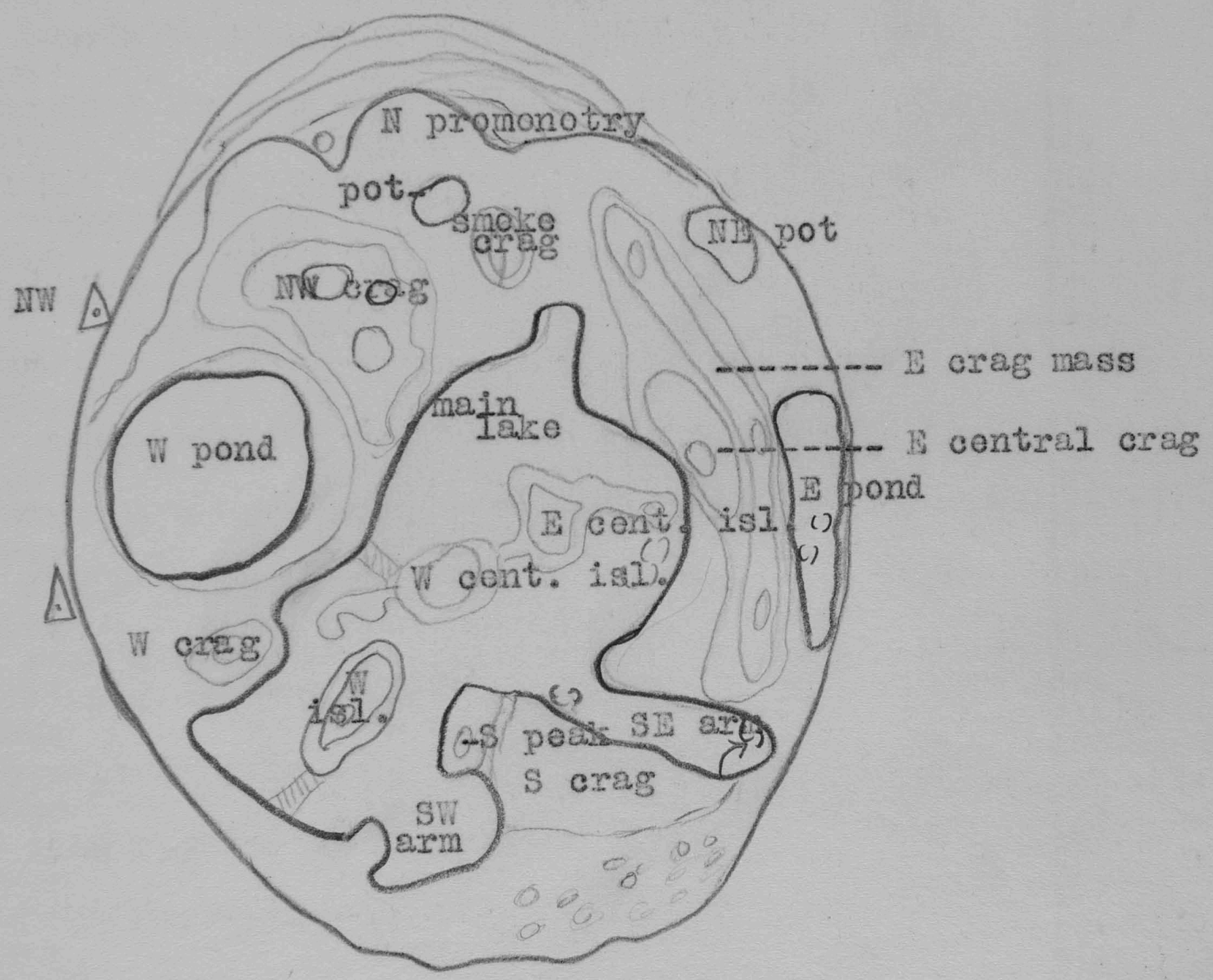
t	sta	pt	hor	vert	lev	dist	elev	h. i.
8:45 p	NW	W	0					
	W	NW	0					
	NW	Summit W island	L 36 00	-13 33	0	690	-166	
	W	same	R104 39					
	NW	Point S crag (lake)	L 44 12	-15 57	0	735	-196	
	W	same	R 98 46					
	NW	N summit NW crag	L 81 14	-19 52	0	258	93	
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date April 23, 1921

4 to 5 p.m. Very smoky. Seeing on leeward and NW side.
Twenty-five fountaining pools W of E crag mass. Some rock-falls heard. Crusts between puddles. Islands more or less connected by bridges. Large bowlder talus fills S wall-valley. North region much choked with crags and talus. East pond fountaining and barely visible. Streaming out of S cove at end of SE arm. Two central islands connected.



T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date April 24, 1921
Monday " 25, "
Tuesday " 26, "

April 24. Glow more dim and red, and fume thicker.
In the night p.m. the NNE projecting spatter lump on the edge of pit largely fell away.

April 25.
2:30 p.m. A large avalanche cloud seen to shoot up from S and W margin. More of edge rampart fell.

April 26.
4:15 p.m. Lower SW rift cone shows faint glow in easternmost of the two wells. Upper cone with stalactites still glowing brightly.
Pit more choked and liquid lower. Some rocks heard falling. Numerous fountaining puddles in crust areas. Light wind makes it possible to see northern interior of pit. North third of bottom covered with downsloping crag matter transversely crevassed, glowing pot in NE part. Streaming inrush to bank at a pointed cove N. E pond larger with much bubble fountaining and variable streaming. Partition E of W pond higher. Each puddle among the many crags has an outflow from crust and a few fountains.
Streaming very irregular amid twelve crag peaks, more or less.
Edge of pit more fallen away SSW and NNE. Pot glowing in tumble NNE,.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date April 26, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
4:15 p	W	Fountaining patch W point of S crag mass		-24 17		522	236	
	NW	same		-18 00		741	241	
	NW	Summit W island		-15 22		674	186	
	NW	Fountain against E central crag		-20 07		683	250	
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

JOURNAL

Hawaiian Volcano Observatory

Day Wednesday Date April 27, 1921
Day Friday Date " 29, "

April 27.
8:00 p.m.

S saddle has developed steam again in old crack at edge of pit. Red glow in cracks back from edge of pit NNE.

Slow streaming outward in SW arm. Twenty puddles in pit, much crust. No sign of rising. Fountaining plashing noises. Breaking crusts. Flame hole in tumble NNE. E pond has numerous bubble fountains. About fifteen peaks among the pools from 30 to 60 feet high and the NW, W, S and E crag masses are still higher. Pit remarkably choked with numerous crags. Rocks sliding. Opening in fume N between two eddies.

April 29.
5:00 p.m.

Upper SW rift cone grotto as bright as ever.

Lakes appear lower. Twenty puddles in crust, streaming and fountaining W of E crag mass. Streaming out from between E central crag and E crag on NW side.

Opening in fume NNE. Fume hugging walls W and E. W island joined to SW wall and to E central island. Other crags and islands becoming joined by crust bridges. Partition between W pond and central lake no higher. Tendency is to shut off numerous ponds. No grotto construction. Fume dense and sometimes browmish.

The NNE edge block completely fallen and gaping red hot cracks there.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date May 2, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
4:45 p	old W	W end S crag (lake lev.)		-25 57		522	-254	
	"	W base E central crag (lake)		-20 50		661	-252	
	"	Summit W island peak		-25 29		405	-193	

Distances of April 23.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date May 2, 1921
Wednesday " 4, "

May 2.
4:45 p.m.

Only eighteen fountaining patches W of E crag mass. W pond dark. Only six of the patches moderately large. Center and all the bays mostly hard crust. Four open patches in SE arm.

Hissing and spatter margins. Blistered skins. Fresh overlap on talus. Lake is rising. Streaming mostly S. Thinner fume.

Two small fountaining patches in W pond, one at N and one at S end.

In E pond the streaming is westward at N end of the main pool and eastward at S end. No glow can be detected in the NE wall-crack pool. (This pool destroyed by falls from NE rim.)

May 4.
5:00 p.m.

The glow at night for the past week has been increasingly dark red. This goes with the increase in crust.

Fume today thinner. The hissing of gas from under heavy crust continues and has created ten blowing cones in the W and S and two at least in the NE.

E pond has two open puddles. Main and W lakes have fifteen open puddles of which nine are small. Central region has irregular streaming in the puddles and bubble fountaining. The blowing cones are at cracks in crust of the lake, where lids can be seen lifting and the occasional sputter makes small heaps on the crust. The smaller puddles, three or four feet across, tend also to build spatter heaps and to show blowing tendency. W lake mostly crusted over.

No movement discernible in the crags. No border grottoes. Crags covered with Pele's hair. Central island has a bridge of crust connecting it with E central crag.

Rift cones unchanged.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date May 5, 1921
Friday " 6, "

May 5.
5 to 7 p.m. Less hissing. Crusts cracking and foundering. Rainy and fume thicker. Upper SW rift cone appears brighter; lower one also.

During all the period of April subsidence no floors have formed except the one in SW and S wall-valley and this maintains a level 5 feet above lake. The lake edges elsewhere are talus slopes or spatter margins, one below the other as the liquid recedes.

There is crust over most of the W lake, cracked and glowing, with an open puddle SW side. Steady northward streaming through N arm to a bright fountaining pot.

E pond has some open puddles with streaming from rosette centers and a puffing noise recurs from time to time at N chimney.

There are still fewer open puddles in whole lake area, not more than a dozen. Fountains small, fling up not more than five feet.

The ground around rift SW has made very little sulphate deposit. The crackling noise heard as the wall cracks opened during the first fortnight after the March eruption, from snapping of the fresh glassy cinder, has stopped.

May 6. Glow at night dull, yellow-red.

Fume this morning thinner. Calm weather, fume settles over Kilauea floor and drifts northward, nucleating the steam jets all the way to the Sulphur Banks.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date May 7, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11a.m.	W	Summit W island		-26 15		405	200	
	"	Base E central crag (lake)		-21 58		661	267	
		Distances of April 23.						

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date May 7, 1921

t	sta	subject	no	pl	scr	stop	ex	cam	
		(smoky)							
11a.m.	N edge	NW shelf	1	W P	8x	f/11	1	5x7	
	"	NW crag	2	"	"	"	"	"	
	"	NNE shelf	3	"	"	"	"	"	
		Near view of whirlwind fragment of March, back of W station	4	"	"	f/16	3	"	
								T A J	

1921, May 7

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1921, May 1

220

1921, May 7

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Taj

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date May 7, 1921
Monday " 9, "

May 7.
11:00 a.m. Fume diffuse and a little thinner.
Hissing and crust as before. E pond seen clearly, wall-crack choked with avalanche debris N and S of pond. No wall-crack pond NNE, but there is a small puddle of crusted lava in a small pit N. Wall-crack glow cones in two places NNE, occasional puffing. E pond open only at N end, four or five small pots in crust elsewhere.
N cove of main lake crusted.
Avalanches heard falling S and W.
Puddles of live lava open in crust smaller than before, about fifteen in number.
W pond crusted except at N corner. Rampart edge of pit at W niche working as though preparing to fall.
Note that the spatter veneer clings to wall rim NW and SE, gone SW and NE.
Wind S, light. Transparent fume, turning brown above, rising at the two rift cones.
Two puddles in crust at SE end SE arm.

May 9.
9:45 a.m. Turns rainy. Avalanches SE and NE.
E pond getting to be small from choking by falls in wall-crack. Puddles fewer, crusts larger, ponds smaller. Small open area W side E pond.
Fault slickensides S and NE in walls of pit. Fume thinner. Puffing and plashing.

5:15 p.m. Large avalanches make dust SE.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date May 9, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:45a		Locations of stations						
		Location of new E, iron peg:						
	NE	Hut stone	0					5 ft
	NE	New E (ground)	R 88 14	- 1 38	+02	319	-9.3	
		Stadia distance 316 feet						
		Stadia checks with triangulation 300+ feet within 2 feet.						
		Location of new NNE, chiselled cross:						
	NE	Hut stone	0					5 ft
	NE	New NNE (ground)	L 118 56	-1 50	+01	347	-11.2	
		Stadia distance 345						
	NE	Hut stone	0					
	NE	SE channel	R135 33	-23 37		597	262	
	NNE	NE	0					
	NNE	SE channel	R 48 41	-18 21		767	256	

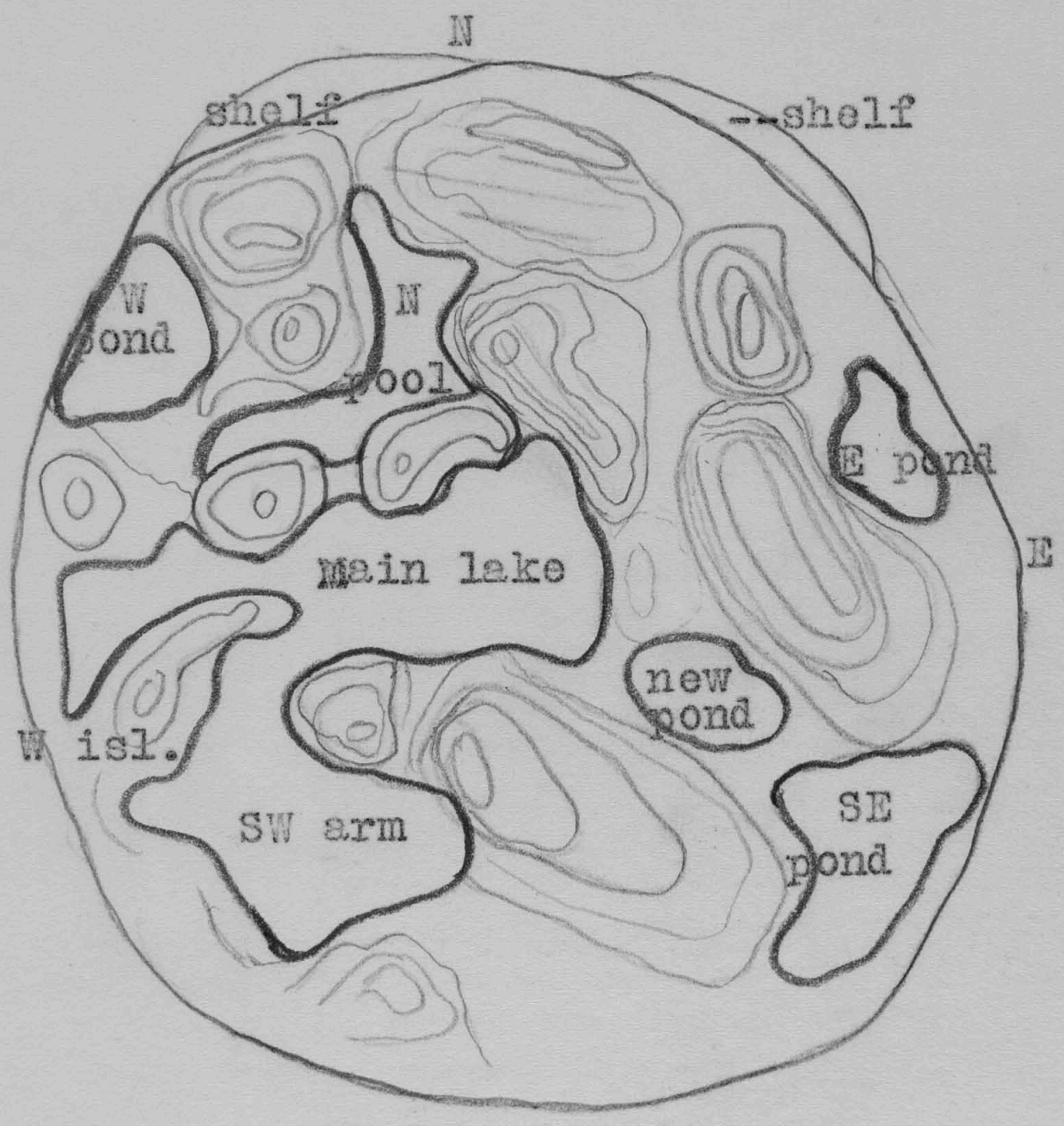
T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date May 10, 1921

10:00 a.m. Fume thinner and crusts still heavier. Steady hissing, some thudding and plashing. Good view above NNE shelf. Rocks falling often about SE pool. Thirteen open puddles counted. SE channel separated as a pond. Hence there are now five ponds besides central lake, for the N pool is separated off.

10:20 a.m. General cracking and foundering spread across the E pond. There had been only a small blow-hole in crust building spatter rim on W side. After the break-up there was streaming out from S, wrinkled black skin and two fountaining areas.



T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

JOURNAL

Hawaiian Volcano Observatory

Day Thursday Date May 12, 1921
Saturday " 14, "
Monday " 16, "

May 12.
5:00 p.m. Glow and roar strong upper rift cone; wells in lower cone a little brighter.

Count eighteen fountaining puddles from W station. From here can see E pond over E crag mass, meaning pond higher (or crag lower). Hissing and bubbling activity. Sudden noisy break-up W side W pond, cause not apparent. Some rock sliding.

N pool connected through past central islands with main lake, appears higher than on the 10th. Lava in pot NE talus. E pond much larger, open all over, extended northward, streaming from N and S to W. Some rampart building.

May 14.
6:25 p.m. W pond appears higher than central lake. Only seven puddles visible at W station. Hissing and fountaining. New notch N of W station in rim. Thirteen glow patches in whole pit.

May 16.
2:45 p.m. SE and E ponds appear very low. Hissing at E pond. Avalanche SE. Slickensides and smooth fault surface very large, low down wall SE. Only seven or eight active puddles center and W. N pot cut off from N arm. Crags appear lower. Pots in crust spatter on crust, some making cones.

Upper rift cone less bright.

Laid out ten trig stations with Alex.

NOTE. Mr. Kreble, the assistant forester, sent Mackenzie to plant nine pine trees in Observatory grounds this day. Three back of the cottages, three in cliff path, one near peach tree at telescope house, two on trail to road from Kualono.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date May 14, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
6:25 p.m.								
	W	Base E central crag		-22 29		661	275	
	W	" S crag		-26 01		522	255	
	W	Summit W island		-28 06		405	217	
	W	S corner SW arm (This distance unreliable; see May 20)		-28 52		573	315	

Distances of April 23.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date May 16, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
2:45 p.m.		Tessar lens.						
	N rim	NW	1		8x	f/11	1	5x7
	"	W island	2		"	"	"	" (both upright)
								T A J

1921, May 16

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Wednesday Date May 18, 1921
Thursday " 19, "
Friday " 20, "

May 18.
12:15 p.m. View into pit from SW rim. Nothing new. Eight or more open pots with spatter around margins. Much hissing. Festooned skins on W pond. Fume rather dense. Glow at night dull. Hot gas from SW cones as before.

This appears to be the turning point from sinking to rising. End of the avalanches.

May 19. Fume dense in daytime. Glow a little brighter at night.

Strong quake in Kona at 9:30 p.m.

Note. The path built by Alex was lined with stones one or two feet in diameter in a row, on the W side of the pit. The March whirlwinds blew these stones away for a length of 100 yards or more, leaving the trail indistinguishable.

May 20.
2:00 p.m. Ten bubbling puddles. Whole S rampart of March (except a little SE) has fallen and choked end of SE arm. SE arm crusted. Hissing as before and much fume. SW rift cones glowing. Crag and bottom lava looks slightly higher. Festoons over end of SW arm.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Wednesday Date May 18, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
12:15	p.m.							
		Aa at end of swollen heap of March 1921	1	film		f/11	1/35	Kodak stereo
		Same	2	"		"	"	"
		Sulphur and white stain on swollen and cracked flow below aa	3	"		"	"	"
		Looking down on aa emergent from heap	4	"		"	"	"
		Same showing surface striations	5	"		"	"	"
		Showing where a small outbreak of aa paste carried forward definitely bounded shell blocks of pahoehoe	6	"		"	"	"

Pahoehoe in two layers each 8 inches thick, very red shell or glaze below, then aa greenish brown.

T A J

1921, May

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1921, May 18

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Jay

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Friday Date May 20, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
2 p.m.	S saddle	Hal S	0	(Hal S wrong)				5
	New SSW	same	0	"	" "			5
	Hal S	S saddle	0	+3 31	+3			
	S sad.	New SSW	R 86 00	- 1 55	+2	572	19.44	
	Hal S	same	L 61 07	+ 0 33	+2			
	S sad.	New SW	R106 47	- 0 17	+2	883	4.86	
	New SSW	same	R198 41	+ 1 36	+3			
	S sad.	Summit S crag	R135 23	-23 43	+2	404	178	
	New SSW	same	L 77 15	-20 26	0	436	163	
	S sad.	New W	R118 03	- 0 33	+4	1080	10.17	
	New SSW	same	R206 38	+ 0 29	+4			
	S sad.	SW arm pot	R108 38	-27 45	+2	537	283	
	New SSW	same	L101 57					
	S sad.	Summit upper rift cone	R 88 28	- 0 52	+2	1043	-19.5	
	New SSW	same	R152 59	- 02	+3	472	-2	
	Hal S	same	L 72 00	+ 0 30	+2			
	"	New stone pile E of S saddle	R 8 18	+ 3 08	+2			

Note corrected azimuths obtained by base <u>S saddle to SW</u> and <u>SSW to SW</u> as follows:-

S sad	SW	0
New SSW	SW	0
S sad	Summit S crag	R 28 36
New SSW	same	R 84 04
S sad	SW arm pot	R 1 51
New SSW	same	R 59 22
S sad	Upper rift cone	L 18 19
New SSW	same	L 45 42

S crag below NE -- 170 feet
Lake below NE -- 276 "

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date May 22, 1921
Tuesday " 24, "
Wednesday " 25, "

May 22, 9-11 p.m. Much fume. Avalanches numerous from NW crag and from W wall. Is lava sinking? Twenty-one open puddles.

May 24. 9:30 a.m. Alex reports big avalanche carrying away wall under W niche for 200 feet of length and lasting ten minutes, making the W pond lose gas and sink 10 feet.

12:50 p.m. Another slide N of NW station carrying away a block of remnant March bench 150 feet long, the material going into W pond and starting fountains.

May 25. 9:45 a.m. The recent avalanching NW means disturbance of NW crag mass somewhat like the sudden lift of Elephant Island in center of pit March 16. A new conical crag has been created out of the southern scarp of NW crag, appears 60 or 70 feet high, with uptilt of southern half lifting a raw wall of aa (?) from under W pond: dip scarp on top tilted 35° towards NE. Similar movement in N half of NW crag mass, which has lifted a bank of paste from under N side of bottom of W pond. The motion is now going on, small slides falling off of NW crags and off of W wall of pit. Large splash mark glistening over whole NE side of bank of W pond for 30 feet above pond, marking the disturbance of pond made by one of the falls into it. The upper March bench mostly gone from N of NW station and the whole width of W niche. Talus on S corner of W pond has slipped down, along with W crag remnant against wall of pit, leaving a smooth slickensided wall above.

Eight or ten sluggish bubbling places. Fume diffuse and obstructive to seeing, but not thick. Active pool between E central crag and E crag mass. The W central island has been merged with the new NW crag and the space between them filled with avalanche debris.

Small pot of N cove cut off from lake by similar crowding due to uptilt of N half of NW crag. E lake streaming to a stalactite grotto under W bank and has a festoon train of slow streaming under skin from SW bank northward. Some appearance of new platform around W island.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Wednesday Date May 25, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:45	a.m.	Location of Stations						
	Hut stone	NE	0	+1 58 (to 5 ft mark on rod)	0	stadia 600 (map makes it 642)		5
	"	New E	L 26 54					
	"	New NNE	R 20 37	ca				
	Heaps interfere with seeing.			Heat vibration.				
(New (NNE	NE		0					
NW	New SW		0	-0 23	-1	731	4.68	
NE	New NNE		0					
NE	Top W island		L80 29	ca				
NW	same		L21 08	-19 52	0	647	234	
(New (NNE	New NW crag (tilted block bet. W pond and central lake)		R91 28	-13 11	+2	740	-175	
NW	same		L41 45	-23 56	+2	421	-187	
(New (NNE	W side E pond		R37 32	-34 12	+2	405	276	
NE	same		L83 50	-48 32	0	250	284	

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

JOURNAL

Hawaiian Volcano Observatory

Day Thursday Date May 26, 1921

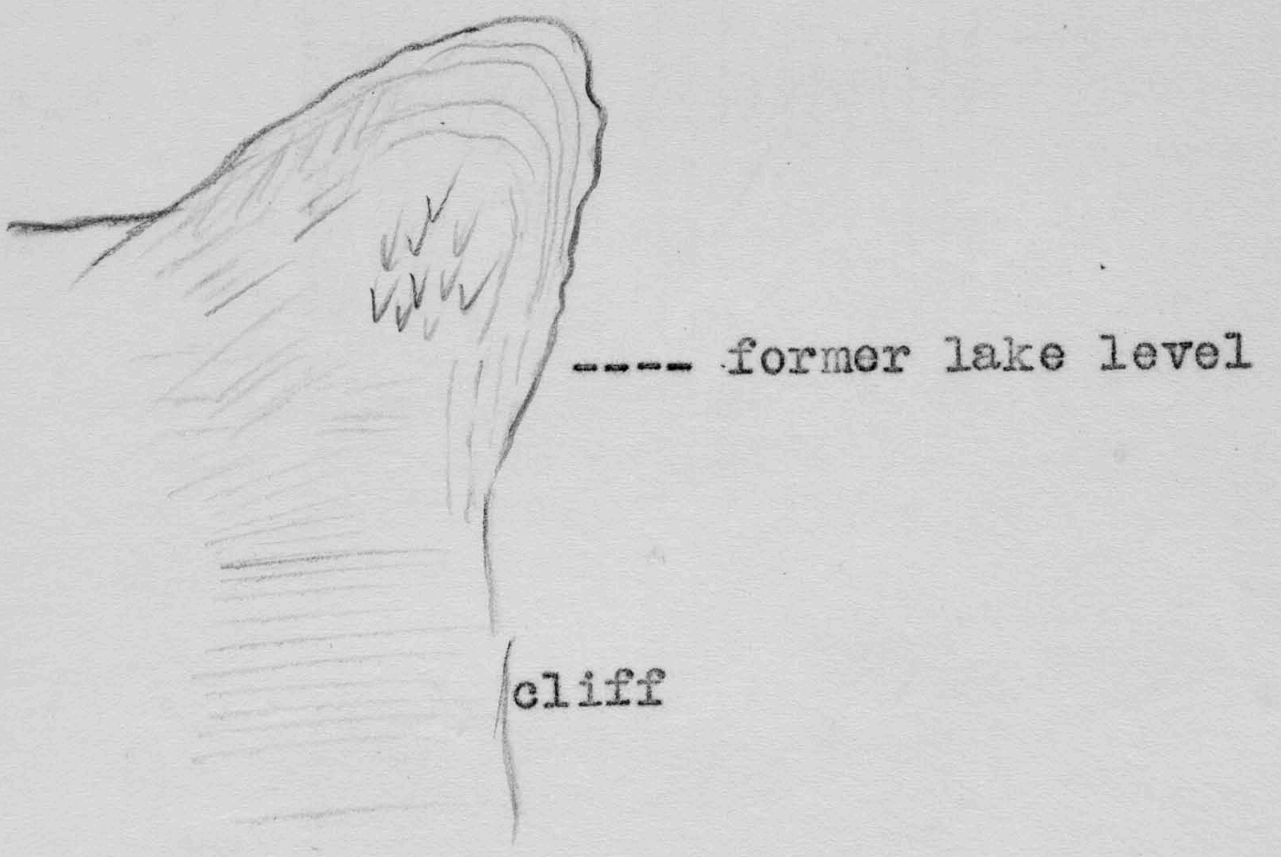
6:00 p.m. Fume rising hot over SW rift vents more transparent over upper cone, more condensed over lower. Lower has large cool condensation chamber before incandescent well is reached, 30 feet below surface. Stalactites and walls of wells bright as ever. The fume is not strong with acid. The ground hereabouts is stained but not like January-February, no thick deposits of salts. It is rather rusty and some tasteless white deposit. No dense vapor.

Pit full of diffuse fume. Some small slides E. Ten or twelve open patches. Some puffing, W pond. New NW peak appears overhanging on E side.

The extension N of E pond in March is now a raised valley bottom, showing that N end of pond was shallower than S end. The crag mass there has its shoreline marks tipped inward toward center of pit; S crag mass similarly tipped northward; NW mass tipped northeastward.

Active puddles still between E central and E crags. E pond slightly down with five-foot margin. Lakes in general probably lower.

There is a remnant March grotto rampart SE rim of pit with section showing stalactites inside covered by a curtain, thus:-



T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date May 27, 1921

5:00 p.m. Dense fume fills pit; calm weather.
Fume from cones SW making transparent cauliflowers. Cones bright. No changes conspicuous. Lower cone making more condensation than the upper.

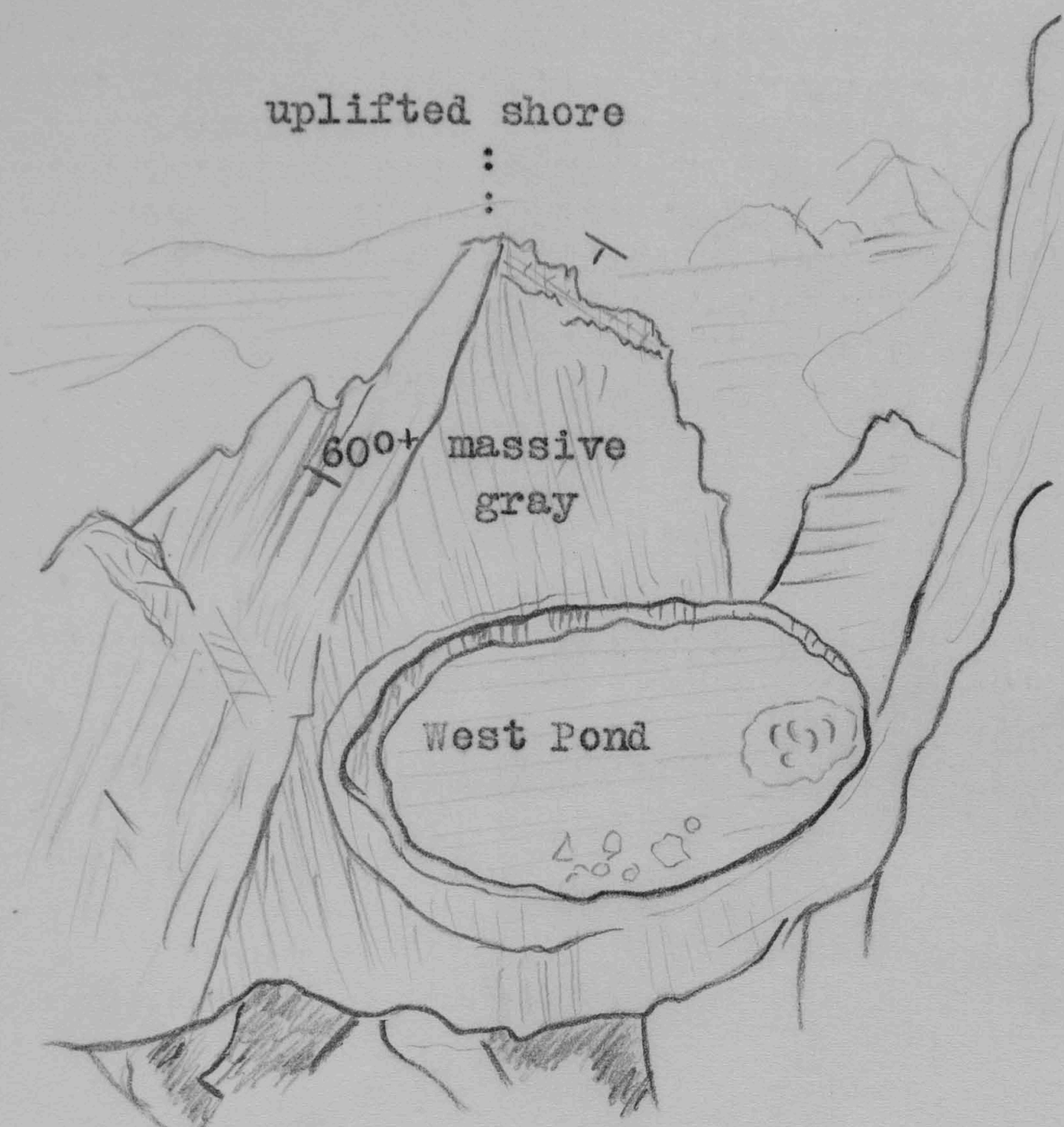
Note. Explored the region of small cones due W of Halemaumau in Uwekahuna shrubby country. Found NW-SE fresh 1919 cracks extended back of the Uwekahuna line. Searched for footprints. Found an old trail headed toward Kapapala and another along Uwekahuna edge. No footprints, too much gravel.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date May 28, 1921

3:40 p.m. New NW crag from NW, looking down:-



Fume changes noticed, largely due to light shifting wind, however. Fifteen active puddles. Not much rock sliding.

NW crag uplift very remarkable. The flat-bedded layers on back of the massive gray uplifted lake bottom material standing at an inclination of 60 or more degrees. Contact of upper and lower rocks extends across N shore of pond, which is new, and what appears to have happened is that a big block of bench magma rotated about a NW-SE axis with a great welling up of paste on the W pond side. The old W crag against the wall preserves its horizontal marks.

Most of the main lake puddles show a drift of streaming southward. Much hissing. A light tinkle, continuous, heard at W pond, possibly the snapping of surface of very heavy crust.

No change of level or in cones.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date May 29, 1921

10 a.m. to 3 p.m. Jaggar and Finch took Ford car entirely around Kilauea crater, pioneering a road. Left Observatory at 10 a.m. Climbed by road to Uwekahuna trig station. Went on, following bluff down to its low bend W of Halemaumau. Zigzagged on steep slope in timber and arrived at wash 11 a.m. Followed wash across rift belt, using two boards for cracks, canvas for sand and hoe for gullies. Lunch in wash near Cone Peak. Headed up after crossing the rift and found hard pan easy to cliff above sand valley N of monument 3704. Went down into valley, around front of new outflow, up to sag SW of Keanakakoi, down sag and out to new lava in S bay, and around S bay to road near algae locality. Road at 3 p.m. No mishaps.

4:00 p.m. Halemaumau. Very little change and very smoky. Same glow at rift cones. Fume of cones not very noxiuos. Some rock sliding. Dim views of ten or twelve fountaining puddles. Hissing.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date May 29, 1921

t	sta	subject	no	pl	scr	stop	os	cam
11½a.m.		Where car came down from Uwekahuna to desert wash	1	film				Kodak
		Approaching lateral crack near Cone Peak SW of Kilauea	2	"				"
		Crossing same crack	3	"				"
								R H F

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1921, May 29

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JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

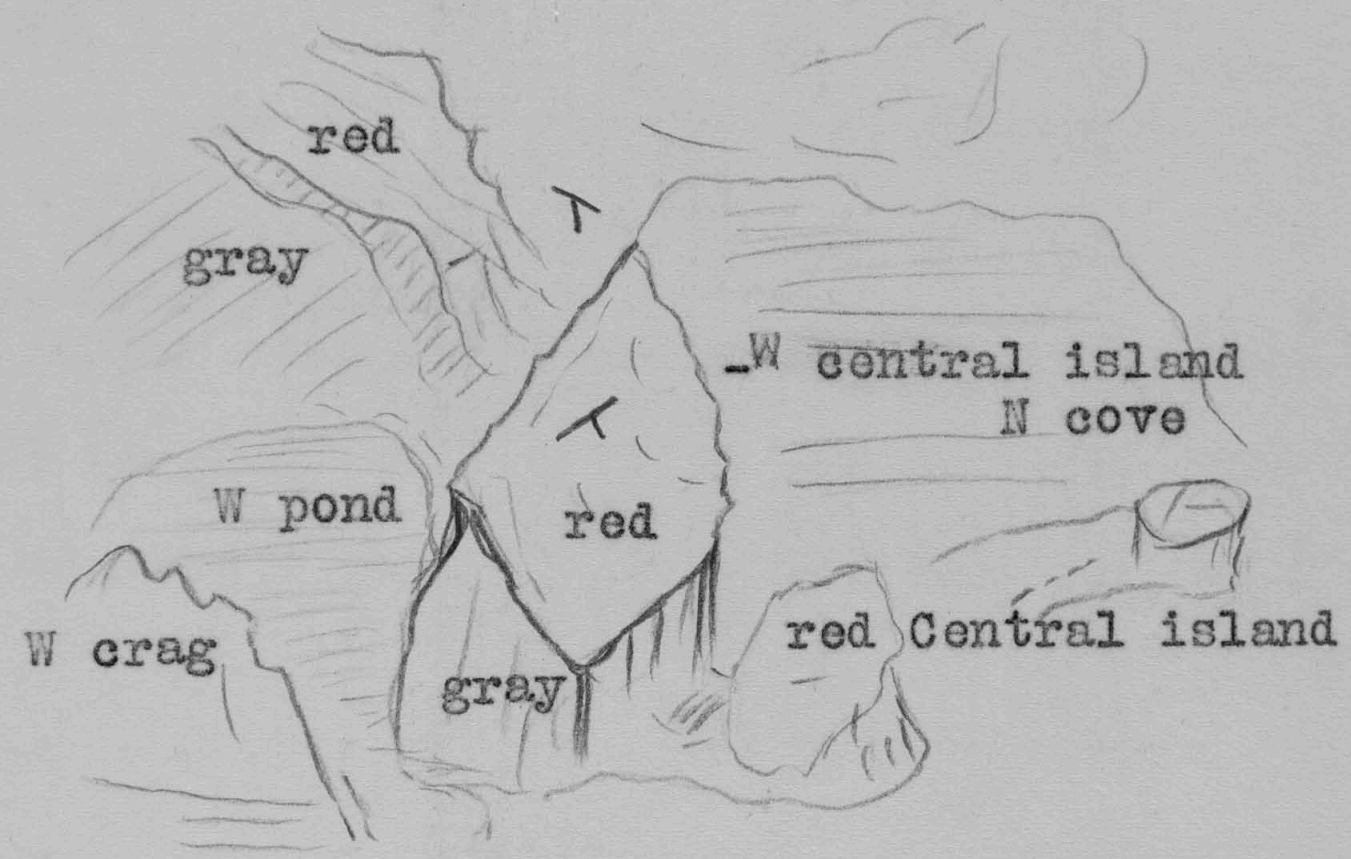
Day Monday Date May 30, 1921
Tuesday " 31, 1921

May 30.
3:40 p.m. Fume thinner. Twelve open puddles. Increase of debris in SW wall valley. W pond crusted with rocks on it and one small blowing cone. Festoons on E pond. Glow cone between E central and E crags. Floor above all the lakes 4 feet high. SW cove hooked and smaller, S peak has shifted.

Uplift of W pond evidently involved W central island, with tilts away from pond NE and SE.

Hot fume jet, dense, on top W crag.

Rift cones the same.



Sketch from SW station showing perplexing back slope of New NW peak on SE side. Appears to be converted from W central island.

May 31.
4:30 p.m. E pond hissing. W pond hissing from five spiracle cones on heavy crust. Only four open puddles visible. Largest of these against S crag. This cracks and founders at edges until liquid pool spreads all over center lake. One rock tinkle heard. Pit appears choked and stationary. Fume moderate.

Lower rift cone puffing up brown fume.

Crater dark red at night.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date May 30, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
3:40 p.m.		Location of stations						5 ft.
	NE	Hut stone	0					
	"	New SW	R160 26	+ 0 08	+1	1226	2.45	
	NNE	same	R 83 05	+ 0 27	+2	1219	8.93	
	NW	same	R 14 12	- 0 22	0	731	4.68	
	NE	New W	R173 21	- 0 13	+1	1228	5.04	
	NW	same	R 25 50	- 1 21	0	482	11.53	
	NE	Old NW	R195 54	+ 0 07	+1	1112	1.89	
	NW	W island	L 6 47	-20 30	0			
	SW	same	L 77 32					
	NNE	NE	0					
	NW	New SSW		- 1 02				
	SW	SSW	0					
	NE	W side E pond	R155 37	-48 53	+1			
	"	Glow crack between E and E central crags	R155 53	-34 18	+1			
	NW	Pot against E central crag	L 44 02	-25 24	0	624	-297	
	SW	same	L 86 43					
	NW	Summit NW crag	L 27 11	-25 16	0	423	-200	
	SW	same	L105 31					
	NW	Lake at base S peak	L 19 20	-22 21	0	732	302	
	SW	same	L 66 15					

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Wednesday Date June 1, 1921
Friday " 3, "
Sunday " 5, "
Monday " 6, "

June 1.
9:00 p.m. Ten or twleve open puddles. Avalanches. Southward streaming. Rift cones bright. Much fume. W pond crusted. Glow back of seat on N shelf, in crack, is bright and steady, same for weeks; only hot air smell. Glow pots in talus N of W pond, and between E central and E crag. W pond hissing.

Glow over Halemaumau as seen at a distance dim at night.

June 3.
5:30 p.m. Three puddles visible in E pond. Only four active puddles in central and other lakes. Several avalanches heard. High jumble of bowlders between S crag and S wall, filling S channel canyon completely, and talus resting <u>on top</u> of S crag mass.

Hissing cones on floor of W pond. Platform vacated by sinking lake. Much hissing everywhere.

SW rift cones bright.

June 5.
11:30 a.m. High wind and fume obscures view. No apparent changes. A few more active places SW arm and W cove. Sliding near W pond. Less hissing.

About 10 p.m. last evening a bright flaring spell at Halemaumau. Fountains make sudden flares occasionally.

June 6.
5:00 p.m. Pit fumy. Only seeing W and SW. Eight active places W of center and hissing through crusts. Some sliding.

SW rift wells continue to glow.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Sunday Date June 5, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11:30a	NW	NW crag		-26 06	2	423	-208	4
	SW	Lake W point S crag		-36 23		421	-310	
		Distances of May 30.						
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date June 7, 1921
Wednesday " 8, "
Thursday " 9, "
Friday " 10, "

June 7.
Forenoon. Places U.S.G.S. bronze bench marks at three stations along bluffs W of Halemaumau. Two on the edge of Kilauea to furnish, with Uwekahuna proper, a base-line for Halemaumau NW. One on a height N of Cone Peak for triangulation control of the rift belt. These all to be occupied by Wilson of Burkland's party, U.S.G.S, for precise location of future movements of the rift belt.

June 8.
Forenoon. Placed another tablet on the dome swelling of the "New Lake" locality (1885) E of Halemaumau, to act (with a bench mark on the gravel peninsula) as a base-line for Halemaumau SE.

Halemaumau smoky. Only five puddles. Steady hissing. One puddle seen dimly in E pond. No visible change of level. Crags same. Some slight fresh overlap on shores west.

June 9.
11:00 a.m. Conditions the same but more crusted. Only two puddles seen in W part of pit. No avalanches heard. Fume remains dense.

June 10. Places three U.S.G.S. tablets. One S end of gravel peninsula, making an eastern base-line with the 1885 dome. One at the 3744-foot station of Birdseye, E of rift. One at the rift on stone near S end of large chasm. This stone is a gabbroid rock. (Sample collected)

Pit continues smoky and dull at night. Flaring seen.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Saturday Date June 11, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
		Ford car on new lava S bay Kilauea (hand)	1	film		f/11	1/35	Stereo Kodak T A J

1921, June 11

Jag

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date June 11, 1921
Sunday " 12, "
Monday " 13, "
Tuesday " 14, "

June 11. Tried automobile across the new lava of S bay, but sand too deep to ascend hills to the E.

Left car and placed a U.S.G.S. tablet on high spur a mile SE of Cone Peak.

Explored the hills S of Ahua Kamokukolau and found a clump of ten thriving koa trees and two ohia lehua in the midst of desert country. Ash covered pahoehoe. No exceptional moisture evident. Followed up the wash and f found good sections of ash with two unconformities.

June 12.
10:15 a.m. Fourteen fountains around an islet in W cove; three fountains in S central region; one fountain and several cones in W pond. Blowing and puffing N. One fountaining pot in E pond. A slide making red dust seen SSW. Crags are evidently down and lakes up. W pond distinctly higher on its shores and nearly joined through to W cove. Fume fairly thin and seeing possible from S and SW.

Rift cones remain bright.

June 13.
5:00 p.m. General cracking and foundering in central lake. Ring of fountains in W cove. Usual fume. Fountain in N cove. Rift cones bright as usual. No apparent change of level.

June 14. Fume dense during day. At 7 p.m. noticed bright glow in SE arm region. Changes at short intervals.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date June 12, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10:15 a.m.	S saddle	SSW	0					
	SSW	SW	0					
	S Sad.	S crag summit	R 48 21	-21 38	0	402	160	
	SSW	same	R 84 12	-18 20	0	430	143	
	S sad.	Fountain foot S peak	R 44 31	-26 37	0	610	306	
	SSW	same	R 56 51	-32 41	0	450	289	
	S sad.	Peak W island	R 35 30	-19 12	0	731	256	
	SSW	same	R 35 56	-29 09	0	426	238	
	NW	NW peak (cf June 5)		-27 26		423	-220	4

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date June 15, 1921
Thursday " 16, "
Friday " 17, "

June 15.
3:45 p.m. Smoky. Weak hissing and splashing. Six or eight open holes. No sign of special change. Crust of lake appears higher around S peak (or peak has gone down).

June 16. Pit smoky in daytime and very dark at night.

June 17.
2:30 p.m. Inspected stations in turn from S to W. Pit smoky, NE wind.

S saddle. S crag appears unchanged. Hissing in SE arm. Pots active near S peak.

SSW. Crags and floors perhaps a little lower. Fountains in W cove and S central region and one in SW cove.

SW rift cone (upper). Glowing. New stalactites. Sun shines in and makes them dark in appearance. This cone must be a mere shell if these stalactites drip.

SW. At 3 p.m. cracking and foundering in central pool and W cove. Streaming from narrows westward in W cove.

W. Lava from here looks lower in W pond and W cove. Overhang strong in remnant rampart W niche. NW crag narrow and high.

NW. Much debris on N and S sides of W pond. One fountain S end of pond. NW wall of Halemaumau appears very high and pond low. Some rock sliding from this wall started by wind (?).

N shelter (W side N shelf). Ground here scorching hot and heat seems increasing.

From eastern stations fountaining puddle in W side of E pond can be seen. The fume at NE solfatara (postal crack) is increasing slightly.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date June 15, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
3:45 p	SSW	Lake S peak		-32 46		450	-290	
	"	S crag		-23 52	ca	430	191	

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date June 19, 1921
Monday " 20, "

June 19.
12:30 p.m. Eleven fountains visible from S and SSW. New islet 3 feet high in central pool. One fountain in SE arm and one near SE narrows. New platform one to two feet above present level all around. Crust bridges separate several pools in W cove. Avalanche E at 11:15 a.m. and moving rocks S of S crag mass about 12:45 p.m.

Fume thinner in S and SW and seeing better. Pit last night brighter. Noises hissing and plashing. Movement of some kind has started. Open channel between central island remnant (now a peninsula) and E central crag; leads to N cove. Partition between W cove and W pond still low.

SW rift cone wells glowing and making gas as usual.

June 20. Went by Kau road to Keamoku flow and thence on foot to make a U.S.G.S. bench mark station (tablet) W of rift line and NW of Puu Koae. In midst old aa flow. Marked with high spire of stones.

Found very large pisolites of ash all over surface in this region W of Kilauea. Possibly rolled balls of mud. More irregular than the spherical pisolites and lying above them on same bed. Size of walnuts.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Sunday Date June 19, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
12:30 p.m.	SSW	Fountain at N base of S peak		-32 58		450	-292	
	"	S crag summit		-24 09		430	-193	
	"	W island		-29 36		426	-242	
	"	NW peak		-15 27		719	200	
								TAJ

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date June 21, 1921

9:50 a.m. Pit more clear, light NE wind, fume apparently thinner. General hissing. Six or eight open pots. Some avalanches.

From S saddle can see to E pond. SE arm crusted. Cone on crust in SW arm. Open puddles N of S peak and in W cove and N narrows.

10:50 a.m. From SSW. Cracking and foundering starts at N narrows, then begins at SE narrows, later appears in W cove. Spreads all over slowly and heat felt above increases. Destroys the cone pots on crust. Central lake islet unchanged. Less platform around lake than two days ago, lake higher. After the break-up less hissing and more splashing. Occasional clearing spells when even N part of pit can be seen from S and SSW,

From W after 11:15 a.m. the W cove seen to be open with streaming westward from bridge across narrows leading to central lake. W pond crusted, but the recent cones on crust are gone and replaced by a wrinkled crust that indicates recent breakings up. The bright times occasionally seen at night are undoubtedly breakings up of lakes. High talus at foot of NNW wall.

SW rift cones bright and some roar in upper one. No glow in western well of lower cone.

Fume from cones not strong and fume from pit thin and breatheable on leeward side.

From NNE hissing in N pot heard and two open pots in crust of E pond.

General situation very slightly suggests beginning of rise, but the crags look low as ever.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

PHOTOGRAPH RECORD

Hawaiian Volcano Observatory

Day Tuesday Date June 21, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
9:50 a.m.	S saddle	S crag	1	film		f/16	1/15	Stereo Kodak
	"	SE corner	2	"		f/22	1/10	"
	SSW	S peak	3	"		f/32	¼	"
	"	W island	4	"		f/16	1/15	"
	Near SSW	S saddle cinder rampart (single picture)	5	"		f/22	1/10	"

T A J

Testing different stops and the use of a tripod.
Glycin developer.

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1921, June 21

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Jag

1921, June 21

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Jag

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date June 22, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11:30 a.m.	S saddle	SSW	0					
	SSW	SW	0					
	S sad.	S crag summit	R 47 57	-27 36	+2	402	-211	
	SSW	same	R 84 15					
	S sad.	W island	R 35 41	-19 37	+2	742	-266	
	SSW	same	R 35 08					
	S sad.	Lake, base of S peak	R 44 53	-27 06	+2	615	-316	
	SSW	same	R 56 27					
	S sad.	Summit NW crag	R 51 14	-13 39	+2	916	225	
	SSW	same	R 38 58	-15 44	+4	716	204	
	S sad.	Lake shore SW of S peak	R 32 01	-35 08	+2	447	-315	
	SSW	same	R 78 12					

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

JOURNAL

Hawaiian Volcano Observatory

Day Wednesday Date June 22, 1921
Friday " 24, "
Saturday " 25, "

June 22.
Noon. Avalanche W wall. Conditions stationary. Cracking and foundering much. More open pots in crust. Fume moderate. Several rock slides. Clearing spells show a definite N cove with channel around the peninsula (formerly central island). Lakes have overflowed yesterday's edges, notably at wall end of SE arm. Strong hissing somewhere NE. Open pot again in SE arm. Much activity in W cove. S central islet remains the same.

Fume from pit as a whole seems thicker as seen from the Observatory.

June 24.
12:26 p.m. Smart rocking shock of earthquake felt by T.A.J in Hilo; E-W dominant.

Reported that at night there was much open fountaining in Halemaumau, with cracking and foundering. Rock slides continue. Seeing good on SW side. SW rift cones bright.

June 25.
10 a.m. to noom.

Little change. Seven puddles open. Cracking and foundering. Slides. Considerable clearing spells. Raised N cove extension and shelves E of it. Boom now and then from E crag region; a spasmodic blow cone. SW cove has risen on its shore. Red walls SW. Rift cones unchanged; glowing.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date June 25, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10 a.m to noon	SW	SSW	0					
	NW	SW	0					
	SW	Point W of S peak	L 45 04	-38 37	+2	404	323	
	NW	same	L 27 55					
	SW	Fountain base S peak	L 68 41	-36 49	+2	429	321	
	NW	same	L 34 34					
	SW	Summit NW crag	L108 59	-24 41	+2	286	224	
	NW	same	L 37 58					
	SW	Summit S crag	L 49 29	-20 50	+2	552	210	
	NW	same	L 37 17					
	SW	S central islet(top)	L 70 00	-28 20	+2	574	310	
	NW	same	L 45 34					
	SW	E central crag summit	L 79 34	-17 40	+2	774	248	
	NW	same	L 63 12					
	SW	N central island(peninsula) top	L 93 26	-25 38	+2	635	306	
	NW	same	L 57 43					
	SW	Summit N crag	L113 34	-18 08	+2	737	243	
	NW	Same	L 78 22					
	NW	W island	L 20 19	-22 59	0	652	277	

Angles from NW station only approximate.

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Saturday Date June 25, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
10 a.m. to noon	Near NW	W pond	1	W P	8x	f/16	1	5x7
	"	SW cove	2	"	"	"	"	"
	"	Center	3	"	"	"	"	"
	"	N cove	4	"	"	"	"	"

T A J

1921, June 25

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1921, June 25

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SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date June 26, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10:30 a.m.		Survey to correct location of SW, SSW and W stations.						
	E	NE	0					5
	NW	S saddle	0	- 08	0	1317	3.03	5
	E	same	L141 17	+ 49	+3	606	3.12	5
	NW	SSW	R 25 19	-1 02	0	1069	19.25	5
	E	same	L112 54	-0 22	+3	1035	7.56	5
	NW	SW	R 39 32	-0 22	0	731	4.68	5
	E	same	L 92 51	+0 23	+1	1168	7.48	5
	NW	W	R 51 15	-1 23	0	482	11.53	5
	NE	NW	0					

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

JOURNAL

Hawaiian Volcano Observatory

Day Sunday Date June 26, 1921
Tuesday " 28, "
Thursday " 30, "

June 26.
10:30 a.m. to 1 p.m.

Everything appears the same. About four fountaining pots. Hissing. At 12:25 p.m. violent and sudden break-up in W pond, thick crust, crunching noise, movement migrates from E to W across pond with violent bubble fountaining in half-minute. Noisy. Chills quickly leaving blistered surface. Snall slide follows. Heat on face. W cove takes up the process and continues it. Snapping noises follow.

June 28.
6:45 p.m. Although white vapor in dense clouds has risen from pit all day, the seeing now from S saddle is fair. Central lake crust cracking and foundering towards N, SE and SW. Only four fountains seen; three in lake, one in E pond. Hissing. Two glow spots in pot between eastern crags. No apparent change of level. Rim of SE pool shows fresh subsidence of a foot due to recent break-up.

Some bright flares at night.

June 30.
2:45 p.m. Avalanches SE and W. Wind squally, fume troublesome.

Rift cones glowing but appear darker in afternoon sunlight.

S peak has developed a point extending it westward. Three fountaining puddles in main lake, none in W pond, one in E pond. The whole platform or floor in SW arm wall-valley is now concealed under talus. No change in S central islet, stands 8 or 10 feet high. N central island (peninsula) also unchanged.

Bright glow spells at night due to occasional break-ups.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date June 30, 1921

t	sta	pt		hor	vert	lev	dist	elev	h. i.
2:45p.	SSW	S saddle		0					
	SW	SSW		0					
	SSW	S crag	L	44 32	-25 01	0	430	201	
	SW	same	L	49 52					
	SSW	Fountain under S peak	L	77 15	-37 55		388	302	
	SW	same	L	61 57					
	SSW	NW crag ca	L	90 38	-15 27		703	195	
	SW	same	L	108 59					

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date July 1, 1921
Sunday " 3, "
Tuesday " 5, "

July 1. Avalanche reported seen from Volcano House.

July 3.
11 a.m. to 12 noon.
Nothing new. Fresh wind and pit full of fume. Upper rift cone red hot as usual.
Hissing, stiff crust, only one fountain puddle detected in main lake (at base of S peak) and one in E pond. NW crag high and steep. No slides heard.

July 5.
9:25 a.m. Only five fountaining puddles. Strong and continuous hissing from at least six blowing cones on crust of W cove, and from end of N cove. Fresh tricklings and festoons frozen on lake surfaces. Fume thinner than of late. Rock falls heard toward N. Fountain W side E pond. There has been falling away from NW end S crag mass. NW crag a steep horn as seen from SW. Islands as before. Fume so that NW and NE flags can be seen from southern stations. Smoke rises from talus mostly N, SW, W and E. There is a strong suggestion of a new gas pressure. SW rift cones bright and hot as usual. Occasional hollow clatter sound NE which may be crag mass snapping.
Fume dense after noon.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Tuesday Date July 5, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
		Light SW wind. E side pit clear.						
	S							
9:25 a	saddle	NE	0	-0 46	0	879	11.78	4.5
	SW	S saddle	0					
	S sad	S crag	L 60 33	-28 25	0	399	-216	
	SW	same	L 19 18					
	S sad	Fountain (S peak base)	L 70 43	-27 30	0	610	-318	
	SW	same	L 31 33					
	S sad	Middle summit E central crag mass	L 31 02	-20 17	0	693	-257	
	SW	same	L 48 58					
	S sad	Summit N crag (or N talus?)	L 45 53	-12 47	0	1383	-316	
	SW	same	L 98 20?					
	S sad	W cove E pond	L 16 34	-23 07	0	756	-324	
	SW	same	L 47 55					
	S sad	SE corner E pond	R 0 33	-25 31	0			
	" "	Glow holes E pot	L 26 47	-27 02	0	588	-300	
	SW	same	L 40 40?					
	S sad	SE end SE arm	L 5 09					
	SW	same	L 19 45					
	S sad	Fountain W of islet central lake	L 58 43	-29 09	0	574	-321	
	SW	same	L 36 29					
	S sad	Fountain E of islet	L 42 12	-30 48	0	537	-320	
	SW	same	L 37 07	-26 49	0	641	-325	
	S sad	Fountain N cove	L 42 28	-23 26	0	740	-322	
	SW	same	L 55 15					
	S sad	W island	L 73 20					
	SW	same	L 50 07					
	S sad	Smoke talus SW	L 96 00					
	SW	same	R 17 26					
	S sad	W corner S crag	L 70 50					
	SW	same	L 12 50					
	S sad	N corner S crag	L 50 00					
	SW	same	L 27 04					
	S sad	E corner S crag	L 21 00					
	SW	same	L 15 35					
		Survey for location of South Saddle:-						
	NW	NE	0	- 0 25	+1	1111	-8.45	5
	NW	S saddle	R 41 25	- 0 06	+1	1318	-2.64	
	NE	NW	0	+ 0 08	+ 1	1111	+2.22	5
	NE	S saddle	L 81 59	+ 0 17	+2½	879	+3.78	
	S sad	NW	0	- 0 12	+ 1	1318	-5.06	5
	" "	NE (fume, no seeing)						

Elevation NW - 3732 plus h.i. -- 3737 feet
" NE - 3727 " " -- 3732 "
Mean S saddle -- 3734
This survey changes location S saddle station 34 feet ENE

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Date July 5 & 6, 1921

The following figures are an adjustment of levels of stations to accompany sheet of July 5, adopting datum NE -- 3727. Positions of S saddle, SSW, SW and W are corrected, and elevations of NW, W, SW and SSW are corrected. NW appears uniformly too low for agreement with the datum station NE and so was corrected. The line NE-NW was the base line relied on from the old triangulation. Its actual length, and also the actual height above sea-level of NE, are in doubt.

Some recent discrepancies have shown that the "Hal S" pile of stones of Roberts and Thorndike (July, 1919) is located wrong on their maps.

Data used in adjustment are from all the surveys of May, June and July where stations were located.

Elevations of stations:-

S saddle	3734
SSW	3720
SW	3735
W	3728
NW	3734
NNE	3721
NE	3727
E	3722

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date July 7, 1921
Friday " 8, "

July 7.
10 to 11:30 a.m. Fume moderate, much clear seeing of pit from S and W. The usual five fountaining puddles and a new platform all around central lake which may be something more than mere residual of recent foundering. In about four places very tiny border grottoes one foot high splashing on the bank; little border puddles in crust two feet across. Hissing at W cove. W and E ponds crusted.

Upper rift cone as before, but lower well has brightened and become lined with new orange hot stalactites, within the last week. (Nothing new June 30 and on June 21 western well was dark.) This is particularly surprising in the western well of interior chamber of lower rift cone, for that is now the brighter of the two as though the lava in rift were rising strongly below. This is the first positive sign of a marked change since the solstice.

July 8.
8 to 10 p.m. With Brooklyn Eagle dedication party of National Park.

Fume continues thick. Five or six fountaining puddles. Cracking and foundering all over lake every hour or two. Hissing W cove. Snapping noises as crust reforms. A little rock sliding. The wall-crack between SE wall of pit and E crag mass deepening by the slow subsidence of a wide mass of debris.

Both rift cones very hot, bright yellow incandescence. Flame at upper cone.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date July 9, 1921
Sunday " 10, "

July 9.
10 a.m. to 12 noon. Dedication of National Park; Thurston for the Territory, Burkland for the Federal Government; about 100 people. At Halemaumau.

No marked changes. Rift cones increasingly hot. Usual hissing and few fountains. Three fountaining patches in E pond. Very fumy.

Examined tunnel leading S from lower rift cone and found it cool and apparently penetrable. G.D. Hubbard of Oberlin went into it a little way.

July 10.
9:00 p.m. J.A. Kennedy reported in afternoon that interior of rift wells was black. Now find them glowing red-orange, no flames. Sparks rising from lower cone. Roaring greatly increased. The tunnel leading from lower cone red hot all through to its far end 150 feet away, in marked contrast to yesterday. The two wells at bottom of chamber appear choked and no brighter than rest of interior. Part of roof of chamber has caved and opened a new window 2 feet across. Upper cone making a roar like fountaining lava or rushing gas.

In the pit twenty-two fountains instead of five. Two fountains in W pond. Fountaining lava back of talus in a niche in SW wall at rift locality, appears on level with lake. Looks as though lava yesterday were above lake level in rift cones and now had broken through here back of the talus, making the lake rise. This would account for the noise and some of the changes in the cones. Some spitting border grottoes and blowing cones among the open puddles, but no hissing continuous as before.

Very hard to explain the new heat in tunnel at rift cone. Appears like oxidation of rock. No smell. The sparks a new feature, appears to be incandescent rock dust flying up.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Monday Date July 11, 1921
Tuesday " 12, "

July 11. 6:00 p.m. With Hobbs and Hubbard to Mauna Iki, Cone craters and S bay flow.

Pit dull. Five fountaining holes. Slight depression rim around the lakes. Nothing new.

In afternoon rift cones reported dark. In evening they were red but darker than usual.

July 12. To see pictographs at Pahala and Naalehu with Westervelt, Lyman, Hobbs and Hubbard.

Petroglyphs at natural arch locality, Naalehu east, near two pandanus trees and one papaia:

T A J

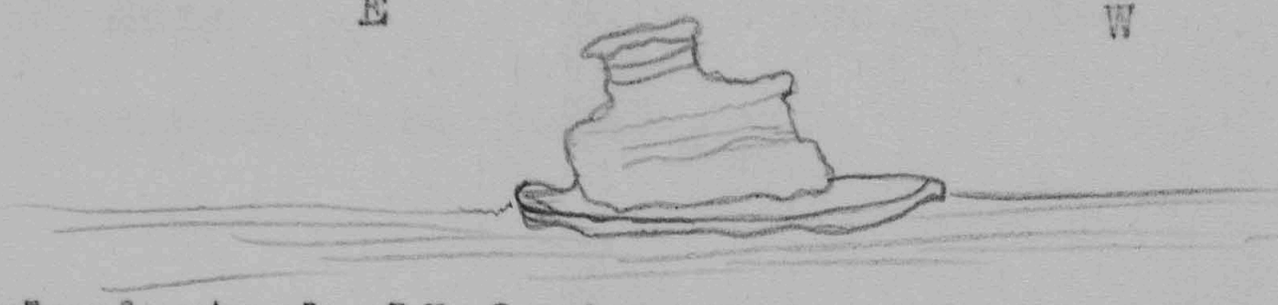
JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Wednesday Date July 13, 1921
Thursday " 14, "

July 13.
11:00 a.m. Occasional avalanches W. Only two fountaining puddles in main lake and one or two in E lake. Much fume. No hissing. S central island in greater relief above lake, thus:-

E W



Island stands 15 feet high. Lake has shelf 2 feet high around it.

SW cones both dark inside by daylight; stalactites a silver gray tinge; very hot air rising; roaring and rushing noise. Tunnel SE from lower well very hot. Tunnel and wells probably cherry red by night.

July 14.
8+ p.m. Rift cones completely dark inside by night light. Rushing noise through them of air or gas. Gas to leeward not very strong, but what sulphur there is is SO_3 Tunnel from lower cone very hot but not glowing.

Apparently what happened July 9-10 was sinking of lake below rift opening and air came in below. July 10 access of oxygen from this blast and increased rush of air draught. Oxygen heated walls of the tunnel above and maintained a lower temperature than before in the wells below. July 10 in afternoon Mr. Kennedy saw dark walls because the oxidation had not yet become effective. After July 10 the system cooled off because the surface iron oxides had oxidized to the ferric condition and direct exposure to the excessive oxygen was not afforded the inner vesicles. Compare this rift about March 1, and the effects observed in Postal Rift tunnel after November 28, 1919. Compare also the oxidization of aa.

On this day the pit very dull. Eight or nine glowing and fountaining pots in crust. Some rock sliding. No cracking and foundering observed during two hours.

No changes observed in crags except that the large ones next wall of pit are getting smothered slowly in talus slopes. The old SW arm wall valley is thus smothered, and the N crag.

Fume rather dense and pit dark red at night as seen from a distance.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date July 13, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
		Brunton.						
11a.m.	SSW	Fountain N cove		-23 55		736	327	
		S crag		-26 25		431	-214	
		NW crag		-16 15		703	-206	
		Distances from July 5.						
		Lake 334 feet below NE station						
		S crag 221 " " " "						
		NW crag 213 " " " "						

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date July 16, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
		Brunton						
10a.m.	S saddle	S crag		-29 10		401	224	
	"	N cove fountain		-24 10		741	333	
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

PHOTOGRAPH RECORD

Day Saturday Date July 16, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11:45a		Looking NE, 1919 rift chasm	1			f/11	1/30	Stereo Kodak
"		Looking SW, 1919 rift chasm	2			"	"	"
Noon		W of rift, bomb and pit, 25 ft. away	3			f/10	"	"
"		W of rift, bomb and pit, 10 feet away	4			"	"	"
		Ball piscolites 6 feet away, E of upper Keamoku flow near supposed footprints. Pisolites 1 inch in diameter	5			"	"	"
4p.m.		Vesiculation in a 3-foot section of lava dome on Pahala road near Prison Camp, coarse below, fine above, graded	6			f/16	1/5	"

T A J

1921, July 16

1

2

6

Jaj

1921, July 16

3

4

5

Jay

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date July 16, 1921
Tuesday " 19, "

July 16.
10:00 a.m. Avalanches SE from E crag. Cracking and foundering SE arm. Fountain in E pond. Fountain in N cove narrows Cracking and foundering spread across lake.

Rift cones blowing with air. No glow. Red, bearded stalactites and cavern linings.

Went across desert W to Keamoku aa searching for footprint traces. Found some indefinite ones. Much steep gulch erosion and coarse pisolites. Some of the latter imbedded in fine ash in dry water-courses and their surfaces facetted apparently by water scour, afterwards polished by blown sand. Graded vesiculation in old pahoehoe from coarse below to fine above.

In the evening some bright spells seen at Halemaumau as though extended cracking and foundering were taking place there.

July 19.
9:25 a.m. Much fume. Rain interrupts survey. Fountains E and W of central island. Hissing W cove, W pond and E pond. Much crust. Avalanches E and SE. No apparent change in level.

Hot air rushing up rift wells. Dun colored deposits inside.

T A J

280

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Tuesday Date July 19, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:25 a		Transit						
	S							
	saddle	SW	0					
	"	S crag	R 26 53	-29 08	-1	398	222	
		Survey interrupted by rain.						
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Wednesday Date July 20, 1921

With Rev. A. S. Baker and O. H. Emerson, in afternoon, went to footprints by Mauna Iki on E side aa flow where trail emerges going N.

The numerous footprints are on upper hardened layer of pisolitic ash. Scarce ones are on a layer of suncracked pisolitic ash two or three feet lower stratigraphically. Dune sand is over all. The ash patches are remnants from an extensive erosion. The best preserved area is in a hollow. Evidently the substance was a clayey mud when the footprints were made. Thicknesses of layers very variable.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date July 20, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
		Footprint photographs.						
Afternoon.		Print showing deep toe-nail marks	1	W P	8x	f/16	1	5x7
		Two prints of standing person; pisolites	2	"	"	"	"	"
		Sun cracks in old ash layer (lower layer)	3	"	"	"	"	"
		Detail of toes. Two footprints in suncrack layer	4	"	"	"	"	"
		Prints showing squeezed mud. Two strides.	5	"	"	"	"	"
		Prints in sun crack layer	6	"	"	"	"	"
		Group of twenty prints (two figures)	7	"	"	"	"	"
		Group showing squeezed mud. (camera case)	8	"	"	"	"	"
		Three strides and large print where ball of foot twisted, in fore-ground	9	"	"	"	"	"
		Prints of adult and child	10	"	"	"	"	"
		Pair of prints whiten-ed with chalk	11	"	"	"	"	"
		Footprints receding south	12	"	"	"	"	"

T A J

283

1921, July 20

4

6

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Jag

285
1921, July 2

286

1921, July 20

7

8

Jay

1921, July 20

10

11

Jaf

9

12

Jag

288

1921, July 20

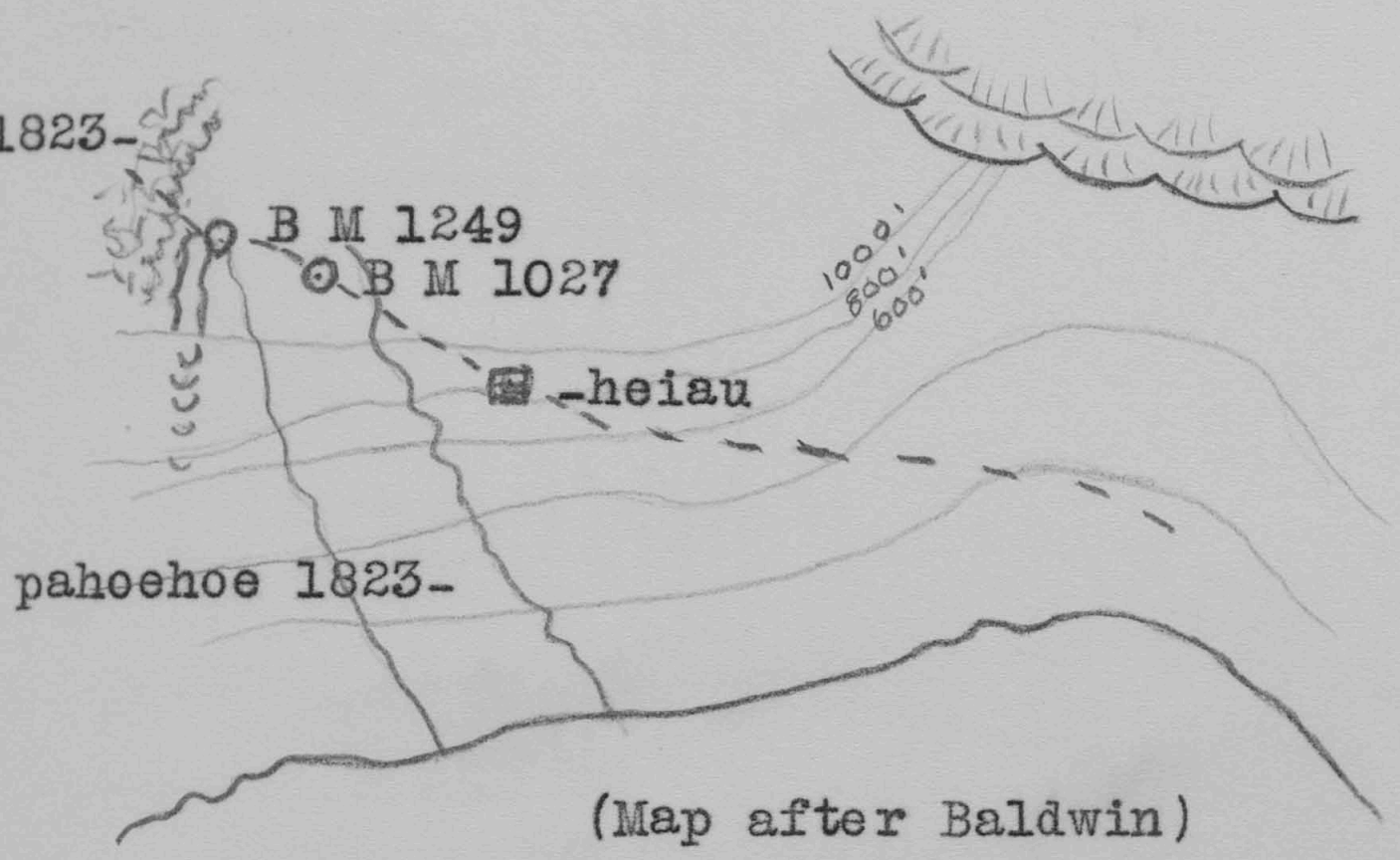
JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date July 22, 1921

To heiau, Kamooalii in desert, entering trail beyond Kapapala gate. With I.P.J., Rev. A.S. Baker and O.H. Emerson.

At T.B.M. 1249 found lava tubes and channel on makai side; sleeping niches and petroglyphs -- many human figures and circles.

At T.B.M. 1027 after crossing aa found an anchor and circles on fresh pahoehoe.



(Map after Baldwin)

Heiau 20x20 with walls EW and NS. Many petroglyphs in vicinity. One petroglyph slab with two other flat slabs on top of it in E outer face of heiau wall.

S half of interior a platform of stone. Other half of interior lower and is grassed. A slab on S wall has letters KALA suggesting modern work, perhaps "Kalapana". Letters chipped in face.

A surface of smooth lava adjacent to the heiau on E side has several circles, and the carving is half covered with ash, grown with grass. This looks as though carving was, in part at least, older than 1790.

A design on NW flat near heiau looks like an anchor, different from that at T.B.M. 1027. Common designs here are circles and semicircles.

T A J

290

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date July 22, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
After-noon		Heiau, Kamooalii in Kau Desert (looking west)	1	W P	8x	f/16	1	5x7
		Heiau, interior, looking south	2	"	"	"	"	"
		Heiau and shoreline, looking east	3	"	"	"	"	"
		Detail carvings next Finch photo 9/8/20	4	"	"	"	"	"
		Single group petroglyphs	5	"	"	f/11	"	"
		Male figure with spear and others	6	"	"	f/16	"	"
		Duplicate of No. 4	7	"	"	"	"	"
		Large figure NW of heiau	8	"	"	"	"	"
		Same area, with "Greek letters" (?) and circles	9	"	"	"	"	"
		Same area	10	"	"	"	"	"
		Slab in E wall of heiau	11	"	"	f/11	"	"
		E wall of heiau, Baker chalking slab	12	"	"	f/16	"	"

Nos. 4, 5 and 6 all near heiau, mauka, in whitened glaze of interior shells opened.

T A J

1921, July 22

292

1921, July 22

3

12

Taz

11

4

Ta J

1921, July 22

7

9

Ja J

295

1921, July 2

Ja J

9

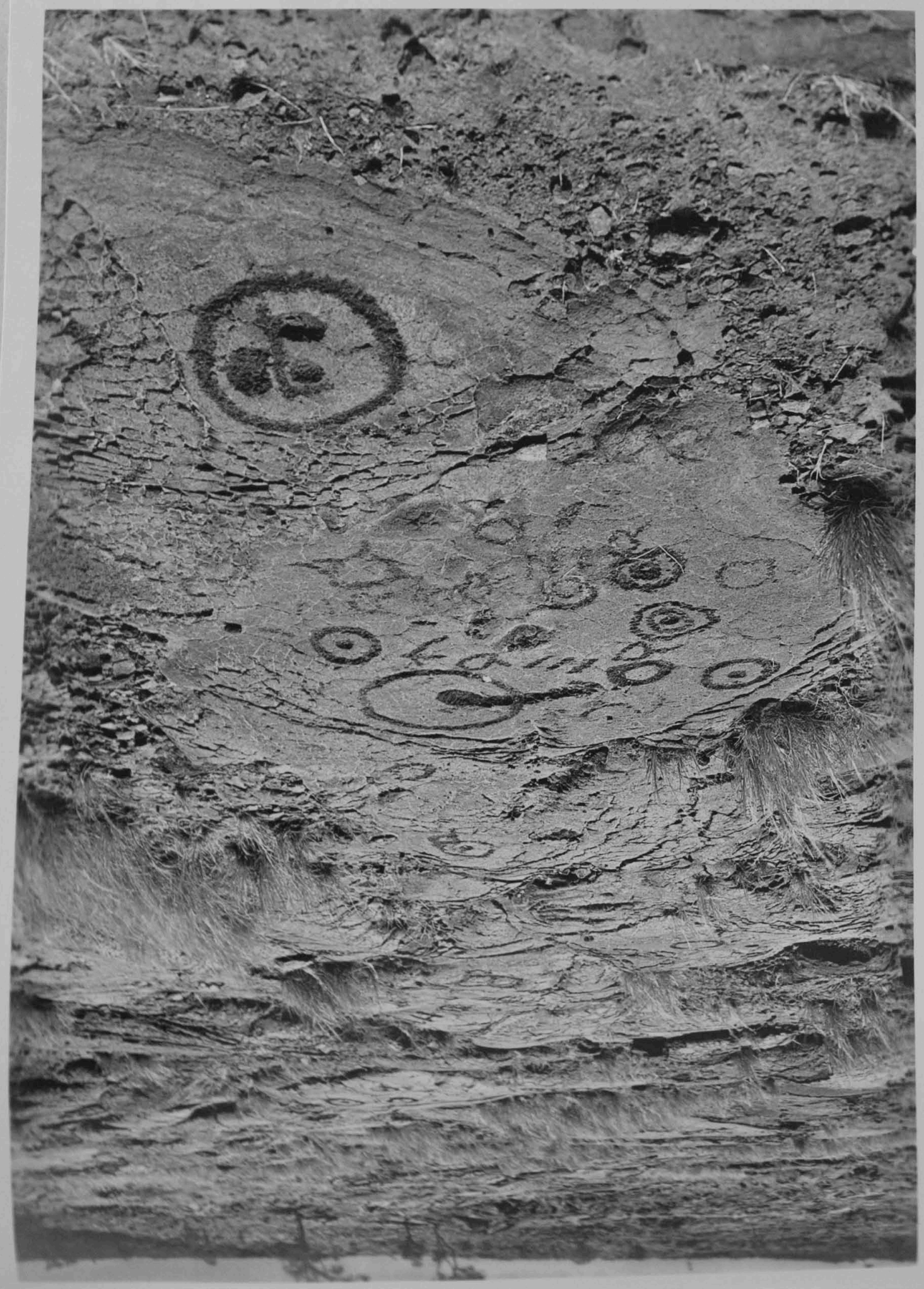
15

1921, July 22

296

bog

01



8

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

JOURNAL

Hawaiian Volcano Observatory

Day Saturday Date July 23, 1921
Monday " 25, "
Tuesday " 26, "

July 23.
6:00 p.m. Fume moderately thin. Seeing fair S and W. Seven fountaining puddles in center. Peninsulas growing NW from S peak and from W island tending to shut off pools W and SW. Fountain in W pond and two fountains in E pond. Some breaking up SE arm. Avalanche prolonged from SW wall breaking up SW bay.

Rush of hot air continues up rift wells and tunnel still very hot. Stalactites lighter colored.

Glow over pit at night variable but mostly dim.

July 25.
4:30 p.m. Fresh sulphur and sulphur smell along rift between upper cone and pit. Both cones blowing and hot. Looked down into interior of upper cone. Saw black well 10 to 12 feet in diameter under W side of shell of oven. Handful of one to two-inch pebbles of light porous lava thrown in were all blown out but one.

Fume moderately thin. Only three fountains seen, one in N cove end of main lake, two in E pond. Hissing W and N. Conditions stagnant. Heavy crust. Topography of crags and islands unchanged.

July 26. Fume thin enough to show whole W rim of pit from Observatory.

Between 10 and 11 o'clock at night pit bright.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Monday Date July 25, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
		Brunton						
4:30 p.m.	S saddle	S crag		-29 35		398	-226	
		N cove fountain		-24 55		741	-345	
								T A J

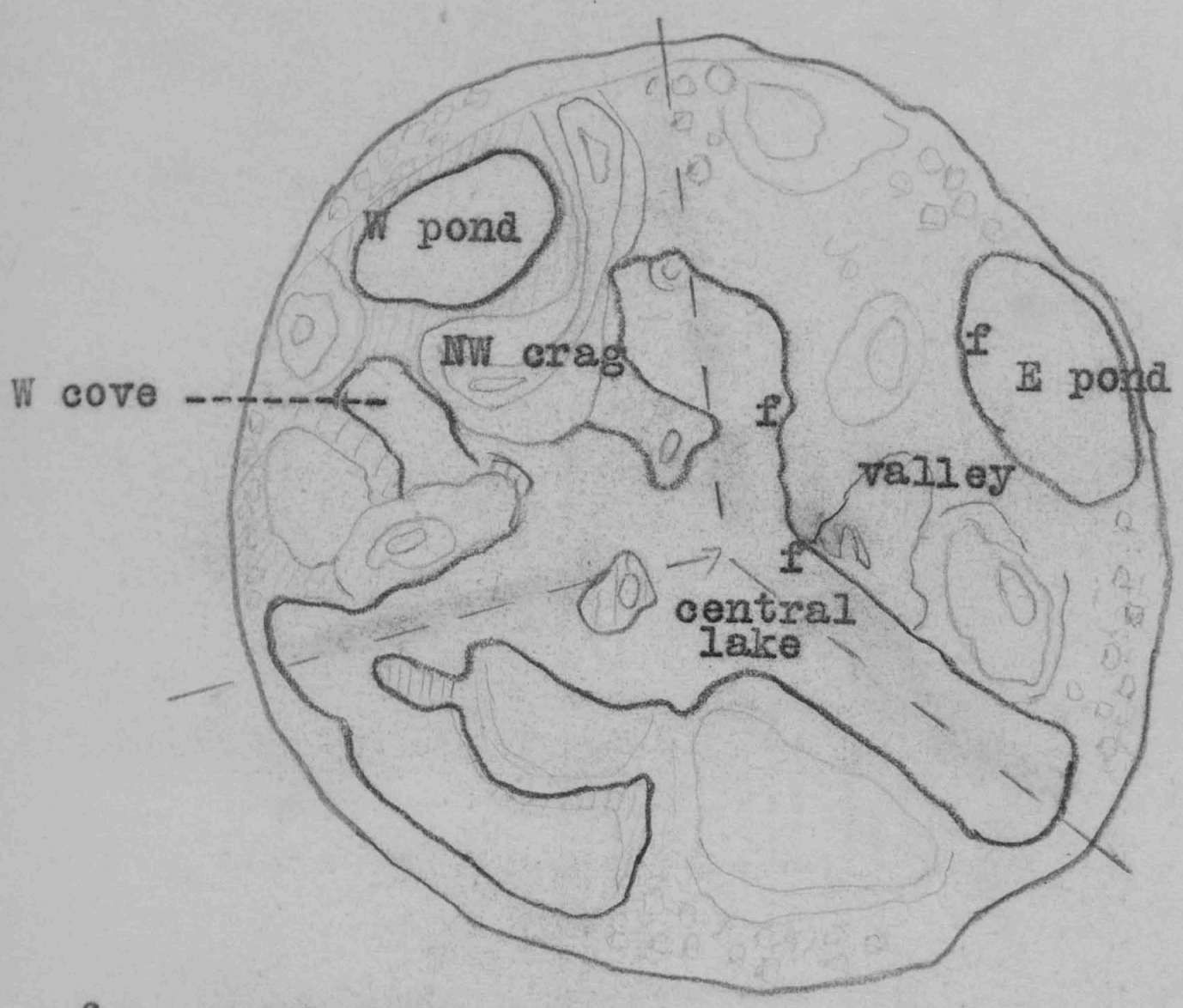
JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date July 27, 1921

10:00 a.m. Hissing E and SE. Cracking and foundering N cove. Hissing W. Fume moderate. Crags same.

Cracking-and-foundering spreads all over. Only steady fountain seen a small pot N end N cove. Arrangement of dips look sectoral.

Haleamaumau from S;



f -- usual fountains
Dotted lines show sectors. Central lake should be larger.

New force of blast at SW rift cones. Red dust on ground near openings and thin fine red dust being carried out in the blast. Transparent cauliflower gas clouds above both wells. At upper cone the blast stopped for an instant, then began again with renewed force and noise. Handful of pebbles thrown into well all blown out. Handful of large pebbles up to 3 inches diameter of vesicular lava thrown into lower well all blown out. Six inch blocks thrown in are deflected as they fall. Heat at lower well increased and the blast comes out of the tunnel as well as the well. Red dust lines the interiors and seen glimmering in the sunlight as the hot gas goes up. No condensation whatever.

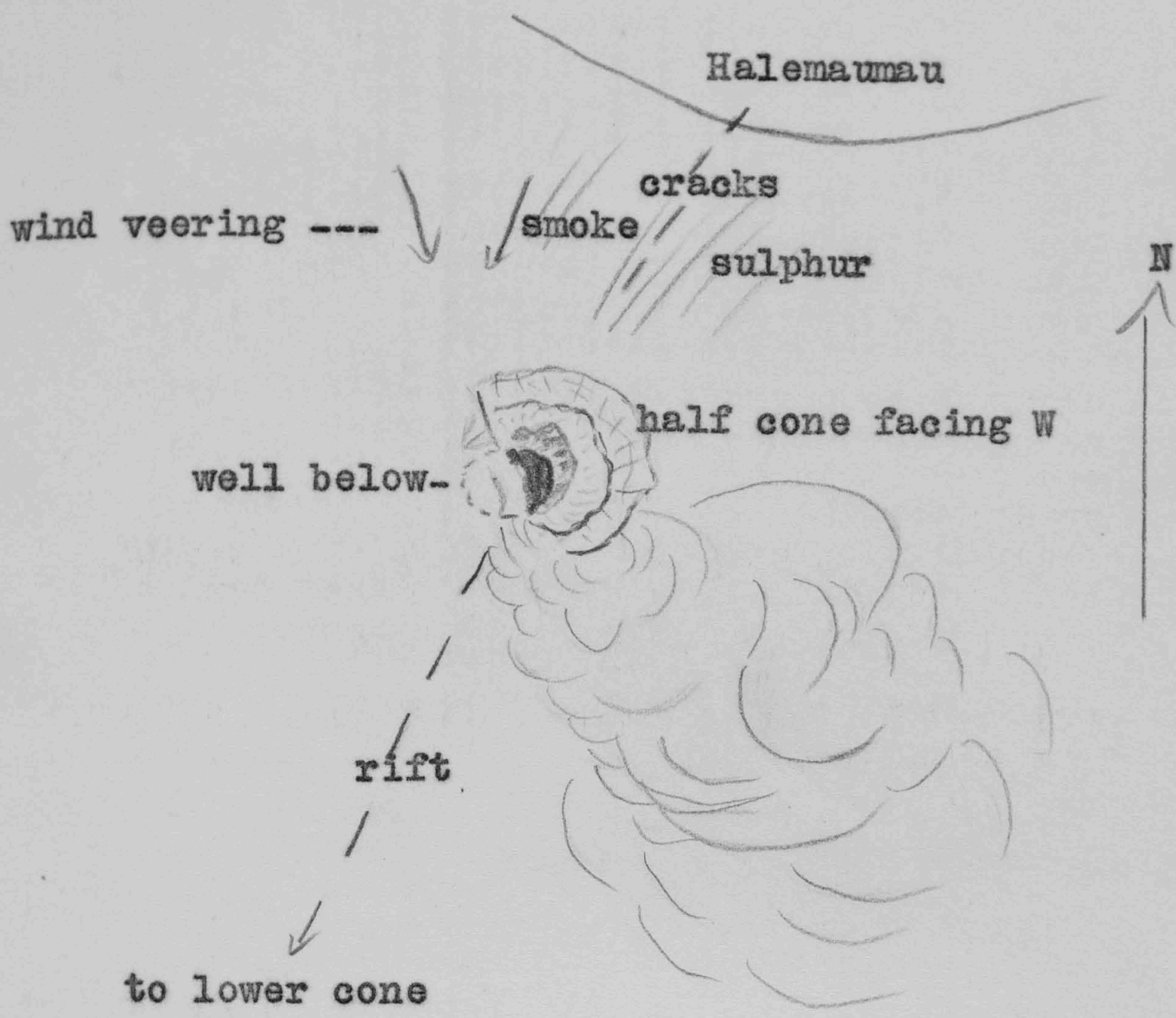
Map of lower well.

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Wednesday Date July 27, 1921

Map of upper cone:



There is an obliquely vertical crack in inner SW wall of Halemaumau, 100 to 175 feet above bottom, just N of SW station line from center of pit. Under this an open wall-crack back of the talus with upright slab back of talus and a chasm between slab and wall of pit, where yellow fume rises, different from steam seen elsewhere. No insucking of the fume could be seen anywhere (as in case where rift from cones opened below in the pit).

Cracks of N rim very hot and incandescent, white margins.

No open fountains E pond. Only a noisy blowing cone. One border pot in end SE arm, fountaining sluggishly after the break up.

One avalanche SW wall near rift.

Single noisy puff heard in pit 11:15 a.m. Source not identified.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date July 27, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
		Brunton.						
10a.m.	S							
	saddle	S crag		-29 30		398	-225	
	SSW	NW crag		-16 55		703	-214	
	"	Tip N peninsula		-28 35	(8/13)	587	-320	
	"	Top central island		-27 15		578	298	
	"	S crag		-26 05		431	-211	
	"	W island		-32 50		436	281	

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Thursday Date July 28, 1921
Saturday " 30, "
Sunday " 31, "

July 28.
3:00 p.m. No changes in pit. Less hissing. Two open pots central lake on E side. Large fresh avalanche dump at foot of SW wall covering much of the small pond at SW end of W cove. Scar white with sulphur or sulphate in wall above where this rock fell. This place at rift site. The gash in wall described yesterday, farther N than this scar. Gash wider open. One fountain in E pond. SW rift wells not blowing so hard as yesterday. Estimated gas current 80 to 100 feet per second. Wind not especially different, ordinary trade wind.

July 30.
12 noon. After all night rain, on clearing, fume over pit seen to be extraordinarily thin. From S whole pit visible. Crusted pools, same as before; hissing; islets in E pond; three or four fountains; heavy avalanches.

From avalanche scar, SW wall, downward, a rift chasm back of talus, high and deep. A cavern inside with a peaked slab in front of it. No live lava visible in the cavern. The peeling off of SW wall appears to have developed the rift seams in wall.

Rift crack has moved where it crosses trail and deposited new yellow salts. Open 1 foot more or less. Sulphur smell.

July 31.
11:00 a.m. Fume thin but diffuse. Lakes have recently been cracking and foundering. Two fountains in N cove, one in N narrows, one E of island, two in E pond. Slides numerous, E pond, W wall and from E crag mass. Longish island in E pond. Fresh avalanche material many places. W island surfaces wet with H_2SO_4. Much hissing W pond and W cove, which are covered with dusty crust, which has not taken part in the recent cracking up. Lake high against the platforms. Entire pit in view from time to time. Lake has been rising around islands.

SW rift wells blowing as before. Fresh smoke patches between them and Halemaumau, some deposit of yellow and orange crystals, and greenish yellow area with sulphur smell on S side of rift zone.

Veneer on wall of pit peeling off in large masses E.

12:30 p.m. Cracking and foundering taking place.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date July 31, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11a.m.		Transit. Fume thin.						
	S saddle	NE	0	- 0 45	0			4½
	SSW	S saddle	0					
	S sad.	NW station (closing △ of survey)	L56 37.5	-0 11	0	)With July 5)adds up 180°		△ 1.5'
	" "	S crag	L 60 43	-29 22	0	398	224	
	SSW	same	L 43 48	-26 06	0	429	211	
	S sad.	Fountain E side central lake	L 40 55	-31 08	0	558	337	
	SSW	same	L 54 46	-27 13	0	633	326	

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date August 2, 1921
Thursday " 4, "
Friday " 5, "

August 2.
5:00 p.m. Nothing new. Seven open puddles. Hissing from under slab through glowing crack in W pond. No avalanches heard. There has been some breaking up of W pond. Cracking and foundering make bright spells at night. Fume in general thin as compared with recent weeks.

N peninsula of central lake tilted NNW to raise four benches above lake level. E crag has been tipping over towards center and towards E central chasm, opening ESE wall-crack.

Blowing moderate at SW rift wells. No new solfataric activity nor rift movement.

August 4.
11:45 a.m. Fume thicker, but largely attributable to rainy weather. Still thin during sunshine spells. Seeing poor.

Lakes crusted heavily. Fountains W of center and in E pond. Hissing in region of E central chasm. Occasional puffs from fountains of E pond.

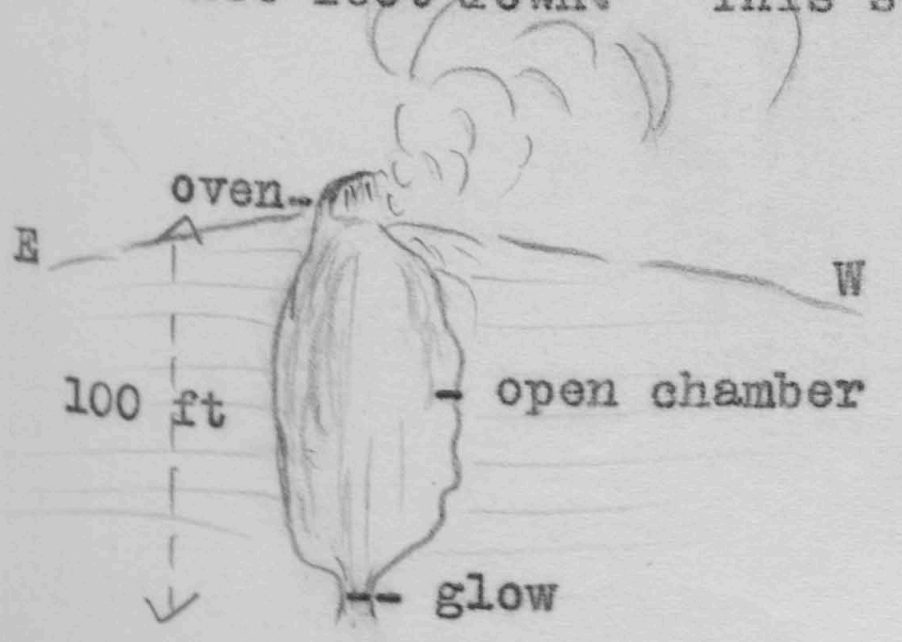
Avalanches NW and E.

Under NNE wall, and over wall-crack, yellow fume rising through talus, and hissing somewhere in that vicinity. Lava in wall-crack probably.

August 5.
3:00 p.m. At 1 p.m. fume notably thin and red avalanche dust going up.

At 3 p.m. found pit remarkably free from fume and lakes higher. New platforms SE of W island, E of central island, S of N peninsula. Six fountains with tendency to form small grottoes. Cracking and foundering in progress in SW bay. Fresh black crust everywhere and W cove connected through to W pond.

Upper SW rift well shows a glowing streak about 100 or more feet down. This streak the rift crack, and the chamber under cone seen to extend as a wide hall SW and NE, lengthwise of rift, towards pit and towards lower well. The glow streak appears to be lava rising in crack at floor of this hall. Blowing diminished and heat increased at openings. Heat less at tunnel.



T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date August 6, 1921
Tuesday " 9, "

August 6.
2 to 4 p.m. Fume a little thicker. Pit stagnant. Cracking and foundering locally continue; seen in SE arm. Blowing cone on crust of W pond. Four or five fountains in pit.

Blowing at rift wells much less and heat at lower tunnel less. Upper rift well shows a wide ribbon of lava in its bottom with two glowing edges, one of them fountaining a little. Lava in well higher than yesterday and appears to be much higher than lakes in pit.

No change in rift marker in desert.

August 9.
8:00 p.m. Fume moderately thin, dull glow over pit. Slight avalanches E and W. Pit crusted. Two or three active pots. Main activity an open pool at the west with streaming across it from NW to SE. Recent cracking and foundering evidenced by glow cracks all over the lakes, curved festoon patterns.

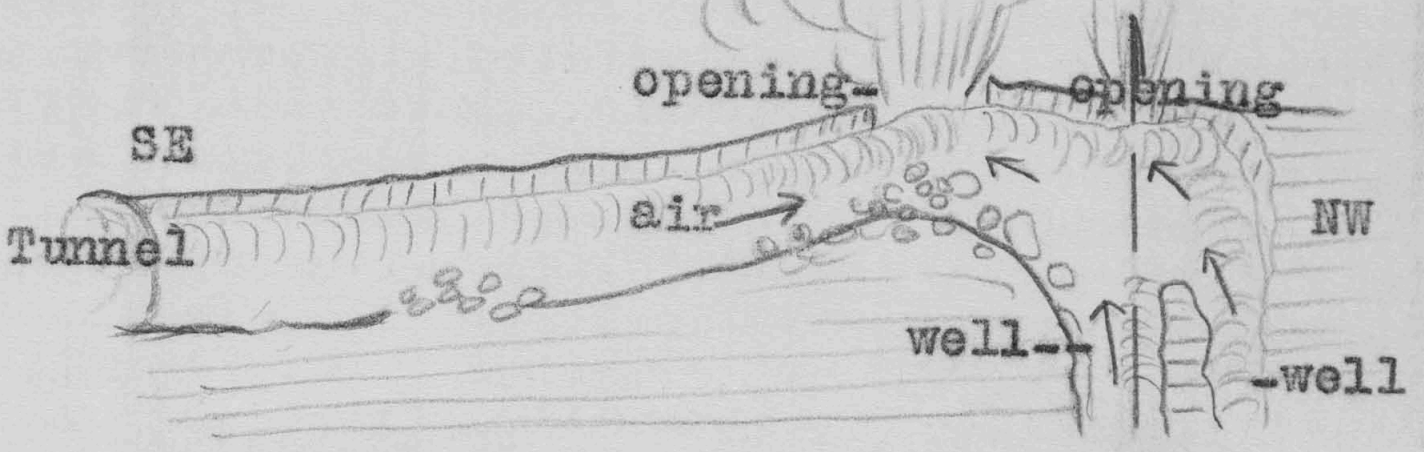
T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date August 10, 1921

5:00 p.m. Activity continues sluggish. Six or seven fountaining pots. Fume thin. E pond low in its cup of recent marginal material. W pond high, with festooned flows N and S along NW edge of pond from an open pot with built-up edges about 3 feet in diameter; lava splashing inside. A flaming blow cone at W margin of pond. Another festooned flow southward from narrows between W pond and W cove.

Upper SW rift well shows lava less than 100 feet down, and very hot gas rising. Penetrated cavern leading to lower well without difficulty and at the large window saw the gas stream emerging with an air draft now sucking through the tunnel from the entrance. Red glaze in tunnel. Probably dark cherry red heat in wells. Following shows arrangement:-



This same tunnel during beginning of the blowing episode had become red hot while the wells had become cooler. Now the wells are heating and the blowing is slight and the tunnel cool. Wells lined with yellow-green deposits.

Explored Postal Rift cavern for half a mile beyond lower window. Large cave, ramifies, many worm stalactites, some stalagmites. Another opening under Uwekahuna with tumble beneath. Large buttresses and pillars, flat roofs. Yellow tips to stalactites. Marginal ledges to stream. Some soluble sulphates. Tunnel cold. Did not reach the end.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date August 11, 1921
Friday " 12, "

August 11.
Noon. Pit very quiet. Few fountains. Increased blue fume condensing above colorless gas rising from the hot rift wells. Fume continues thinnish over pit. Dull glow at night.

10:30 a.m. Made tests with aspirator and tubes containing powdered P_2O_5. Tubes had previously been weighed. Object to draw air through tubes and determine water content. Temperature air 23° C, relative humidity 82% at 8:30 a.m.

Set up apparatus in normal air 100 yards S of Halemaumau. Moderate NE wind blowing, sun shining at beginning of experiment, clouds forming.

Aspirator worked very slowly owing to finely powdered condition of the salt. First 10 litres of air drawn through in 50 minutes and even then the lower container of aspirator did not overflow until shaken.

It took two hours more to suck another 8 litres through the salt and then it began to rain. For an hour the aspirator did not work at all as the P_2O_5 blocked the gas. A drop of liquid formed in the salt tube and stopped the suction.

Stopped at 2 p.m.

T A J

August 12.
9:00 p.m. Fume thin. Three fountains in main lake, one in W pond, two in SE arm and two in E lake. W pond crusted with hissing at a crack in center of pond. Two of the fountaining places in main lake were surrounded by red streaming lava to a distance of some 20 feet. Small avalanche from E wall.

SW rift cones glowing clear to the surface.

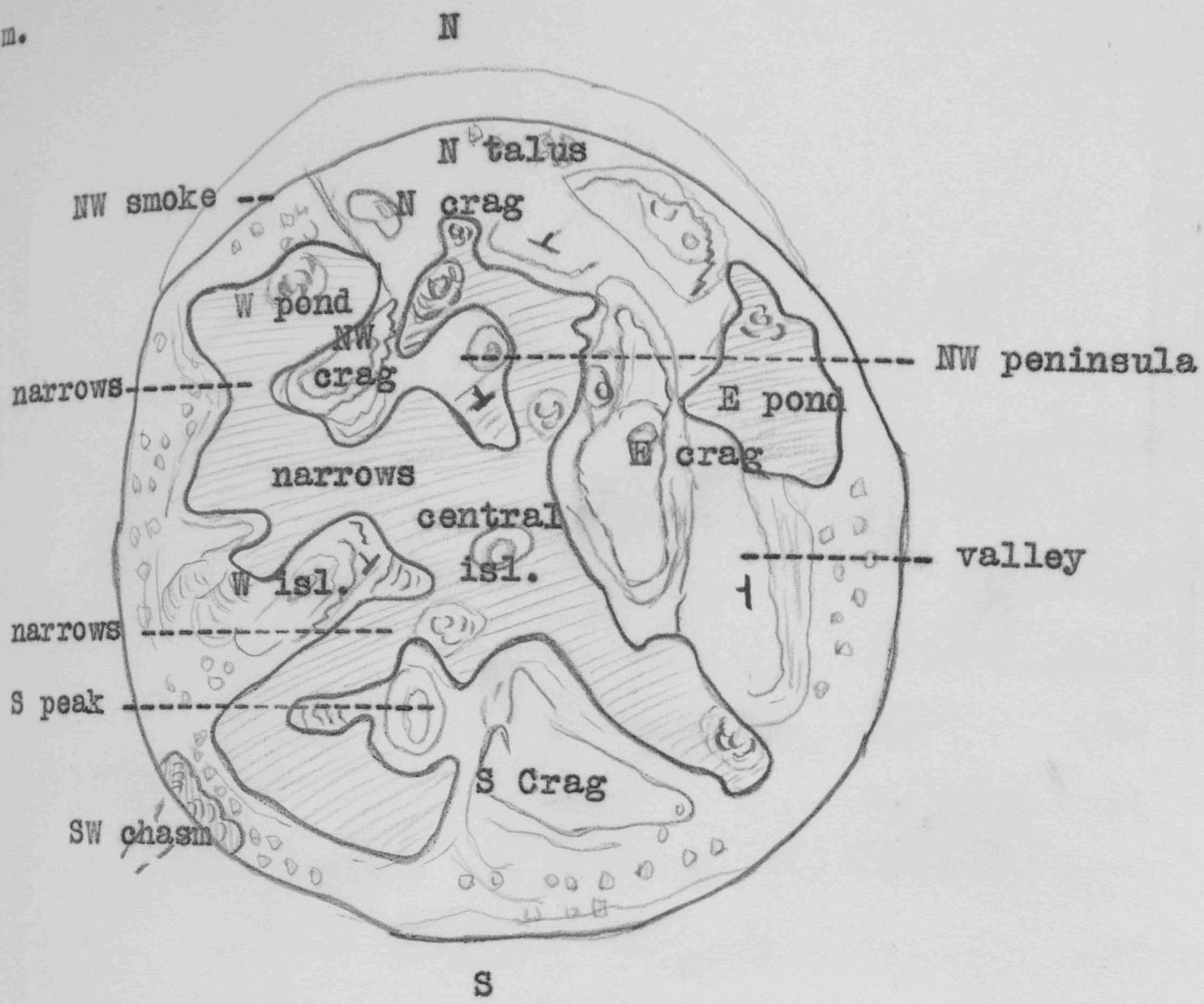
R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day **Saturday** Date **August 13, 1921**

11:00 a.m.



Fume thicker at SW wells and very thin transparent over pit.

SW wells dark in daylight but glowing at night. Very hot gas acrid with SO_2 and transparent below, condensing blue-brown above. Waxy alum deposits, yellow. Cones growing hotter and also ground around them. Cavern from lower cone cool. Fume more dense from lower cone than from upper.

Pit has seven fountaining puddles. E pond fountain is noisy. Tendency to form spatter banks. Cracking and foundering SW bay and W pond. Lakes higher on banks. Occasional slips of rock especially SE. Fresh black lava festoons in SW chasm back of ledge adjacent to SW bay -- the rift chasm. Festoons have flowed from chasm toward pit. Yellow sulphur at smoke jet NW talus. Smoke remarkably lessened elsewhere. The E crag mass has closed the valley extending N from SE arm to a tight "V", where it was full of tumbled pits before, owing to the centripetal overturning of the eastern ledge. New little coves N from the N cove and the E pond and on N side of SE arm.

Fume from pit thicker towards evening.

The stalactites and interior lining of SW wells blackening as they grow hotter, have been yellow.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

SURVEY RECORD

Day Saturday Date August 13, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11 a.m.	S saddle	SW	0					
	SW	S saddle	0					
	S sad.	SW chasm	L 2 23					
	SW	same	R 23 41					
	S sad.	Tip SW peninsula	R 10 11					
	SW	same	L 27 22					
	S sad.	N tip S peak	R 20 30					
	SW	same	L 31 33					
	S sad.	S tip S peak	R 14 09					
	SW	same	L 14 58					
	S sad.	Summit S crag	R 25 19	-27 27	0	391	-203	
	SW	same	L 17 32					
	S sad.	Lake NW point	R 34 47	-24 53	0	673	313	
	SW	same	L 49 24					
	S sad.	Top central island	R 34 27	-25 44	0	611	-296	
	SW	same	L 42 19					
	S sad.	Top W island	R 14 33	-19 52	0	738	-268	
	SW	same	L 47 54±					
	S sad.	Top NW crag	R 30 34	-11 46	0	932	-196	
	SW	same	L 80 18					
	S sad.	Top N crag	R 42 07	-12 39	0	1088	-243	
	SW	same	L 84 00					
	S sad.	Top NW peninsula	R 41 27	-19 34	0	822	-294	
	SW	same	L 63 50					
	S sad.	Top E central bluff	R 48 08	-16 34	0	774	-231	
	SW	same	L 57 31					
	S sad.	Top E crag peak	R 56 57	-18 17	0	706	-234	
	SW	same	L 49 54					
	S sad.	Narrows W pond	R 22 27					
	SW	same	L 91 57					
	S sad.	W base S crag mass	R 4 08					
	SW	same	L 3 13					
	S sad.	Wall end SE pond	R 77 34					
	SW	same	L 17 36					
	S sad.	S end E crag ledge	R 96 31					
	SW	same	L 21 18					
	S sad.	Island E pond	R 76 22					
	SW	same	L 48 54					
	S sad.	N fountain E pond	R 75 21	-18 18	0	946	-315	
	SW	same	L 54 52					
	S sad.	W side E pond	R 69 51					
	SW	same	L 48 26					
	S sad.	SE corner E pond	R 87 06					
	SW	same	L 40 22					
	S sad.	Top E crag valley	R 60 31					
	SW	same	L 51 11					
	S sad.	S end E crag valley	R 60 03					
	SW	same	L 30 27					
	S sad.	N end E crag mass (NE cove)	R 51 17					
	SW	same	L 65 27					

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Saturday Date August 13, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
	S sad	N cove extension	R 44 42					
	SW	same	L 77 15					
	S sad	W cove narrows	R 24 12					
	SW	same	L 61 20					
	S sad	SW bay narrows	R 21 54					
	SW	same	L 37 23					
	S sad	Tangent SW bay	L 4 39					
	SW	same	R 7 30					
	S sad	Tangent SE fill talus	R 95 40					
	SW	Wall W of W pond	L107 26					
	S sad	S end S crag mass	R 61 42					
	SW	same	L 15 51					
	S sad	N corner top S crag	R 37 12					
	SW	same	L 25 48					
	S sad	Smoke hole NW talus	R 33 03					
	SW	same	L101 24					
	S sad	Top N talus	R 54 00	-9 56	0	1219	-107	
	SW	same	L 80 26					

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Saturday Date August 13, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11a.m.	S saddle	NW	1	W P	8x	f/16	1	5x7
	"	NE	2	"	"	"	"	"
	SSW	SE	3	"	"	"	"	"
	"	N	4	"	"	"	"	"

#1 shows tift chasm with lava in it, upturned markings on NW crag, extension of N cove, upturned benches W island, SW peninsula, central island, NW peninsula, E central point, W talus.

#2 shows E pond and island, uptilted E crag and talus fill, N extension E pond, level edge NE rim of pit, SE arm foreground.

#3 shows S crag, SE arm trench, S wall and talus, S peak, E crag and pond, central lake and island.

#4 shows NW crag, N cove, smoky N wall, NW peninsula, W pond and cove and island.

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1921, Aug.

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

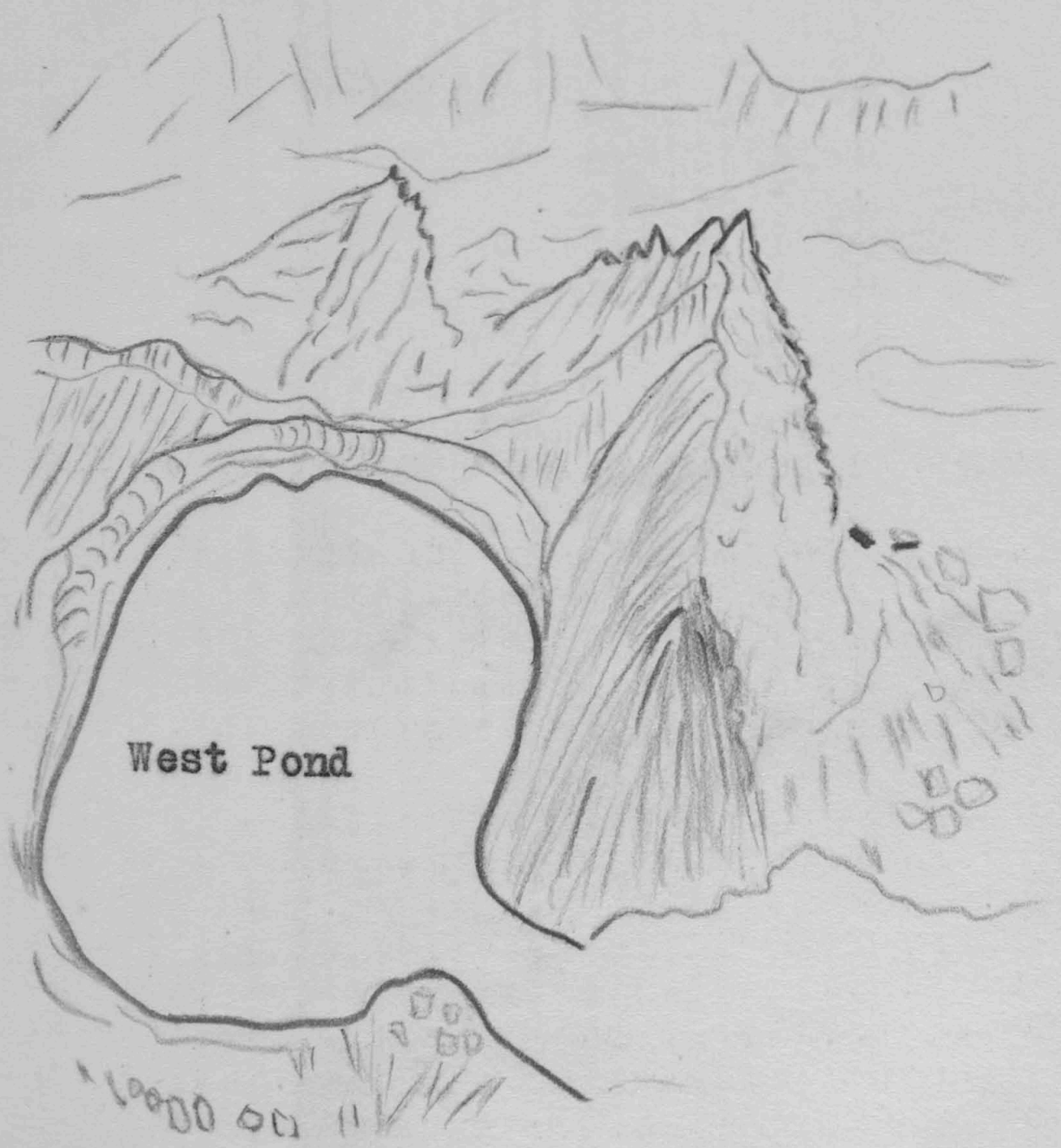
 Day Monday Date August 15, 1921

2:30 p.m. New marginal platforms around brimming black lava, latter recently the product of cracking and foundering. Fresh overflows on platform SW bay, N cove, on NW peninsula and elsewhere. Hissing vents SW chasm, W pond and E pond. Two fountaining patches E pond, three in N cove, one SE arm, one SW bay, one W of central island. Central island nearly joined to NW peninsula by further uplift of bottom. W cove dry crust covered with fresh avalanche dust. This avalanche had fallen from W niche region. Fresh bench overflows lapping into talus of SSW wall valley. E pond gaining on island.

Fume today a little thicker, but whole pit visible. Rudimentary spatter grottoes N cove, SW bay, N narrows, E pond and SE arm.

W pond hissing through two glow cracks in crust W side. Pond heavily crusted and about 2 feet below its border bench which it has recently been overflowing.

NW crag from W station:-



SW rift wells making transparent cauliflower clouds. Upper well shows pool glowing with red hot crust; crust has crack. Stalactites are chocolate brown. Lower well shows glow only at night, incrustations more yellow-green, and lower well makes more visible smoke. Upper well the hotter.

Striations on the smooth half of NW crag look like Pele's spine.

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL Day **Monday** Date **August 15, 1921**

3:40 p.m. E pond has five small border grottoes active and one central fountain. Skin thin and blistered. Overflows from the pond extend N along wall-crack.

SE arm also is blistered and a small border grotto in SW corner seen. Noises puff and plash. Some heat felt on rim.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date August 16, 1921
Thursday " 18, "
Friday " 19, "

August 16.
2:30 p.m. Nothing new. Rift cones hot. Lakes crusted. Spatter niche active NE side E pond; blow vent SW side. Fountaining puddle near central island. Fountaining niche N of W cove narrows. Pile of lava inside SW chasm. SE arm heavily crusted. Fresh driblets from E pond over S bank of pond. Blue veil of fume transparent. Central island connected NW peninsula by an isthmus which has lifted since yesterday.

August 18.
10:45 a.m. Blue fume veil over pit. Hissing marginal cones. New overflows on platforms and new wider platforms. W island mass now a raised semicircle enclosing what was W cove as a new S cove of W pond. Ten fountains. W pond extended to wall NW and nearly overflowing through gap between NW and N crags. NW crag a sharp peak, has changed shape and appears very high, a "gibraltar". SW bay narrower and its platform wider with fresh driblet flows. SW chasm floored with wide area of festooned flows out of cavern overflowing the red ledge and connecting floor of chasm with platform of SW bay. SE arm cracking and foundering. E crag and E pond region avalanching.

General situation a rising lake and lifting tips of sectoral crags.

T A J

August 19.
9:00 p.m. Fume thin. Five or six fountains active. W pond crusted over entirely. After foundering of crust in main lake a surface current persisted for twenty minutes or more from entrance to SW arm to a border fountain in N cove.

SW rift cones glowing brightly. Sluggish lava could be seen in upper well.

R H F

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date August 18, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10:45 a.m.	S saddle	S crag		-26 43		391	-197	
	SW (3735)	Lake under NW peninsula		-31 03		508	305	
								T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date August 21, 1921
Monday " 22, "
Wednesday " 24, "

August 21. 11:00 a.m. No change in topography of pit. Cracking and foundering center to east. Four fountaining patches, sometimes five. Hissing blow-cone SW bank. Lakes crusted and level with platforms. By constriction of SW bay and building of platform, the peninsula protruding NW from S peak is enlarged. Some rock slides.

SW cones very hot and blowing transparent cauliflowers, interiors dark in daylight.

August 22. 11:00 a.m. (Pan-Pacific Educational Conference.)

Little change. Few fountains. Masses of red earthy matter with particles of Pele's hair clustered on the stalactites of upper SW rift cone. Fume moderately thin. Went into cavern lower rift cone and saw glow in wells beyond from dark interior.

August 24. 10:00 a.m. Pronounced rising of both lake and crags evident. NW crag base on N cove side shows fresh raised shoreline. Lake however has risen faster than central island and drowned the isthmus connecting it with NW peninsula. NW crag has fallen away and changed shape of its summit, which is sharp and more serrate. Large cavernous space in its S face. One slide from it seen.

W pond has flooded W wall-crack more. SW bay flooding talus of wall-valley and the ground W of W island. SE arm flooding SE talus to wall making new wall-crack pool. More floods from SWb**chasm** -- the rift -- making a fountaining pool in the chasm and an outward flow where the ledge across chasm entrance had been. This ledge now entirely submerged. Lava in chasm pool evidently higher than lake.

About five fountaining areas, the ones on E side SE arm and E pond each making grottoes.

Fume thin. Talus invaded S of E pond. SW cones very hot but dark when seen in sunlight. Hair was singed by a flare-back from the flame on top of upper cone.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date August 24, 1921

	sta	pt	hor	vert	lev	dist	elev	h. i.
10 a.m.	S saddle	SW	0					
	SW	S saddle	0					
	S sad	S crag	R 23 41	-24 46	0	390	180	
	SW	" "	L 16 31					
	S sad	Grotto E side E pond	R 79 37	-17 31	0	907	286	
	SW	same	L 50 58					
	S sad	Lake, tip N penin.	R 34 32	-22 41	0	678	284	
	SW	same	L 49 41					
	S sad	E side W cove pond	R 23 06	-19 12	0	821	286	
	SW	same	L 68 21					

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date August 26, 1921

10:00 a.m. E pond hissing. All lakes risen. NW crag lifted into a remarkable spire like the peaks of Theophilus. Avalanches from NW face of W end of NW crag; have quite changed its shape. Another avalanche seen from S face. Shoreline N cove, E side of this crag, greatly lifted, showing a cavern. The whole NW sector has lifted. A large N sector has lifted breaking the N-S valley through E crag mass in two in the middle. S and E sectors have also lifted.

Wall-crack is gushing at new pool SE; pool higher than SE arm. Other evidences that main rising of liquid is in wall-crack are the rising of E pond and extensions N and S into talus; of SW chasm until the cavern is almost submerged; of SW arm which has extended itself S between S crag and wall; of NW talus (where smoke was) which is gushing from a blowing cone top of talus and lava pouring under crust, (revesled through a window) down slope into W pond.

Fountains in the three arms of main lake. Cracking and foundering spell, rapid, seen in W pond. Some bright spells seen at night. Central island nearly submerged, peninsula from S peak totally submerged, W island and S peak both nearly isolated. Streaming in W cove pond from under a bridge of crust, westward from central lake.

SE wall pond will soon connect through with E pond on wall side of SE fill.

The fountains are circular puddles in crust. Fume thin.

Rift cones the same.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date August 26, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
		Ilford Panchromatic plate.						
10 a.m.	SW rim	NW crag	1	I.P.	8x	f/22	1	P
	"	E central crag	2	"	"	"	"	"
	SW sta.	S crag	3	"	"	"	"	"
	N rim	W pond and NW crag	4	"	"	"	"	"

T A J

1921, Aug. 26

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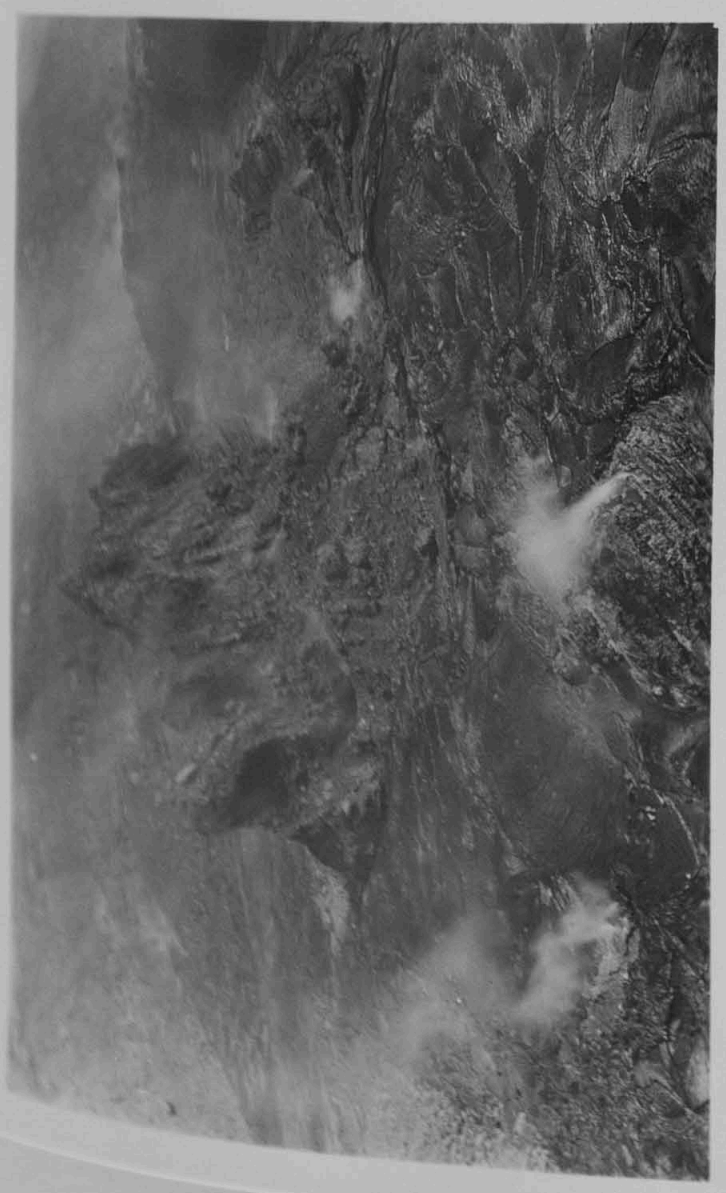

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date August 27, 1921
Monday " 29, "

August 27.
10 a.m to 12 noon. Rising continues strong. Pool at top of N talus cascading down over N wall valley. Border pools extending along wall-crack.

NW crag rising into a remarkable spire and shows a round cave opening obliquely down under its SW overhang. Filagree glow patch E of N cove.

Slight glow in SW rift cones visible in daylight.

August 29.
6:00 p.m.

Seven fountains. Strong rising. Lakes joined along wall-crack SE and SW. E pond has overflowed whole NE wall-valley and joined with pool fed by N talus cascade. SE wall-pool now connects with SW and E pools. New chasm pool to wall W from W cove. Old W crag against wall again rising here. Marginal bench magma under talus everywhere rising so as to make wall-cracks open. N and S crag sectors have both risen strongly. NW peninsula, central island and E pond island still assert themselves by rising along with lakes. Only breaks in continuous circuit of liquid lava against wall are at N and W. E crag mass has risen least, NW most. Small scarp E of N cove has risen sharply.

Glow in the wells of SW cones now plainly visible in daylight.

Hissing and plashing mild. Fume thin. Lake above top of SW chasm.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date September 1,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10a.m.	S	SSW	0					
	saddle	S saddle	0					
	SSW	Fountain W channel	R 24 46	-16 55	0	719	-220	
	S sad		L 52 54					
	SW	same						
	S sad	Fountain N channel	R 45 59	-16 20	0	745	-220	
	SW	same	L 55 51					
	S sad	Fountain E pond	R 79 01	-14 02	0			
	" "	W summit S crag						
		(old summit)	R 19 32	-18 14	0	387	-128	
	SW	same	L 14 02					
	S sad.	Summit NW crag	R 33 11	- 5 27	0	921	- 90	
	SW	same	L 77 32					
	S sad	Summit E central						
		crag	R 57 59	- 9 59	0	726	-129	
	SW	same	L 51 03					

Lake 213 feet below NE, up 65 feet in 8 days
S crag 121 " " " " 52 " " " "

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Thursday Date September 1, 1921
Friday " 2, "
Saturday " 3, "

September 1.
10:00 a.m.

Crags higher in center of pit. Central island and NW peninsula, W island platform and S peak platform all lifted. Festooned frozen flows from W pond outward and from SW bay southward and northward along wall base. Seven fountaining patches. Heavy crusts showing crack-and-founder pattern. N crag mass has been cracking on W pond side and disturbing N wall which shows new talus of large blocks. S crag has lifted its NE peak to become summit. SE crag mass has lifted and avalanched on SE side. W crag scarps against wall and W cove island have lifted strongly. New chasm separating crag E of N cove from E crag mass. W pond has 4-foot margin. No trace left of SW chasm cavern.

September 2.
8:30 p.m.

Main lake cracked and foundered visibly over a large area. Formation of small flaming pots in crust. No very marked changes. Six or seven fountains.

Glow red in SW rift wells, chiefly in the linings of the two inner wells of the lower cone, all over the interior of the stalactitic oven of the upper cone. Stalactites stubby.

Fume thin.

Noticeable fume cloud over Mokuaweoweo morning and last night.

September 3.

With A. L. Dean and Finch explore cavern of Mauna Iki, open southward from summit pits. Broken walls and inflowed pahoehoe floor. Many tube and worm stalactites, hollow and not hollow, coated with colored sulphates locally. Connections of stalactites above with stalagmites below; latter in spires. Stalactite drops on broken walls and all stages from this to continuous glaze. Hot cavern above and below. Masses of sulphates whiten interior below (down stream).

Cracking sound in hill every few minutes.

T A J

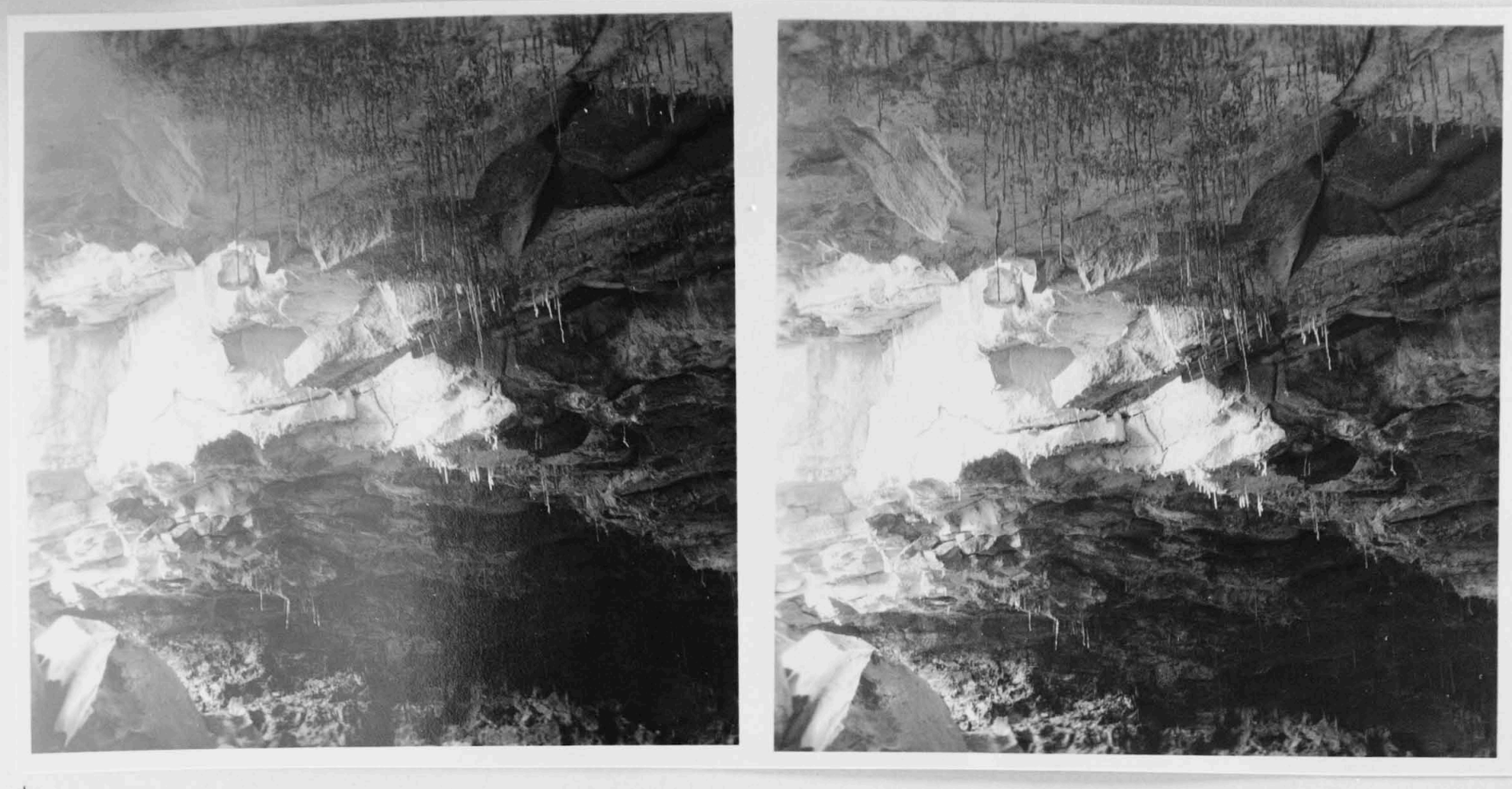
PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date September 3,1921

t	sta	subject	no	pl	scr	stop	ex	cam
		Mauna Iki. First cavern, general view	1	film		f/16	15	Stereo Kodak
		Wall. First opening. Stalactites.	2	"		"	5	"
		First opening. Detail stalactites and stalagmites.	3	"		"	3	"
		Second opening. Droplets on broken wall.	4	"		"	4	"
		General view S side second opening.	5	"		"	3	"
		Detail ribbon stalactite	6	"		f/11	30	"
		(metal tripod)						

T A J

1921, Sept. 3



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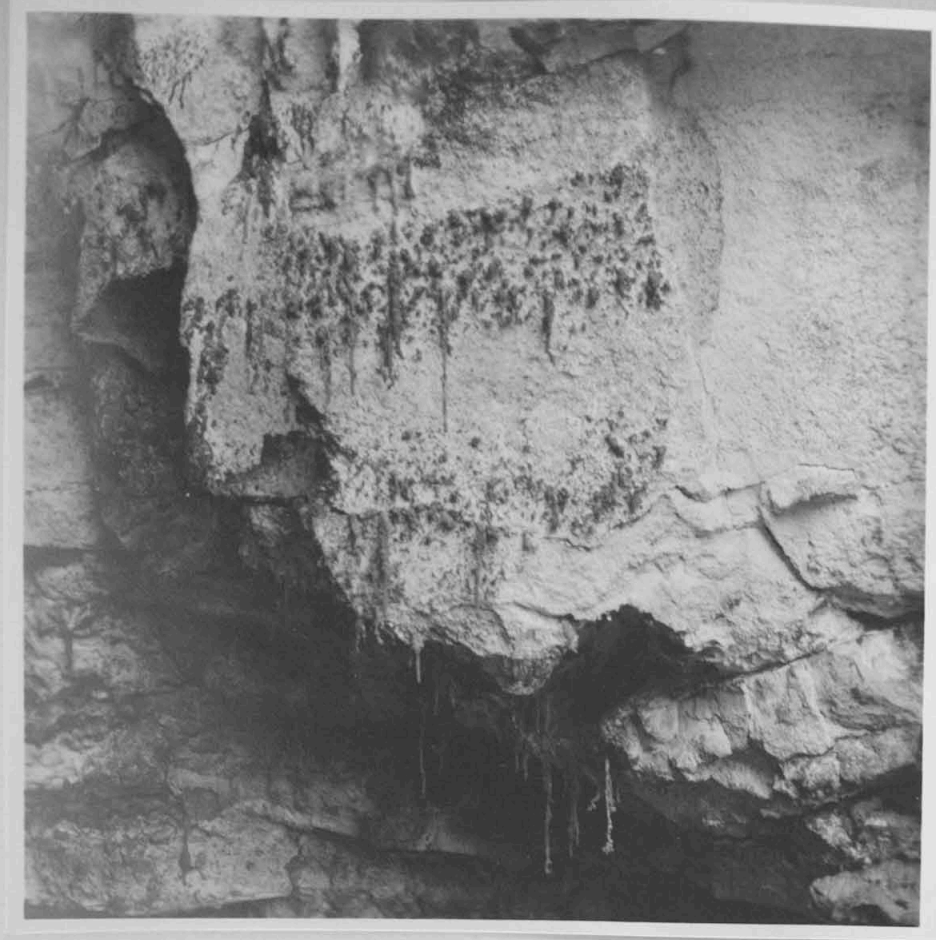
1921, Sept. 3



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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Sunday Date September 4, 1921

3:00 p.m. Lakes quiet. Some hissing. Cracking and foundering center and SW. Five or six fountains. New uplift of a crag dipping to SE at SE end of SE arm, cutting off wall-crack pool from lake. Line of new crags along W wall. W island dwindling. Central island a flat pancake close to lake level.

Evening. Violent cracking and foundering spells seen in both W and E ponds at different times. Few fountaining pots. Glow bright in cracks of N shelf rim of pit. Large extension of E pond to N.

Fume continues thin.

Glow in SW wells.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL Day Wednesday Date September 7, 1921

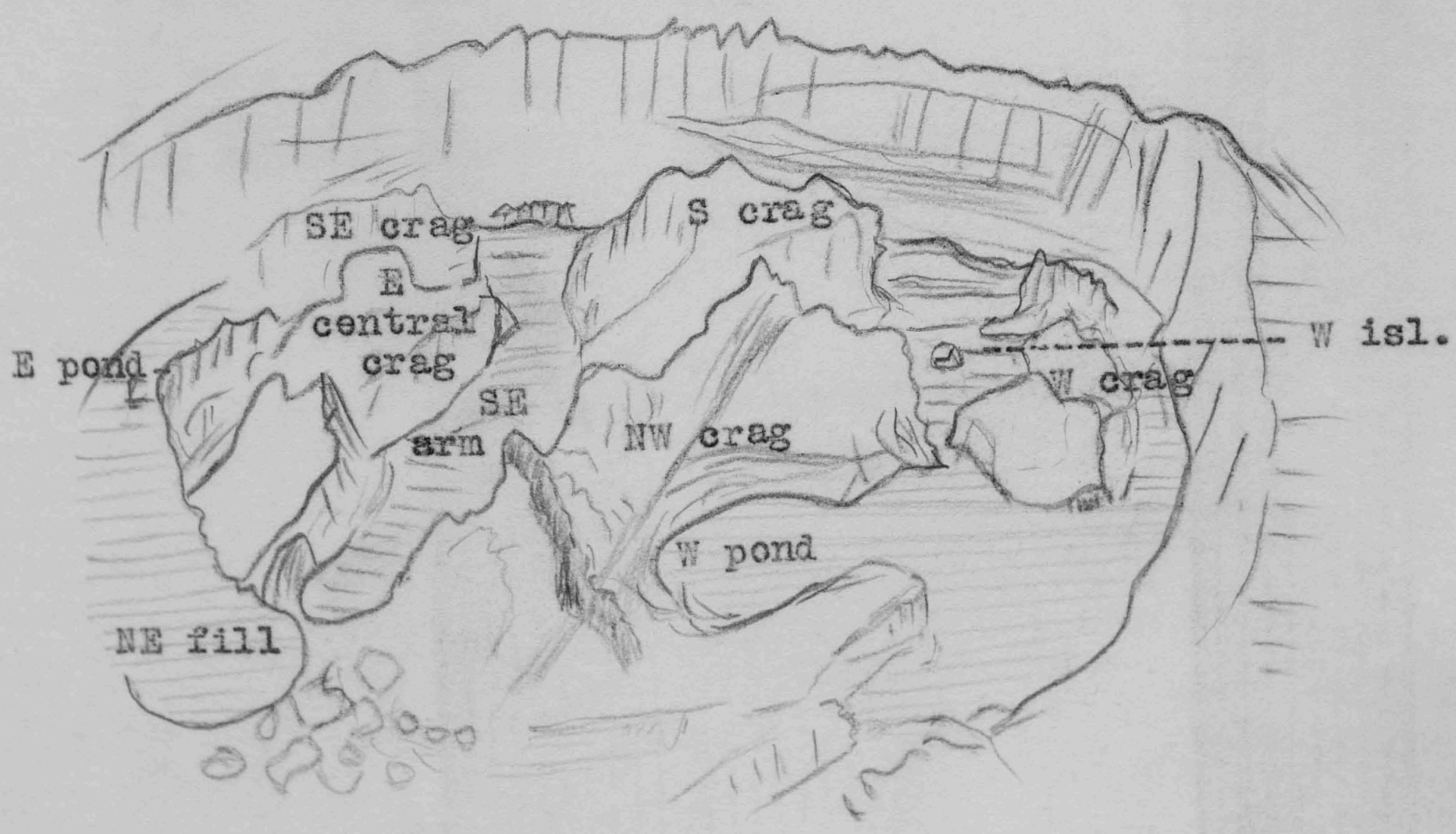
11:00 a.m. Immense pressure. No fountains. Condition like March 16. Central island, part of S sector, has risen as a large flat mushroom 40 feet. S crag has risen and lifted its extension under S channel so as to show a ledge across entrance to S channel from SW bay side.

Around the margins of the crusted lakes flows are trickling everywhere and light hissing is everywhere. Puddles welling up through crust in S channel. NW peninsula nearly submerged.

Three new crags now between W island and W wall. New talus under N side of S crag. Rocks falling from S crag. New summit of S crag enormously lifted cutting off view of center of pit from S saddle. Small NE crag up more and wholly separated from E central crag mass. N crag mass has parted farther from wall. SE crag mass tipping up with dip NW and involving with it the crag on NW side of E pond. The other crags are mostly dipping centrifugally. Lower section of S crag on center side shows two thick masses of aa paste. Top of central island mushroom dips to S. S peak remnants are parts of the S sector. E pond island still persists.

SW rift cones still nearly dark in daylight; transparent fume very hot.

1:00 p.m. Sketch from NW:-



T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date September 7,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11 a.m.	S saddle	SW	0					
S	SW	S saddle	0					
	S sad	Summit S crag	R 29 57	- 6 14	0	387	-43	
	SW	same	L 19 26					
	S sad	Lake NE of SE arm	R 51 23	-20 17	0	468	173	
	SW	same	L 31 44					
	S sad	Summit NW crag	R 33 59	- 3 03	0	900	-50	
	SW	same	L 74 53					
	S sad	Summit E central crag	R 57 31	- 7 03	0	730	-91	
	SW	same	L 51 25					
	S sad	Lake, tip NW peninsula	R 44 43	-12 36	0	777	-175	
	SW	same	L 58 54					
	SSW	S saddle	0					
	"	Top central island (lifted)(level disarranged)	L 62 20	-11 36	-01	562	-115	
	SW	same	L 40 42	-13 37	-0 28	543	-127	

Below NE station -
S crag 36 feet
Lake 167 "
NW crag 43 "
E crag 84 "
Top central island 120 feet (47 above lake)

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Friday Date September 9, 1921

10:00 a.m. Slower uplift of crags continues. Lake stagnant. All pools have cracked and foundered. Hissing every where. S crag sector has lifted ledge 12 feet high athwart SW arm. Two fountaining puddles. Very dark at night. SE crag mass has tilted more toward center and lifted scarp higher on E pond side. This has broken the bottom of valley between this crag mass and E central crag. Latter rises straight with horizontal markings. Tumble from it into valley.

NW peninsula has tilted up again, lifting shoreline that shows NW tilt. W crags now separate from wall by wide channels. Large tabular crag between NW crag and W wall. W island mass lifting a long peninsula in direction of central island. SE wall-crack fill has partially drowned the small crag at end of SE arm and joined with arm.

Cracking and foundering seen in SE wall pool. New talus on SSW side of S crag mass. Latter very high and surface tilting strongly to SSW. New N crag is lifting high. Coarse talus of N wall sinking into wall chasm between wall and old N crag extension of NW crag mass. Islet has reappeared NW of S peak.

General situation appears to be that after the sudden lift of S sector, the other sectors are now catching up, everything rising.

Glow a little more visible in daylight in upper rift cone SW.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date September 9, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
10 a.m.	SSW rim	Central island	1	film		f/16	1/10	Stereo Kodak
	Near SW	S sector uplift	2	"		"	"	"
	SW	NW crag	3	"		"	"	"
							T	A J

1921, Sept. 9

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3

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

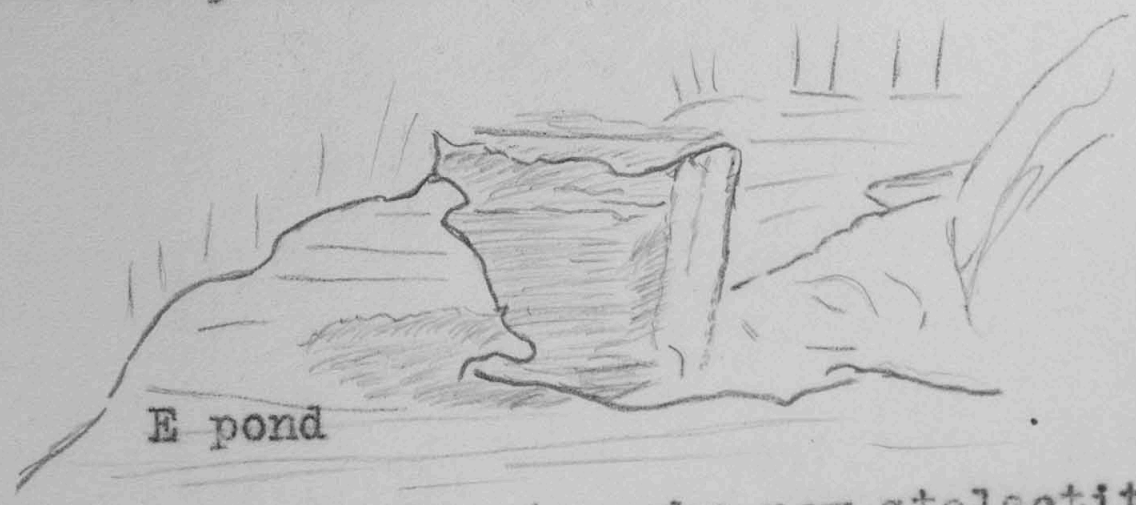
JOURNAL

Day Sunday Date September 11, 1921

11:00 a.m. Bottom of lakes uplifted. S and NW crags came into view from Observatory yesterday and lifted 5 feet since then. Faint harmonic tremor on seismcgram this morning. Fourteen or fifteen fountains and flows in pit. Grottoes and low cones forming. Trickle and cascades adjusting levels in wall-crack valley. Cascade S from pool W of new W crag. N talus largely engulfed. E peninsula of W island now a high new crag. Central island higher. Tilt to NW shows W island mass is part of NW sector. SE crag mass more overturned to NW and lifted. Central island joined by isthmus to S crag. Large shoal raised in SW bay shutting off a pool SW side S peak. New islat in W cove. Crescent grottoes in N cove. E pond island lifted into a mushroom. Lake greatly increased in area around wall margins. E central crag has caved away E and W.

In general lake is resolved into a complex of channels, pools and shoals with great increase of fountaining. W pond shows uplift on NW shore.

The whole NE wall-valley fill is lifted up and swollen into cracked domes and an escarpment 30 feet high on NW side of E pond makes the uplift of this block appear to be westward like that of the SE block. The scarp on S side of E pond now proves to be an island pulpit rock 30 feet high.



E pond

Upper rift cone beginning to make new stalactites.

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

SURVEY RECORD

Day Sunday Date September 11,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11 a.m.	S	SW	0					
	saddle		0					
	SW	S saddle	0					
	SSW	" "						
	S sad	N side SE arm	R 52 14	-17 56	+3	460	-150	
			L 31 25					
	SW	same	R 44 18	- 8 45	+2	968	-152	
	S sad	Grotto N cove	L 79 30					
	SSW	same	R 0 34	-15 26	+2	548	-152	
	S sad	S tip SW islet	L 72 29					
	SSW	same	R 31 50	- 1 55	+1	375	- 13	
	S sad	Summit S crag	L 19 27					
	SW	same	R 33 56	- 1 27	+1	894	- 25	
	S sad	Summit NW crag	L 74 33					
	SW	same						
	S sad	Summit E central crag	R 57 28	- 5 24	+3	714	- 69	
			L 50 39					
	SW	same	L 61 31	- 7 52	0	564	- 78	
	SSW	Summit central isl.	L 40 21	- 9 35	0	551	- 93	
	SW	same						

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

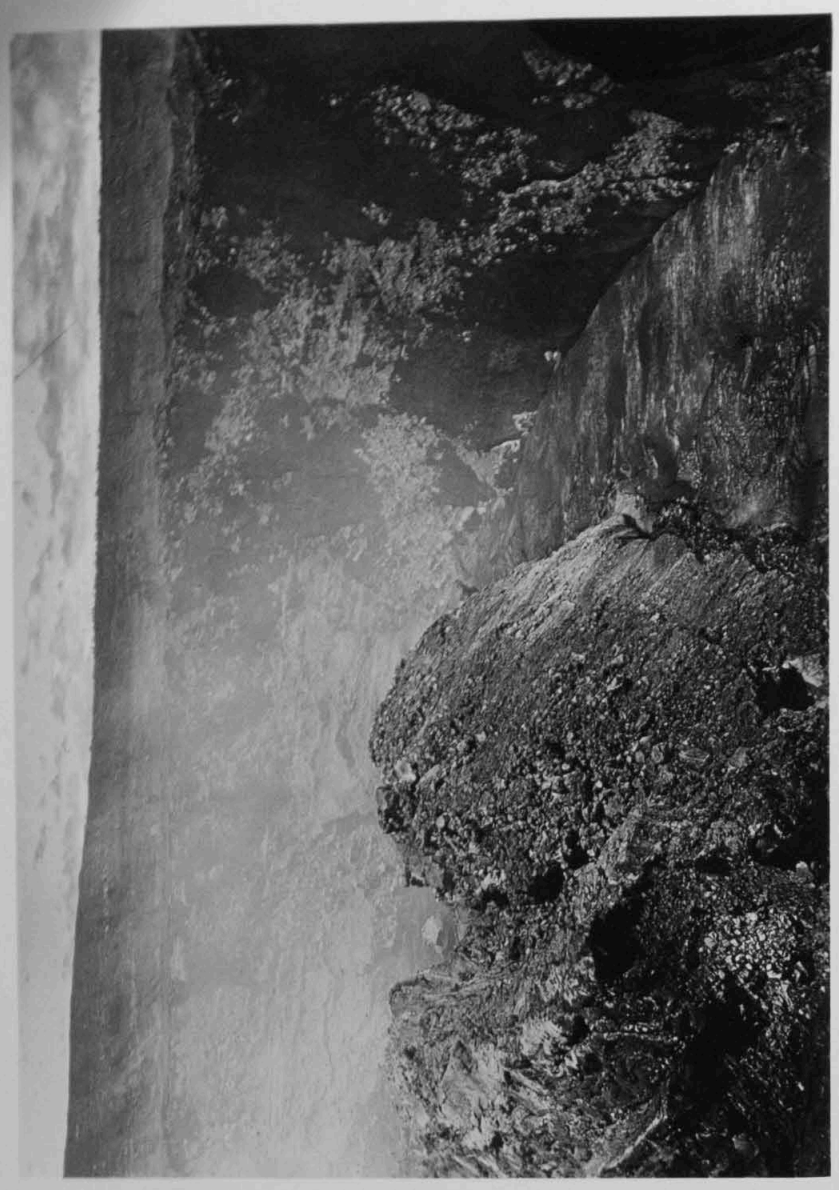
PHOTOGRAPH RECORD

Day Sunday Date September 11, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11 a.m.	S saddle	NE (fume blue)	1	I P	8x	f/22	1	P
	"	N " "	2	"	"	"	"	"
	SSW	NW crag	3	"	"	"	"	"
	"	S crag (upright)	4	"	"	"	"	"
	W	W pond	5	"	"	"	"	"
	NNE rim)	E pond	6	"	"	"	"	"

T A J

1921, Sept. 1



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Jaj

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Monday Date September 12, 1921
Tuesday " 13, "

September 12.
11:30 a.m. Hissing and plashing. Numerous pots and grottoes. Pots building spatter cones. Blue fume troublesome for photography. Bench magma lifting. New ledge across SW arm parting from wall by farther uplift. General conditions unchanged.

T A J

September 13.
11:00 a.m. Ten or twelve fountaining places, the largest and most active in N cove of main lake. All parts of the lakes, except W pond, one to two feet below banks. S floor around S crag 4 to 10 feet above lake lavel.

The lava in upper cone less than 100 feet down, crusted and black, only a few cracks showing red. No glow seen in SW cones.

R H F

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date September 12,1921

t	sta	subject	no	pl	scr	stop	ex	cam
11:30 a.m.	N rim S of W	Pit	1	8 in. wide	K 2	f/16	½	Cirkut
		"	2	6 in. wide	"	"	"	"
								T A J

JOURNAL

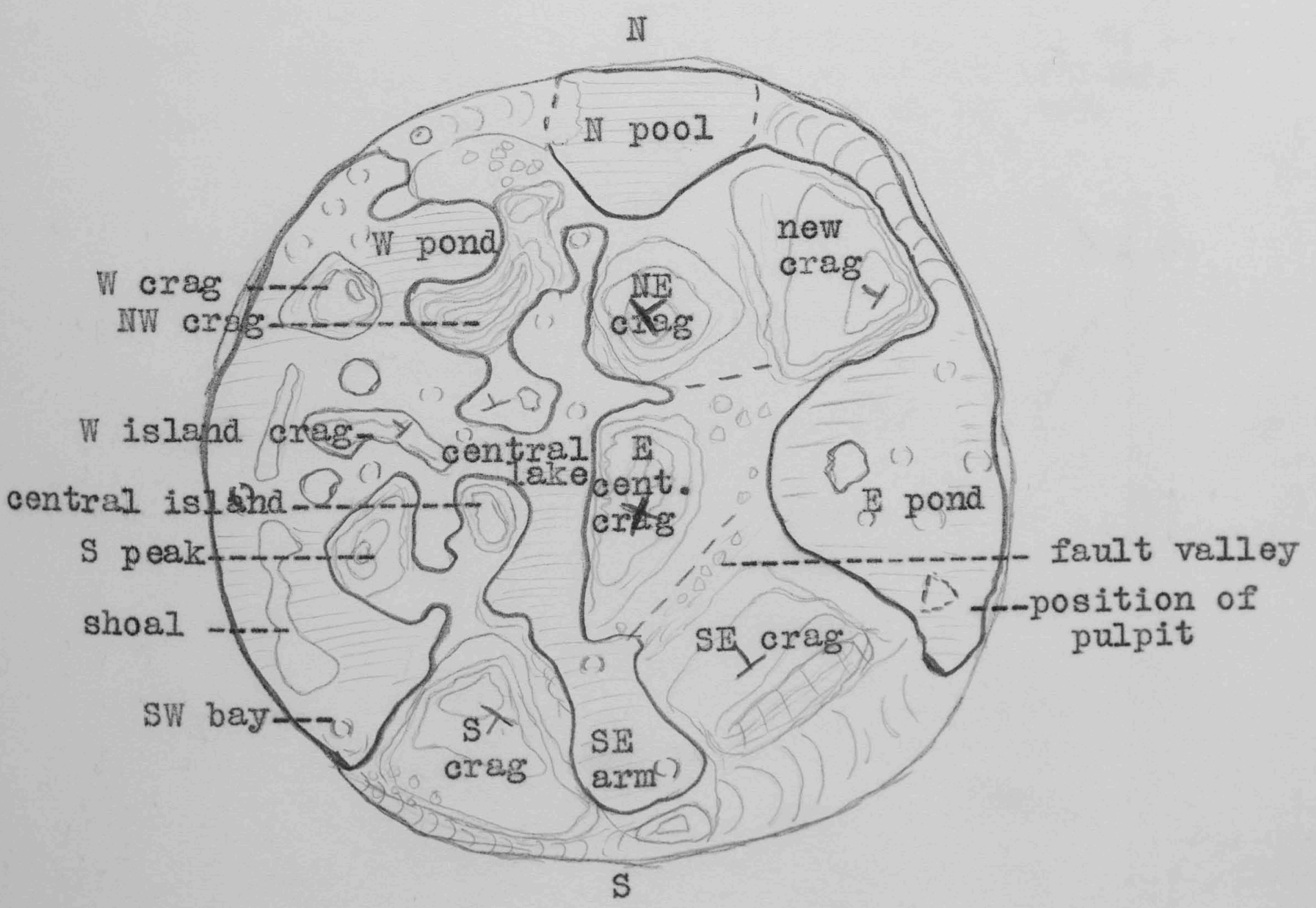
U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date September 14, 1921

2 to 3 p.m.

S pulpit rock in E pond gone. Wall-crack fill has poured from W pond along base of N wall behind the coarse talus joining a N pool filled similarly along new wall-crack from E pond. Hence a ring pool, or at least ring lava is complete around entire wall-crack.

SW rift wells less bright, no daylight glow, yellowish beards on chocolate brown stalactites, heat less, Lower well more collapsed and open at its western opening.

Crags larger and more crowded. About twenty fountaining places. Hissing filagree cone NW wall-crack. Border crags and shoals lifted. N and E pools lowest. Recent wall-crack floors SW, W, NE, SE and S lifted free from wall leaving a new wall-crack which is filling. NW peninsula more lifted. W pond proper quiet and crusted in the circle of NW crag mass and the activity shifted to wall pools W of it. E pond and its N extension now appears to be the largest single area of melt.



T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Friday Date September 16,1921

8:00 p.m. Fifty fountaining places. Numerous streaming patches. Thin crusts heaving and glowing through cracks. Flaming cones and cracks. High glow vents in NE crag and in valley E of E central crag. Impressive view from N of the great throne crag NW with its curved horn in center. Both NE fill and SW fill of recent date upheaved into crags now with new pools on wall side. Noises of puff and plash. Toes trickling around margins.

SW rift wells show moderate glow, some flare in lower one (eastern interior well), noise of fountain heard in upper one. Looking down latter could see about 60 feet below a bright quiet stiff festooned lava surface, festoons outlined by incandescence of higher temperature.

More uplift of crags everywhere, NW lower than S crag, both above level of eyes looking from NW station to S pressure ridge (3734 feet).

Cracking and foundering in SE fill. This and W pool are crusted and quiet. Lakes all fountaining. Increase of glow at night and of disagreeable SO_2 to leeward very marked along with increase of fountaining.

Some fountains flinging up melt 12 or 15 feet.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date September 18, 1921

10 to 11 a.m. Since the 11th NW crag lift has averaged 4.5 feet per day and S crag 4.9 feet.

Lakes are keeping pace better now. Fifty-five fountains counted. Low border grottoes forming. N pool has nearly joined through gap to N cove. NW talus more submerged. E pond island higher and a shoal with fountaining cone S of it. New island blocks in SE wall pool where crusted previous fill has cemented talus below and lifted clear, leaving channels between the blocks. NW and S crags very conspicuous even from auto terminus. Lifted under-lake wall on face of SE crag mass, E pond side, shows smooth veneer and pitted surface, with depressions one to two feet deep, rounded lumps between. A spatter cone in N end E central crag valley. Marginal toes.

General situation like 16th, only higher. Sharp horn NW crag partly fallen.

Measured lift of crags from Observatory:-

	NW	S
Sept. 10-11,	5 feet	5 feet
12	6	5
13	5	8
14	5	2
15	--	--
16	7	9
17	4	--
18	4	10
	8) 36	39
	4.5	4.9

T A J

9:00 p.m. Fifty or sixty fountains in action, some flinging the melt to a height of 15 or 20 feet. Gas hissing loud. SW rift cones glowing brightly, and splashing lava plainly audible inside.

R H F

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL Day Tuesday Date September 20,1921

9:45 a.m. Crags rising more slowly and lake rising fast. Yesterday S crag rose 7 feet and summit now in line from Observatory to top far wall Kilauea. Central crag and W crag now showing as seen from Observatory. Pit very bright at night.

Fume white and more dense at lower rift cone than at upper. Upper cherry red. Lower bright orange, especially western of the two inner wells which has enlarged and is covered with stalactites. Looking down W window one can see the partition between the two wells is only an arch and the liquid lava effervescing can be seen 60 feet down. Noise of lava audible in both cones.

To judge by inspection merely, the liquid lava seen in lower rift cone wells is about at the hydrostatic level of lava in pit -- 70 or 80 feet below rim of pit. In such case outflow will occur when lava in pit is 20 to 30 feet down.

W pond has slightly overflowed its N edge on to the N crag mass. S peak greatly submerged and lake has connected through between it and S crag. Fountains seem to follow the borders of the inner bench magma plug and the cracks between the sectors. The outer part of the ring pool is rather a fill. Line of fountains forming rampart on NW side of NW crag mass is very hot making it necessary to stand back at NW station. This has somewhat the aspect of hot bubble fountaining. Lakes are stagnant however and not streaming. Between the fountains are crusted areas. A crack-and-founder impulse was seen to start NW and travel across N pool, apparently an overflow from W pond region eastward.

(Note. Crack-and-founder is not necessarily followed by gas release and temporary subsidence. That is only in the case where the crust is distended and the cracking and foundering relieves inflation. In the case just cited cracking and foundering was produced by overflow of the surface, and the final pool was higher than it had been before.)

The lack of streaming is very noticeable in present lake, as though a downward circulation were as yet wholly lacking. There does not appear to be any marked difference in height of different pools, so rapidly has the whole basin filled. This is the first big drowning of the crag bases for this rising spell.

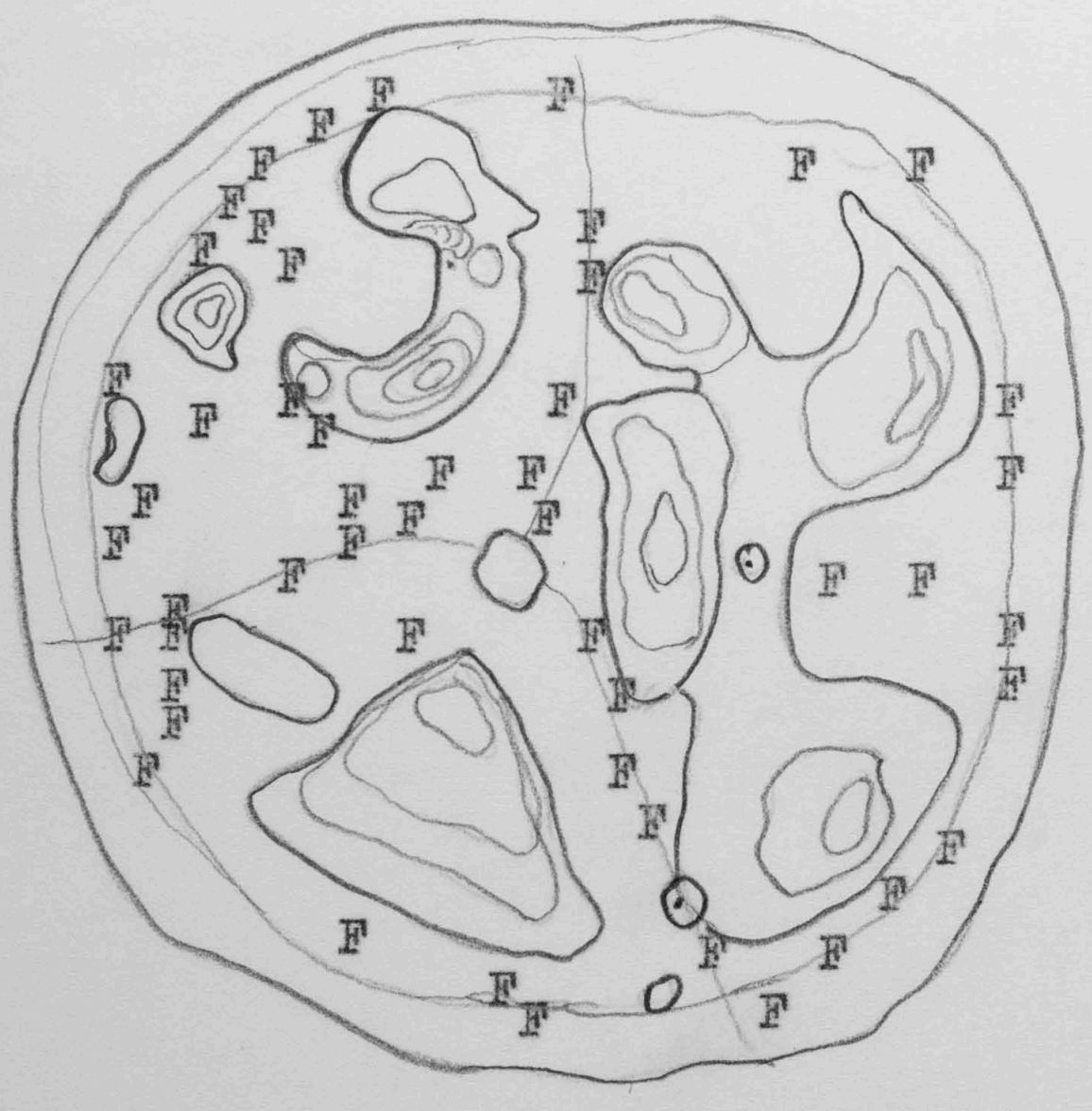
Blowing and hissing still pronounced, and the noise of the E valley cones is audible at auto terminus.

Rise of the lake has drowned the E pond island, NW peninsula, W island group, all the low shoals, and has widened the ring pool greatly and nearly reached the bottom of the two lower N shelves. Small crags W and crag at end SE arm nearly drowned. N pool connects through to N arm of central lake as a wide channel (see photo). SW bay and S wall pool all continuous. Heat at edge of pit greatly increased. Ninety fountains in action, low spatter margins,

large horseshoe cone spouting at end of SE arm, cone making umbrella flings with metallic explosions in valley E of E central summit. High flings from many of the fountains. General condition like the very early morning hours of March 18 before the cauldron action had begun.

Lines of fountains in ring pool are parallel to wall and out from wall, separate puddles irregularly spaced. Lines of fountains in central lake tend to follow very roughly the divisions between the crag sectors, thus:-

N



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T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Tuesday Date September 20,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10 a.m.	NE	SW	0					
	NW (3 ft, back of)	to SW	0					
	NE	Fountain N pool	R 60 28	- 7 58	0	549	-77	
	NW	same	L 101 10	- 7 02	+2	650	-81	
	NE	Fouhtain E pond	L 42 37	-23 48	0			
	NE	Summit S crag	L 21 37	+ 3 42	0	744	+49	
	NW	same	L 39 27					
	NE	Summit NW crag	R 16 34	+ 2 01	0	800	+30	
	NW	same	L 43 59					
	NE	Summit E central crag	R 7 64	0 1 10	0	447	-10	
	NW	same	L 64 28					

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date September 20,1921

t	sta	subject	no	pl	scr	stop	ex	cam	
9:45 a.m.	S saddle	SE crag	1		8x	f/16	1/2	5x7	
	SE	S crag	2		"	"	"	"	
	NE flat	NW crag	3		"	"	"	"	
	NNE rim	E central crag	4		"	"	"	"	
	N	Central lake	5		"	"	"	"	
	NW	W pond	6		"	"	"	"	

T A J

1921, Sept. 20

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350

1921, Sept. 2

3

Tag

1921, Sept. 20

5

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date September 21, 1921
Thursday " 22, "

September 21.
11:00 a.m. Looking from the NE about fifty-seven fountains could be counted E, N and SE. From W and N ninety in center, NW, W and SW; almost 150 fountains in pit.

Lake level on wall of pit down 3 feet and on wall of crags down 5 feet; therefore the crags are up 2 feet.

Streaming out from W to E, bending N, in E pond. E valley cone out of action. Bubble fountaining and stalactite curtains and grottoes. E pond island 5 feet high. Much Pele's hair making.

Conspicuous change is the lowering of lake against wall of pit everywhere by from 3 to 5 feet. Three cones in different parts of E crag valley, none of them active. Streaming more pronounced than yesterday and generally southward in the central lake. All the shoals and islands are restored by the subsidence and the central and SW areas converted into channles and about twenty open pools. Hot fume insupportable at NW station. Much bubble fountaining.

SW rift cones less hot and the lava seen down wells of lower cone appears 80 feet below surface.

Crags continue to rise during day, but slower than before.

September 22.
4:00 p.m. Lake margin against wall of pit 10 feet below highest level of two days ago. Crusts greatly increased and only ninety fountains in pit. Bubble fountaining and little streaming. Some southward streaming from N cove. Glowing cone at N entrance of E crag valley. Crag masses NE and NW nearest to ring pool have lifted with tilt toward center of pit. Platform W of S crag has also lifted. E pond island 12 feet high. Three other new islets in SE channel of ring pool. Flat crag restored at SE end of SE arm. Small flats and islands more defined than yesterday and about 5 feet high. Fresh avalanche debris at S base of NW crag. Crags have risen about 2 feet by measurement and N crag has come into view from Observatory.

Lava down wells of lower rift cone appears slightly higher than yesterday with bubble fountaining and a lump or islet seen in the well.

General situation doubtful, continued rise of bench magma, marked diminution of gas pressure and continued subsidence of lake magma. Pit was very bright last night.

Note absehce of grottoes and absehce of marked level differences go with absence of streaming.

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Friday Date September 23, 1921
Saturday " 24, "

September 23.
4:00 p.m.

Equinox 3 a.m. today.

Crags have risen strongly; lake no higher, 10 feet below highest; SW rift cones show distinct lowering. Lower cone more caved and totally dark. Upper one less hot, and climbing on top could just see bubbling pool, about 125 feet down a round well.

All the crag cakes 8 to 10 feet high. Remarkable rise in SE crag overturned westward, with new wall below covered with smooth gray drip 30 feet high, and spatter lines for 12 feet above that. New part shaped like prow of ship. Smooth crusted lake against it.

Seventy fountain patches. NE block now a crag 50 feet above E pond. E island 15 feet high, mushroom shape. Islets in W pond extension. Block NW of W pond uplifted.

At the NE and SW sides of pit there are channels next wall of pit where the crag lift has not let in liquid, but where rather a line of depressions has been formed in the wall-crack with one or two hissing puddings. NE one is between E pond and N pool. SW one is between SW bay and SSW arm.

No streaming visible. Isolated puddles. Flinging fountains. Increased smoke. Gas pressure seems to be less.

A crack in E crag mass extending W to the E crag valley from W cove of E pond. This is the break made by uplift of SE crag. Crack has a live pudding in it.

Central island has a new platform lifted below it.

September 24.
Morning.

Crags all 1 to 2 feet higher. Central island, a new N peak and new part of E crag mass have come into view at Observatory.

Evening.

No change in height of NW and S crags. Glow dull. Someone reports more collapse of lower rift cone.

More fume at pit.

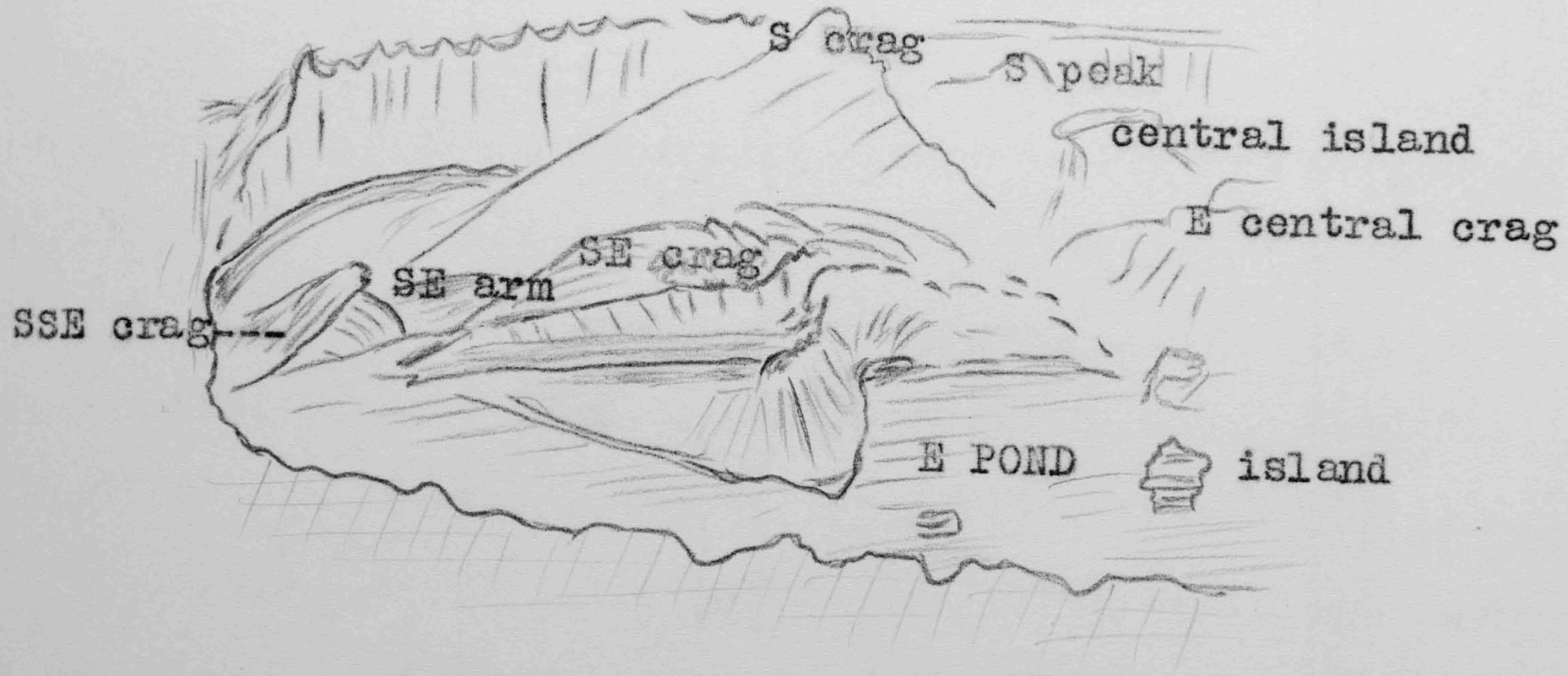
T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date September 25, 1921

11:00 a.m. Forty-five fountains. Notable rising of crags crowding into center without any perceptible rise of lakes. Spatter margin around wall of pit still 10 feet high. E island 20 feet high and has narrow stem. Islet has reappeared in S part of E pond. Spatter ridge one foot high along base of smooth wall next liquid at SE crag. Remarkable uplift of small SSE crag at end of SE arm, with 45 degrees backslope tilted S and wall of smooth paste at similar slope on SE arm side. This appears to be a reaction from the uplift of SE crag, shifting pressure to S and forcing up the paste under the little crag.

Sketch showing SSE crag and SE crag from E rim of pit:-



SE crag rose first and started pressure S. SSE crag rose next, both with smooth walls of paste below representing the submerged wall of lake basin suddenly lifted,

Crags have risen 3 to 5 feet since yesterday. E pond seen to crack and founder; before that only four fountains counted in whole area from SE channel to N pool. More fountains in center, W and NW. Notable lift of W crag. Central uplifted shoals all becoming notable crags and the central lake a canyon. N pool rather small and its former surface on the side of central crags all lifted as part of the bench magma.

Pit darker last night. Fume more abundant.

Interesting to observe whether the present strong crag rising will be followed by rising of lakes.

T A J

355

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

SURVEY RECORD

Hawaiian Volcano Observatory

Day Sunday Date September 25,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11 a.m.	NE	SW	0					
	NNE	SW	0					
	NE	W margin E pond	L 15 13	-17 55	+1	259	-84	
	NNE	same	L 48 20	- 9 34	+2	456	-78	
	NE	Fountain N pool	R 49 32	- 7 25	0	652	-85	
	NNE	same	R 38 54	-11 09	0	398	-79	
	NE	NW crag	R 16 33	+ 2 31	0	810	+37	
	NNE	same	R 7 29					
	NE	S crag	L 22 21	+ 4 51	0	756	+65	
	NNE	same	L 28 08					
	NE	E central crag	R 7 42	-0 08	+1	444	- 2	
	NNE	same	L 20 07					

T A J

JOURNAL

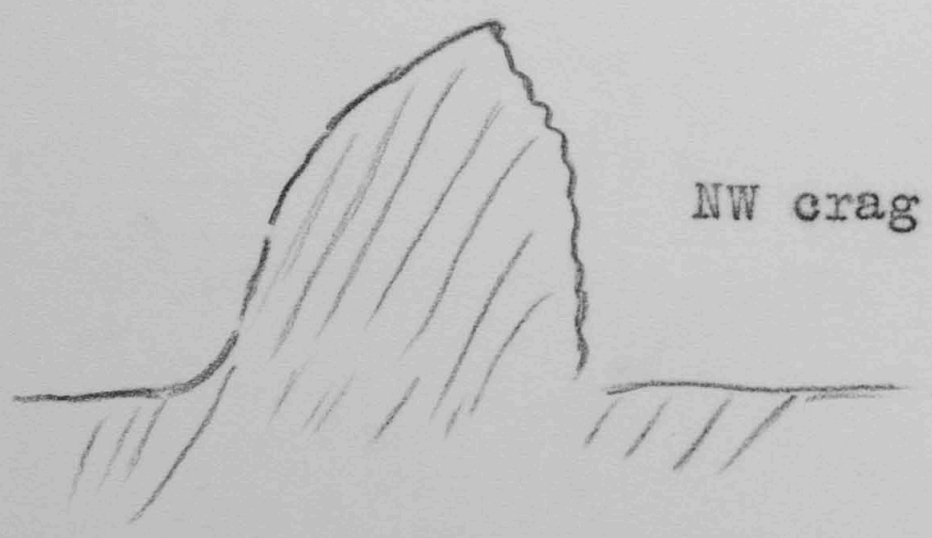
U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date September 26, 1921

11 a.m. to noon. Only about twenty-three fountains. Hissing. Avalanches from W side N end of NW crag mass. E pond island has fallen to a small stump. Lake level about the same. Crags stationary or only slightly risen. More fume.

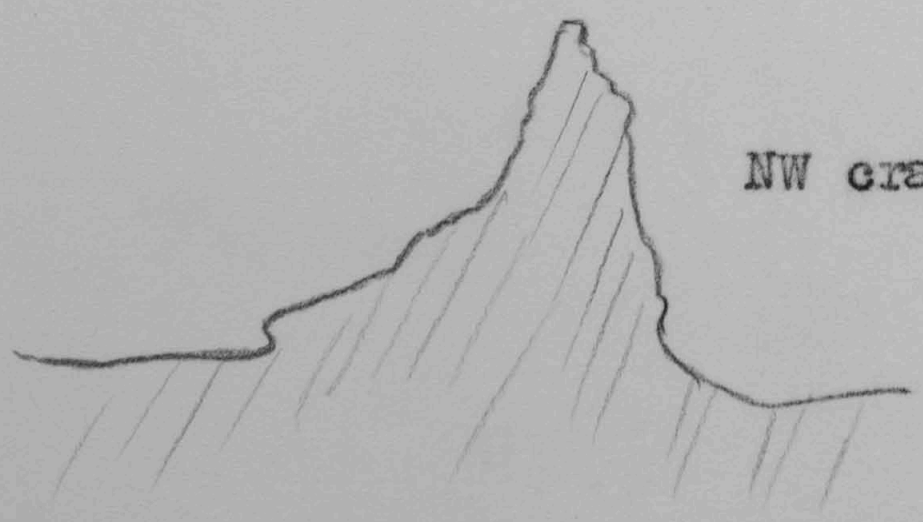
Two SW rift holes covered inside with red-brown oxides and dark. Entire partition in roof of inner chamber, lower hole, has fallen, leaving a single pit. Hissing can be heard at no great depth. Fume from Halemaumau less strong and noxious. SW and W pools mostly crusted and hissing.

In afternoon marked steepening of NW crag to a sharp peak by avalanching, where in morning it had been a massive tower.

As seen from Observatory:-



NW crag in morning



NW crag in afternoon

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date September 26, 1921

t	sta	subject	no	pl	scr	stop	ex	cam
11 a.m. to noon.								
	SE	Crags (1st half)	1	8 in. film	K3	f/11	1/4	Cirkut
	NE	" (2nd half)	2	"	"	"	"	"
		Whole N shelf, a few feet below edge, to pit	3	6 in.	"	"	"	"
		Wnole E high ground back from edge, to pit	4	"	"	"	"	"

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Tuesday Date September 27, 1921
Wednesday " 28, "
Thursday " 29, "

September 27.
4:00 p.m. View from E. Very quite. Probably not twenty fountains in pit. Crags still rising. No change in height of lake which has 10-foot rim above it along wall of pit. Slight new spatter rim along lake shore under SE crag. Latter has pushed back the paste by its overturn to S and foreed up the small crag at end of SE arm revealing a paste wall below a 45° scarp and dip to S. A round pool above lake level N end E crag valley.

September 28.
11:00 a.m. The uplifted SE arm crag shows distinct increase of back tilt with one shoreline vertical and another at 45°. Slight rise to new shoreline of SE crag. Only ten fountains. Hissing cones on crust. Cone in E crag valley has recently been active.

Lake a little higher, shore against wall of pit appears 8 feet below highest mark W, and 5 feet E. Slow lift of crags. Rapid crack and founder spells seen at N pool and SE wall pool. Otherwise very quiet and blue fume troublesome for photographing.

September 29.
11:00 a.m. Only four or five fountaining patches in whole pit. Some hissing. SE arm crag appears lifted higher. SE crag slightly lifted. Lake only 2 feet below highest mark, hence rising. Crag lift has left pool at N end of E crag valley an empty pot. Cone in valley appears broken. Intense rise of W crag recently with crushing effect and striations on the paste, where W crag and smaller adjacent masses have collided. Also the spur NW of W pond is now a high escarpment and the old ledge diagonally across NW crag is still more rotated over backwards. Measurements indicate that only the N crags are rising today.

Hissing still audible in lower rift cone wells.

Much bright flaring especially to north last night.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Wednesday Date September 28,1921

t	sta	subject	no	pl	scr	stop	ex	cam
11 a.m.	S saddle	New uplift mass at end SE arm	1	W P	8x	f/11	½	5x7
	"	W side S crag	2	"	"	"	"	"
	SE	Mass end SE arm	3	"	"	"	"	"
	SE spatter rampart	SE crag	4	"	"	"	"	"
	"	S crag	5	"	"	"	"	"
	"	S pressure rim	6	"	"	"	"	"
								T A J

360

1921, Sept. 28

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1921, Sept. 28

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1921, Sept. 28

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Saturday Date October 1, 1921

11:00 a.m. Pit quiet, crusted and hissing. Only three fountains visible from W. Numerous hissing cones on crust. Crags rising slowly. Lake area increased. Only five or six fountains at night, each marked by its separate flare on fume cloud above.

Fume denser. Central island broken on sides. Lake up a few feet, just over former high mark S side of pit. Sixty feet down SSW station. Seventy-five feet down S saddle (estimated).

SW wells unchanged.

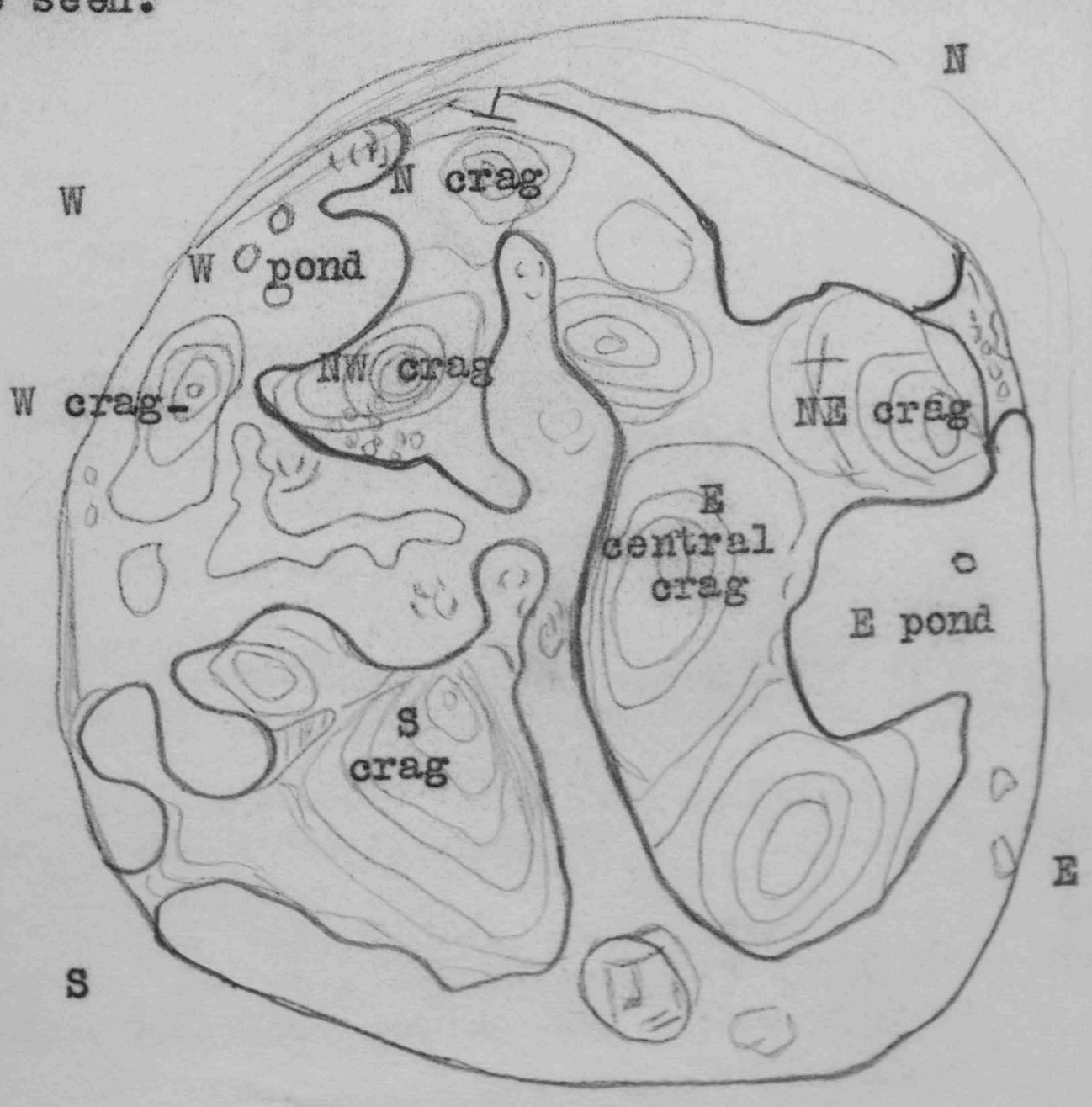
T A J

JOURNAL

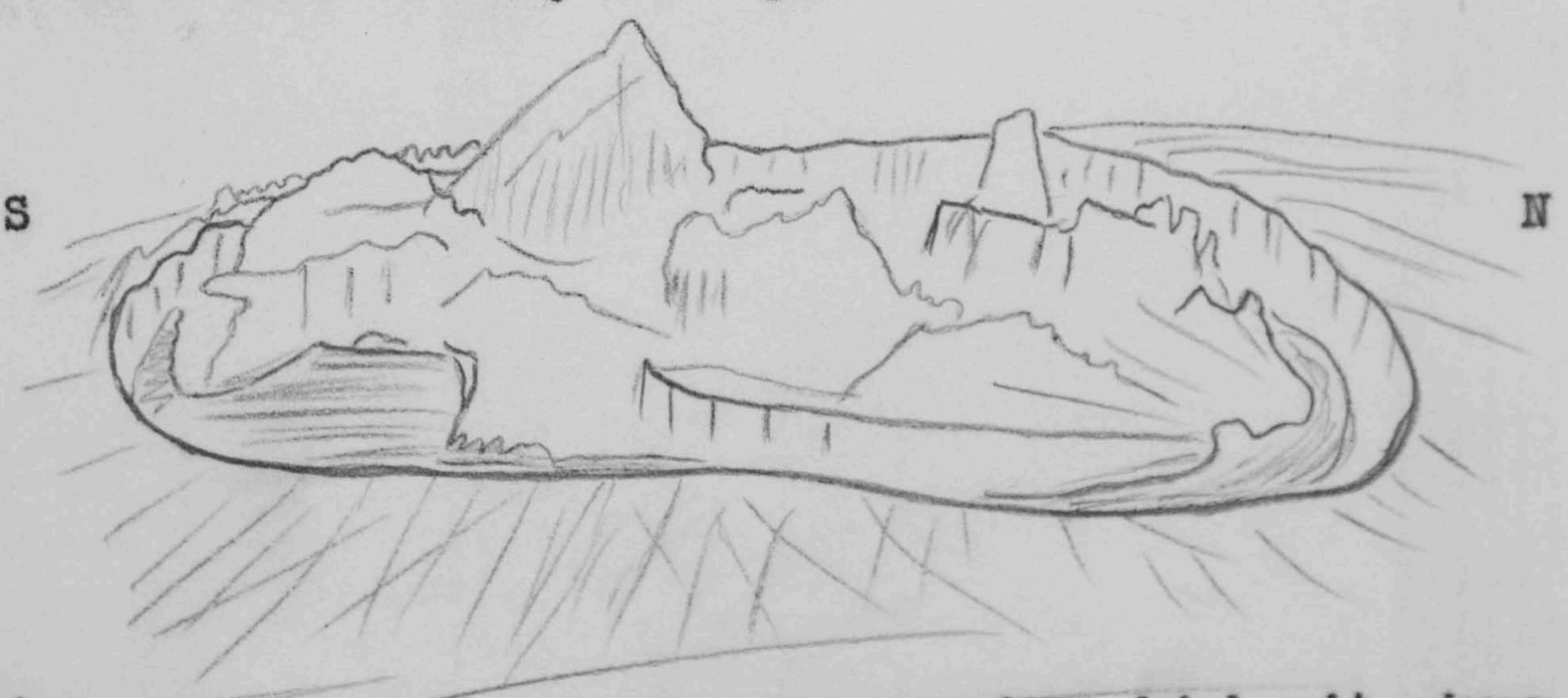
U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

 Day Sunday Date October 2, 1921

10:00 a.m. Southwest rains.
From S saddle. Three hissing cones in SE and S channels. Festooned surface. Very slight additional rise at SE arm crag. Lake 75 feet, more or less, down. Some bright spells last night.
From SSW. Twelve hissing cones on crust and two open fountains in sight. Fresh wellings along wall crack. Fresh tumbles from wall SSW and from wall SW. Gaping cracks in crust along wall-crack. NW crag has fallen away to big tumble S side. W crag is now a large mass with flat extensions S. W island replaced by a new scarp crag dipping N. Open pool in center on W side of central island. Breaks on S face of latter, which overhangs.
Surface cracks disturbed back of SW station.
From SW. W end of N crag lifted so that old shore bench of W pond is 30 feet high and dips E. There is a fresh bench one to two feet high around the crags but not along wall of pit. Most of the crags show changes of direction of tilting uplift of recent date. Thus the S crag after tipping up S to 45 degrees has now lifted vertically a 10-foot bench. W crag shows layers of upper mass dipping N, southern extensions dip W at flat angle. E central crag has raised vertically. SE crag dips NW.
Upper SW rift cone shows curtains of Pele's hair, yellow stained stalactites and very little heat, as though lava crusted below. Noise of lava not far down.
Lower SW wells have a hissing and puffing spiracle in bottom not more than 50 feet down, very slow rising gas column and much border steam; tumble on crust of bottom can be seen.



From W. Two sluggish fountains splashing at N end of N crag. NW crag continues to lift by rotation up and to E, making the May shore mark on NW side approach a vertical plane. Six or seven more blow cones. Lava has been welling up crack, with festoons inward from wall-crack all along NW border of pit bottom.
From NW. The fill of N wall valley has not quite reached the high level of September 20 and is no higher with reference to the accessible shelf below N shelter. NW wall of pit appears 80 or 90 feet above lake. There has been slow welling up along wall-crack N as elsewhere shown by a band of pahoehoe different from the crust inside all along base of wall. Blowing fountain in N cove of main lake appears higher than N pool. Slope of fresh N pool lava dips N 20° on N side of N crag, whereas the border lava of the same pool farther E dips W on backslope of NE crag (crag next to NNE wall-crack).
From N. NNE wall-crack a tumbled chasm without a flat fill. All the northern slopes of the bench magma dip northerly as though the bench magma lifted most in the south part of pit. The N pool is crusted, one hissing cone seen in its S corner. A ring of crag matter lifted domewise around the N cove, with one high mass which has gone up vertically on E side of cove and stands 100 ± feet above lake. About six fountains in pit as a whole.
From NNE. Fresh tumble from NE crag into NNE wall-crack. Swollen hard pudding surfaces on N pool and E pond. Hissing vent N end E pond. Island remnant still protrudes through crust of E pond. E pond margin about flush with September 20 level.
From E the impression of lift of whole bench magma plug most on S side is very strong.



Sketch of Halemaumau showing impression which pit gives of lift of the cake of crags most on south side.

No fountains whatever in E pond and a crease in pahoehoe all along wall-crack, passing into a newly welled-up wall-crack fill at SE.

All around wall-crack, therefore, there has been a parting of the cake of inner bench magma from the wall cylinder, and the opening has filled with lava. No

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Hawaiian Volcano Observatory

Day Sunday Date October 2, 1921

cracking and foundering seem anywhere, and the lakes are very humpy and festooned.

Fresh apatter along walls and islets in SE wall pool indicates that the pool has recently been open. Now it is covered with wrinkles and festoons.

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Tuesday Date October 4, 1921
Wednesday " 5, "

October 4. Cracking and foundering seen in forenoon in E pond. Heavy thunder showers afternoon and evening. At night the activity SE, SW, W center and N; brighter than before. Crags lowering slightly.

October 5.
10:00 a.m. Lakes 4 feet lower around wall of pit. Cracking and foundering SE channel from S to N. Three fountains in SE arm, one in SSW channel. Fume thin. Thicker fume upper SW rift well. Maximum of lake marks as before, 60 feet down SW, 80 feet down S. Glowing overhang around edge everywhere.

SSW. Twelve fountains visible in center and W. Hissing, puffing and plashing. Arches of crust between pools. NW summit appears blunt and much talus about its base. At least seven western and southwestern pools separated by higher crust flats from central pools. Arrangement as before. Lake heat much stronger.

Rift wells. Lower ones open to sunlight. Black lava crust 50 feet down. No puffing and little fume. Upper one hot blue fume and yellow and salmon colored coatings on the stalactites. Slight noise of rising gas. Membraneous cobweb covering the stalactites -- Pele's hair.

SW. Dense fume from base of NW crag, which from here is shaped like the Matterhorn. Bench along wall of pit 5 feet wide.

W. Four fountaining puddles NW, glowing shells over sinking lake, edge platforms 3 to 4 feet high. E central crag appears to have tilted over E, its summit peak being nearly hidden by W height. Fresh black glassy pudding in old W pond circle; all the pools have been breaking up lately.

NW. N pool also has 3-foot bench around it. One fountain in SW corner of old W pond. Blistered hot surfaces of puddles, but little streaming. Cracking and foundering in N pool from W to E.

Blue veil of fume over pit everywhere.

N. Three fountains seen in central canyon. Cracking extends all over N pool. Large dome summit seen from here in NW corner of E central crag block higher than former summit which is unchanged farther E.

NNE. E pond has recently cracked up. Only two fountains seen there and one in N pool. Island in E pond persists with platform 20 feet across. Bench 4 to 5 feet high around E pond. The platforms around the pools on the crag side are lower by a foot or two than those on the wall side, showing subsidence of bench magma.

E. Three fountains in SE channel. Fresh bench at lake edge under SE crag very positively only 1 to 2 feet high; 3 or 4 feet high at wall of pit.

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Hawaiian Volcano Observatory

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Day Thursday Date October 6, 1921
Friday " 7, "

October 6. From H. V. O.
In morning crags lower by 2 or 3 feet.
At 7 p.m. during heavy thunder shower the pit made a brilliant glare, probably a break-up with fountaining, due to rain.
At night pit somewhat brighter than during rising spell.

October 7.
10:00 a.m. Not more than fifteen fountains. E and N pools crusted. Hissing continuous W of E pond. Fountains and streaming S and SE arm, streaming to S. Fling fountain N end NW wall pool. Border ledge against wall of pit 8 to 10 feet high. Ledge on crag side 1 to 2 feet high and in some places no ledge where crags have sunk faster than liquid. As seen from NNE the NW crag preserves its sharp "Matterhorn" form. Recent festooned flows from N pool and from SE arm on border benches on crag side. SE crag appears to have lifted on E side and sunk on W side; it has a new zone of spatter ledges 12 feet high at lake level on E pond corner tapering to zero at SE arm corner. Much fume and high talus at base of NW crag; fume also from upper rift cone. Blue fume veil at pit. A second hissing vent heard in NW direction. Two spatter cones, not active, at S border N pool. Some freshly caved off blocks from crags in several places. A few rock falls heard, but conditions appear stagnant, with some gas pressure. Pools as they are this morning are fit subjects for a break-up by a heavy rain shower. Central island stands high. No changes observed in crag arrangements.

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SURVEY RECORD

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Hawaiian Volcano Observatory

Day Friday Date October 7, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10 a.m.	NE	SW	0					
	NNE	SW	0					
	NE	NW crag	R 16 29	+1 45	+1	823	+26	
	NNE	same	R 7 44					
	NE	S crag	L 22 26	+4 51	+1	765	+66	
	NNE	same	L 27 59					
	NE	E central crag	R 7 42	-0 56	+1	440	- 8	
	NNE	same	L 20 30					
	NE	Lake, W side N pool	R 52 24	-5 47	+1	672	-69	
	NNE	same	R 44 20					
	NE	Lake, N side E pond	R 56 12	-21 15	+1	213	-83	
	NNE	same	L 52 58					
	NE	Peak E of N arm	R 32 49	- 0 43	+1	633	- 9	
	NNE	same	R 16 07					

T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Saturday Date October 8, 1921
Tuesday " 11, "
Wednesday " 12, "

October 8.
10:00 a.m. Rapid streaming out of the SE arm, thence along the S wall to a large fountaining area, continued for several minutes. Lakes crusted over. Twelve or fifteen fountains. Fountaining places would sometimes crust over and later resume activity. Hissing vent in E crag jumble active spasmodically and audible at auto terminus. Slight hissing in SW pond area. No noise from SW cones and much smoke. Outer bench around lake 8 to 10 feet high.

October 11.
10:00 a.m. Crags lower, lakes appeared to be nearly stationary. Ledge around pit wall 9 to 12 feet high, and ledge around most of the crags 3 to 6 feet. Ten to fifteen fountains. Many fountains are building cones around them on the adjacent heavy crust. Fume thin except from the central side of the NW crag. Hissing in the E crag jumble continues loud, though diminishing.

October 12.
11:00 a.m. Lakes 2 to 3 feet lower and fume a little thicker than on the 11th. Eight or ten fountains in action. Evidence of recent streaming toward wall in SE arm. Hissing cone in E crag mass still in action, though with less vigor. Lake level fluctuated through a range of 2 to 3 feet during forenoon.

R H F

10:00 p.m. Glow moderate over pit. Fountains E pond, N cove and W pond. Crust on lake with blisters and glowing cracks. Filagree cones in midst E crag mass hissing, spitting and flaming. Much hissing from under crusts. Bright glow over W central region at times. Fume moderately thin.

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Hawaiian Volcano Observatory

Day Thursday Date October 13, 1921
Friday " 14, "

October 13.
3:00 p.m.

From S saddle. Lakes about 20 feet down below marginal shelf on wall. Crags continue to lower. Fountain in end of SE arm. SE crag appears to be tipping up on E pond side lifting new spatter lines-- these spatter lines below the smooth wall.

From SSW. NW peak slab-shaped, looks like "Matterhorn" from SW and NE, looks broad from SE and NW. Line of about twelve fountains from SW arm to N in main lake. Central island much broken off in an upright wall on its N side. Little activity in W pond region.

SW rift cones. Fuming and quiet. Yellow deposits.

From NW. Considerable hissing heard. No conspicuous changes. Cracks red hot near edge of N shelf at shelter. N pools quiet and have been flowing over the bench magma as latter sank.

From E. E pond quiet where a fountain played opposite cavernous recess N side of SE crag last night. Activity transferred to S channel under pressure rim, in form of a southward streaming open patch with bright edge. Loud hissing in spasms from cone in E crag mass valley.

October 14.
11:00 a.m.

Crags lowering. Bench at crag side above E pond 4 feet high; at wall side 20 feet high. Lake has thus sunk 20 feet while crags were lowering 16 feet at this point, or else local crag has been rising. Loud hissing in E crag cone. Blew its crest off and made red mouth near a whitish stain on the rocks. Aperture 20 feet above lake level. E pond very quiet. Not more than fifteen fountains in pit. Much smoke at base of NW crag, blue fume elsewhere.

SE crag has 20-foot wall of horizontal spatter lines above lake and below the smooth wall made by its earlier sudden uplift. This overturn probably accounts for the 4-foot ledge above lake level on inner side of E pond, for really the crags have gone down more than the lakes.

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
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Day Saturday Date October 15, 1921
Sunday " 16, "

October 15.
5 to 8 p.m. Liquid at least 20 feet below black ledge around wall. Loud hissing from the E crag jumble. Volume of gas from this hissing vent greater than on 12th as the noise is almost continuous and audible at road terminus. Two fountaining areas in N lake. Fifteen to twenty fountains in all. Avalanche or tilted crag has slid toward and into N cove of main lake from the E side of cove. Crusts over all lakes broke up, that of the E breaking up twice within three hours. During these breaking spells the liquid level dropped 4 to 6 feet. SW cones glowing faintly. Liquid lava appears to be nearly 100 feet down in upper cone. Glow over pit moderate.

R H F

October 16.
2:30 p.m. In pahoehoe kipukas of Keamoku aa W of Kau Desert. Layer 3 to 12 inches thick of 1790 ash. Rain-washed coarse pisolite on top. Thicker smooth ash next below. Black sand 1 to 2 inches on bottom. No limu. In places a hard shell of carbonate and lapilli a quarter of an inch thick.

Followed old raod to E edge aa. Then walked S following aa. Wash river along E edge aa. Found barefoot tracks at N edge of first alluvial sand basin WNW of my new monument (W edge rift belt NW Puu Koae). Track of adult 10.5 inches long, stride 24 inches headed east around a pahoehoe hummock from which he had just descended evidently. Material is sun-cracked yellowish pisolitic ash, edge of a small flat with washed gravel and sand over the ash. Upper carbonated crust with lapilli 1/8 to 1/4 inch lies stratigraphically ½ foot above the footprint layer. There are many bigger lapilli one to two inches in diameter, and the upper hard layer shows no footprints. General course of the walker who made prints was probably south. Made triangle of dead sticks to mark hummock. These tracks will photograph.

Walked west to the deep wash at aa front. Found rain drop imprints in ash. Modern stream bottom (dry) with sand and ripples.

Location of these tracks:-

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JOURNAL Day Monday Date October 17, 1921

2:45 p.m. From S saddle. Lake 110 feet down. Wall veneer with even horizontal spatter lines 40 feet above lake. Wall 70 feet above that. Fifteen fountains in view. Streaming south at S end SE arm. Spasmodic blowing cones at edge of lake E end E crag valley. This valley overflowed from SE arm. Fresh lava fill in middle part of this valley. Noises puff, plash and blow. SE crag has obviously been rolling over toward center. Fifty-foot wall of horizontal marks on it below the smooth prow. Backslope of SE crag on valley side is nearly vertical. E central crag tipped east and broken. Small SE arm crag has lowered with the rest, platform around it 3 feet high. Cracking and foundering in SSW channel.

From SSW. Twenty-one fountaining patches. Platform blocks SW have lowered 10 feet below top of wall veneer. Central peninsula flats have lowered 30 feet. New platform around central lake and W channels one foot high. W cove region 2 or 3 feet above lake and tumbled blocks of crust in W pond channel. Small border grottoes in several places. Turbulent cracking and foundering with whirlpool action in cove W of S crag. Cracking and foundering seen in central lake. NNE crag peak appears to have moved west. Central island broken on N and S sides and revealed over top of S peak. S crag has raw and ragged N face. Sulphur stain SW wall of Halemaumau. Crags have subsided most towards the NNE and least SSW. The three west crags, between ring pool and W cove are large masses progressively higher northward. Talus, smoke and pinnacles S side NW crag. Blue-white smoke from SW rift wells.

SW wells. Looking down upper cone could see glowing lava shell 100 feet down and bright orange glow in space below. Stalactites stained bright yellow. Much varicolored fuming between upper and lower wells. Lower well more tumbled and the blocks from roof and walls of March lava are brilliant red and brown with oxidation. No noise. Cracks along rift zone stained with acid sulphates pink, orange, green, yellow and red; taste sour and puckery like various alums. Fume pungent with SO_3. Note that this development occurs on a falling lava column. Many places wet and green with sulphuric acid. Does this mean increased attack on rock surfaces, the iron oxides calalyzing the SO_2? And is there a larger gas chamber ? Or is increase of air involved ? This solfataric deposition not a characteristic of bench magma and interior of pit.

From SW. Thirty-one fountains counted. Line of fountains center to SW. Rock falls. Sudden blasts. Marked increase in noises and liveliness in last two days. Occasional big flinging fountain in center. W cove has opened and broken up by cracking and foundering of crust in last half hour (3:45 p.m.).

Much Pele's hair flying. The fountaining remains in form of puddles in crusted lakes, except for short stretches of streaming.

From NW. Three fountains in N pool and five in W pond and NW area. Cracking and foundering on both places. Two new small crags left high near wall NW. N pool has 4-foot walls on crag side. The platform between N pool and NW wall pool recently tilted N is now broken and tilted S. NW and W crag masses make a confused miscellaneaus jumble of tilts. NW peak has been falling away by crumbling. A remarkable large fault face, red, dipping N at 45°, forms the N slope of N peak of NW crag mass.

Twenty-four fountains in view from NW.

From N shelter. A westward streaming to wall in N cove of main lake. The high crag tower E of this cove has leaned west and broken away on its E side, also subsiding en masse so that it is now not more than 60 feet high above lake. Valley where loud blow-cone was, between E central crag mass and NE monoclinal mass, now has a fresh lava pudding all along its bottom. This appears to be the breakage plane between these two crags. Three fountains in N arm of main lake. Chasm open with pool going through from N pool to E pond. Jumble of broken red rock E of N cove crag. Intense red oxidation of broken crag surfaces everywhere apparent. W face of new peak of E central crag mass, over lake, broken and red. By studying location of such broken surfaces something may be told of which way a crag mass is in process of tilting.

SE crag has lifted and tilted W.
NE crag has lifted and tilted W.
E central crag has lifted and tilted E.
E central crag is now tilting W.
N cove crag first lifted vertically.
N cove crag now leans W.
Small NW pool crags now tilt S.
NW crag first tilted E.
N crag first tilted N.
W end of this mass then tilted E.
W crag rose and tilted N.
S extension this crag rose and tilted E.
S crag, central island and S peak rose and tilted SSW,

The tiltings have thus been heterogeneous and neither centripetal nor centrifugal. The crags are an inherited crust on the bench magma and the recent rise lifted the whole column and restored the wall ring pool. The different crag units rose differentially and tilted over at all sorts of angles as they rose, mostly in towards the center. But the S peak, largest crag of all, made an exception to this, rising as a "V" sector with a submerged anchorage against wall of pit and maximum lift toward center of pit. Now they are subsiding with five open pools against wall of pit N, NW, W, S and E and tendency to sink fastest in center of pit.

The veneer along wall is 50 feet high on NW side. Wall there appears 125 feet high. Over N pool the veneer shelf is no higher than at S side of pit (40 feet). The crags join the wall N, SSE, SW, W and NW, and nearly touch NE.

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Hawaiian Volcano Observatory

 Day Monday Date October 17, 1921

Heat felt on edge of pit from the many fountains much more than of late.

From NE. One fountain in E pond, two in SE channel. Tip of prow of SE crag has broken away, leaving red structureless wall. Blow-cone in E crag valley makes an explosive blast at intervals.

About fifty fountains in pit as a whole.

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date October 18, 1921
Wednesday " 19, "

October 18.
9:00 a.m. Crags sinking rapidly. Whole SE arm streaming to S and more broken up. Numerous fountains. Noisy blast at intervals heard in afternoon at road terminus. Small felt quake at 5:30 p.m. and another later. Main characteristic of day is increase in rate of subsidence.

With A. O. Burkland inspected new desert trig stations and went to new footprint locality at Kaamoku aa, then followed straight course thence toward Uwekahuna and discovered a half mile nearer Uwekahuna another set of footprints in the lower fine ash layer, smaller prints headed toward Uwekahuna and possibly running (long strides). Found big cattle trail and old skeleton of cow, bones shredded. This upper region heavily washed. Some more old trail signs in lower ash, showing footprints and squashing in mud. Region W of Cone Peak needs thorough search for bones.

October 19.
10:45 a.m.
to
12:10 p.m. Twenty-five fountains seen from SW station, about forty in pit. Interior topography same as before but lowered en masse. Numerous avalanches. Dense whitish fume from upper SW rift cone, not from lower. Streaming S in SE arm and SW in central lake. Much overflowing of crusted lakes through broken crusts. Hissing and plashing noises and occasional sharp explosions from cone in E crag valley. Wall veneer has caved away in places, especially N and W and appears about 80 feet high above lake. Similar shoreline veneer on E central crag appears 20 feet high. Central island and southwestern platform blocks are cracking up. Some big cracks in other places.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Wednesday Date October 19, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10:45 a.m.	SSW	S saddle	0					
	SW	same	0					
	S saddle	SW	0					
	"	Summit S crag	R 30 07	- 3 06	+1	387	-22	
	SSW	same	L 42 14					
	S sad.	Summit E cent, crag	R 56 39	- 7 27	+2	710	-109	
	SSW	same	L 58 43					
	S sad.	Fountain SE arm	R 51 01	-20 14	+1	438	-162	
	SW	same	L 29 16	-13 01	0	695	-161	
	S sad.	Summit NW crag	R 30 50	- 3 42	+1	882	- 59	
	SSW	same	L 87 38					
	S sad.	Fountain W cove	R 5 54	-13 01	0	693	-161	
	SSW	same	L 98 20	-24 35	+2	315	-145	
	S sad.	Fountain N cove	R 43 06	-10 12	0	891	-162	
	SSW	same	L 76 57	-10 06	+1	821	-148	
	S sad.	Summit SE crag	R 79 14	- 6 34	+3	559	- 65	
	SW	same	L 35 06					
	S sad.	Summit N cove crag	R 44 12	- 6 29	+2	923	-107	
	SSW	same	L 77 27					
	S sad.	Top of wall veneer SE	R 103 44	- 9 37	0	465	- 79	
	SSW	same	L 24 25	- 4 00	0	919	- 66	
	S sad.	Top wall veneer NE	R 71 38	- 4 11	+2	1101	- 84	
	SSW	same	L 60 27	- 2 55	+1	1262	- 66	
	S sad.	Summit N crag	R 40 38	- 4 42	+4	1035		
	SSW	same	L 84 52					
	"	Summit W crag	L 105 37	- 6 00	+1	692	- 73	
	SW	same	L 100 05					
	SSW	N summit S peak	L 67 48	-16 03	0	314	- 91	
	SW	same	L 17 11					
	SSW	Top central island	L 63 49	-10 43	0	533	-101	
	SW	same	L 38 27					

Lake level below NE 154 feet

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date October 20, 1921

Two earthquakes felt in the night.

9:25 a.m. Surface of lake appears 185 feet below rim. Wonderfully steady progress and even black shore veneer with horizontal edge marks against wall of pit. W crags slightly greater relief, SE crags same relief. Along main lake on W side E crag mass the lake margin shelf progressively higher from 0 to 20 feet, S to N. Seventeen fountains counted from S saddle. Fume thin. Hissing and plashing heard. Loud thudding explosions from E crag cove. This is a large irregular cone with a cinder heap beside it. Biggest break in the veneer belt on wall of pit is N, where the bench magma was against wall between N pool and NW wall pool.

From E. Two fountains in SE wall channel, none in E pond, one in NNE wall channel; latter more or less choked with debris. Small pinnacle in talus N side NW crag. Line of six fountains straight following channel between SW bay and central lake. Large talus NE foot S crag. Fresh lava floor between central island and S crag. Shore shelf shows that S crag has been tilting to NE. Small SE arm crag has tilted N. Lakes all much crusted with irregular slabby surfaces.

From NNE. N and NW region a jumble. N pool small. Floor block W of it tilted S 40°. NW wall pool obliterated by jumbled crag matter. This place is getting the brunt of pressure and scraping against wall of pit as lava column lowers.

From N. N wall-crack E of N pool a deep chasm containing broken rocks; W wall-crack the same. Fresh flows from wall-crack inward in W pond area. S streaming in N cove. Rocks slipping. More heat and whitening in glow cracks of upper N shelf. Whole N half bench magma sticks in contact with pit wall and S half going down most. Center is flooded and NW peninsula is submerging.

From NW. Thirty-eight fountains in whole pit. Hissing cone W pond. N pool has broken crag island in its middle and no fountains. No fountains in W pond. Upturned edge of N crag floor rests against wall under N shelter. SW bay is a flat with pahoehoe puddles and raised shoals.

From SW. Biggest line of fountains SW to center, to N. Pudding overflows engulfing the flats. Astonishingly perfect adjustment of the inner landscape to subsidence. Farther rift well no gas whatever. Transparent cauliflowers, <u>new heat</u>, red glow, and gray stalactites at oven cone. Increasing salts and acid steam all around it.

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SURVEY RECORD

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Hawaiian Volcano Observatory

Day Thursday Date October 20, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:25 a.m.	S saddle	Fountain SE arm		-22 59		438	-186	
		" N cove		111 53		891	-189	
		Summit S crag		- 7 06		387	- 49	
		" NW "		- 5 21		882	- 84	
		" E central crag		- 9 23		710	-118	
		" SE crag		- 9 31		559	- 94	
		" W "		- 6 33		1009	-118	
								T A J

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Friday Date October 21, 1921
Saturday " 22, "

October 21.
9:30 a.m. Central and SW region increasingly flooded and the flats submerged. Wider channel S of central island and latter smaller. Avalanche seen to fall from bench magma remnant clinging to N wall, leaving red got surface at break. W pond freshly flooded, appears gaining on crag mass. Blow-cone in E crag valley makes very loud explosions at irregular intervals. Fume slightly increased. Fountains tending to build cones on crust. Cracking and foundering here and there. About thirty fountains in view from SW station. Large rhythmic fountain in center of pit. Intervals of this fountain about 40 seconds. Much hissing.

Upper rift oven SW still thinner and hotter fume, fresh black slender stalactites with white tips and slightly increased incandescence. No noise at cone except rush of gas. No gas at lower well. Solfataric staining appears washed away by the heavy rain; less than yesterday.

Lower NNW wall scoured vertically for 50 feet above lake level. Small puddle of liquid lava about lake level occupying site of N end of former NW wall pool.

Two small wall pools still persist W of western crags. Shoreline veneer still nearly perfect all around.

N pool a concave area of broken crust with one glowing hole. E pond crusted and its inner border on crag side shows shelf higher than yesterday. Shoal emerging in SE channel. Four fountains in E and SE pools. Total about forty fountains in pit.

October 22.
11:00 a.m. Twenty-five fountains in view from S saddle. Rock fall heard SW. W crag has been falling to pieces. New talus in many places. White stains. More bench magma accumulations in SE wall channel. Noise plash and puff. No more explosions at E central cone. Fume veil getting thicker. Depth appears 280 feet by wall veneer measurement. (wrong) Veneer still mostly intact.

Upper rift oven a pronounced cherry red in daylight. Lower well is dead. No blowing. Fume tolerable.

From SW. Liquid pools small. Large rhythmic fountain continues, lies just NW of central island. Puff heard SW. Nineteen fountains counted from here. Not more than forty in pit. Avalanche N wall. W pond smaller. Wall-crack filling with debris W and SW and NW and NE. Scars SW where crags have slipped down. Pools isolated W pond, SW bay, SSW wall pool, W of S crag, SE arm, main lake and E pond. W cove also nearly isolated and possibly N cove. S crag and NW crag still remain dominant.

From E. One fountain in E pond. Bench on crag side E pond left higher by sinking lake.

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SURVEY RECORD

Hawaiian Volcano Observatory

Day Friday Date October 21, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:30 a.m.	S saddle	SW	0					
	SW	S saddle	0					
	S sad.	N cove fountain	R 41 57	-13 15	+2	891	-212	
	SW	SE arm fountain	L 29 06	-16 32	0	720	-215	
	S sad.	same	R 54 12	-26 17	+2	434	-215	
	"	Summit E central crag	R 56 25	-11 25	+2	720	-147	
	SW	same	L 50 59					
	S sad.	Summit S crag	R 31 48	-11 01	+2	403	- 79	
	SW	same	L 21 26					
	S sad.	Summit NW crag	R 30 42	- 7 09	+2	872	-112	
	SW	same	L 73 23					

Lake 207 feet below NE station.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date October 22, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11 a.m.	S saddle	N cove fountain		-14 49		891	-237	
		SE arm (where fountain was yesterday)		-29 08		434	-242	
		E central crag		-13 08		720	-169	
		S crag		-14 22		403	-104	
		NW crag		- 8 43		872	-135	
								T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date October 24, 1921
Wednesday " 26, "

October 24.
3:00 p.m.

Raining yesterday and today. Slower subsidence continues. Lakes appear 270 feet below rim. Larger masses choking SE channel. Twenty to twenty-five fountains. S crag dominant but crushed against S wall. Roundish pond in wall-crack SSW. Blow-cone in east central valley noisy at intervals of about 1 minute; excessive explosions sometimes followed by noise of falling spatter and showing gush of lava. Central fountain occasionally a large dome burst. No much avalanching. Northern wall-crack all choked. Pond behind S peak again connected to SW bay. Much fume as in April. Rift cone brighter.

October 26.
9:00 a.m.

About twenty fountains in pit. Rocket blasts every 75 seconds from E central cone. New platform 1 foot high around lakes. SW rift chasm open and pool inside. Avalanches.

Situation like June-July. Lake appears 300 feet or more down. Liquid relative to bench magma has been rising; but the numerous avalanches N, S and SE indicate that crag masses are in motion, probably sinking faster than the liquid. W pond has encroached on debris NW to reach wall again. SW benches are broken and crowded against wall. W crags have made a long scraped groove downward as they rubbed the W veneer by toppling over against it as they lowered. Masses of debris on S crag mass against wall.

Occasional cracking and foumdering in lakes. Central and western pools all covered with fresh puddled lava and making border toes and small flows. Fresh flows from SE arm into E central valley. Central island lower relative to lake. NW peninsula a flat platform. Talus around S base of NW crag has a valley between it and the crag as though the talus heaps were lifted. All the crags appear lower; S peak looks rather high.

Bluish fume obstructive to seeing. E pond crusted and hissing, and has sent flows into E central valley which is full of lava around base of blowing cone. Broken accumulations of bench magma in SE wall channel.

SW rift oven has scarlet heat inside as far down as can be seen. No especial blowing. Salts forming on ground in spite of heavy rains. No activity at lower well. The rift cracks have moved somewhat near the pit.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date October 26,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9 a.m.	S							
	saddle	SW	0					
	SW	W	0					
	S sad.	SE arm fountain	R 55 17	-35 18	0	423	-299	
	SW	same	R100 52					
	S sad	S crag	R 32 27	-23 41	0	394	-173	
	SW	same	R108 11					
								T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Thursday Date October 27, 1921
Friday " 28, "
Saturday " 29, "

October 27.
11:00 a.m. About twenty fountains in pit. Wall veneer now falling and making red avalanches and new taluses SW, SE, S and all around N wall. Perhaps this is due to hardening of the veneer to the brittle point, as well as to lowering. Border grotto in W pond. Old circle of pond now a platform, new pond is farther W. Some uplift of new platform in places. NNW wall pool covered with talus which is smoking. SSW wall pool smaller. SW bay large, covers whole area of former W island and W cove and SW cove, and is covered with driblet pahoehoe. Rocket blasts from E central cone. Some hissing. Much fume.

Lower SW rift well has resumed fuming and shows heat and sulphur stain. Crackling noise inside. Upper cone scarlet glow. Whole solfataric area strong N_2SO_4. Apparently the shell of lava which was plugging the lower well has fallen inside and the hole is open again.

October 28.
7:00 p.m. From E spitting cones blowing blebs of lava and droplets 50 or 60 feet into the air seen in the region of E central valley, one of these making popping explosions like a gas engine at each gush. E pond crusted. Avalanches falling from NE wall. Flaring back of talus NW where wall-crack lava has again asserted itself and made a chasm. In SW rift chasm a quiet extension of lake lava seen with glowing edges forming a pool which appears to continue for some distance into the rift tunnel. About fifteen fountains in pit and much fume.

SW rift oven glowing brilliantly and blowing audibly.

October 29.
11:00 a.m. Fume obstructive. Explosive noises from eastern cones have ceased. Liquid lava welling up through holes in crust and fountaining sluggishly at crust pots. In SE arm all the lava crust of E half of lake surface is lifted about 2 feet as though the bottom of arm were coming up on that side, leaving only a narrow channel of liquid on the S crag side. No avalanches heard during visit. Bottom of pit very low and smoky.

SW rift oven totally black in daylight and blowing harder than before. Lower rift well also sending up hot gas but
4:30 p.m. not noisy.

Rapid cracking and foundering seen in SW wall pool. SE arm crust has broken down and opened a pool where the supposed uplift of bench was on E side. Occasional rocket burst, noisy, from E central cone.

SW rift oven shows dull red glow.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date October 27,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11a.m.	S saddle	SW	0					
	SW	S saddle	0					
	S sad	SE arm fountain	R 54 21	-36 23	+2	435	-321	
	SW	same	L 29 13					
	S sad	S crag	R 31 39	-26 02	+2	405	-198	
	SW	same	L 21 31					
	S sad	N cove fountain	R 41 08	-19 57	+2	892	-326	
	SW	same	L 70 22					
	S sad	Summit E central crag	R 56 04	-19 29	+2	712	-254	
	SW	same	L 50 39					
	S sad	NW crag summit	R 29 38	-14 30	+2	864	-225	
	SW	same	L 73 06					
	S sad	Fountain N channel	R 43 22	-24 08	+2	723	-325	
	SW	same	L 54 17					

Lake level below NE 317 feet

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Tuesday Date November 1, 1921

t	sta	pt		hor	vert	lev	dist	elev	h. i.
10:20 a.m.	SSW	SW		0					
	SW	S saddle		0					
	SSW	S crag	R	83	41-23	33	0	465	-203
	SW	same	L	22	14-20	30	0	580	-217
	SSW	Lake fountain W of center	R	58	39-37	44	0	424	-328
	SW	same	L	32	48-40	10	0	405	-342
									T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Tuesday Date November 1, 1921
Thursday " 3, "
Saturday " 5, "

November 1.
10:20 a.m.

Very smoky. Probably about twenty fountains in Halemaumau. Fountaining pots plashing in center, W cove and SW wall pool. Main floor 2 to 3 feet above pools center, W central, and SW wall and W pond. Lava pot forms small pit in NW talus. Top NW talus smoking. Avalanches NNE. Hissing. Fresh red taluses. W crag has become crushed against wall and half buried in talus, while fresh lava platforms about its base join W pond and W cove.

SW oven on rift blowing and both wells sending up hot air. Solfataric patches dry and not steaming much. Interior of lower SW rift well lined with yellow stained stalactites, upper cone with black. No glow in daylight.

Most of E side of pit obscured by smoke. Large open patch with bubble fountains seen in E pond.

November 3.
9:30 a.m.

About ten fountains visible from SSW. About fifteen in the pit. E pond splashing. Veneer has stripped off W wall. Avalanche and red dust SW wall. Avalanche dust on platforms between the western pools. SW rift oven continues blowing and the stalactites are a little dusty. No change in general appearance of Halemaumau.

November 5.
9:30 a.m.

Slight rock sliding. Hissing and plashing. Dusty surfaces and crusted pools. About eight fountaining patches in whole pit. Very fumy and little seeing. General situation appears the same. SW rift oven blowing transparent gas, lower well not blowing but sending up gas; fumr along rift. SSW wall-crack pool and W pond both fountaining. Talus NW has wall-crack pots behind it.

From E the E pond seen to be a long deep pit next wall of Halemaumau with occasional fountaining. SE arm a separate pool, 2-foot platform. Remnants of central island still stand up.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thur. & Sat. Date Nov. 3 & 5, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
November 3.								
9:30 a.m.	SSW	Fountain W of center		-37 48		424	-329	
		S crag		-23 43		465	-204	
November 5.								
9:30 a.m.	SSW	West central fountain		-37 56		424	-330	
		S crag		-23 59		465	-207	

T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Monday Date November 7, 1921
Tuesday " 8, "
Wednesday " 9, "

November 7.
3:00 p.m. Pit dull and smoky. SW rift oven same, blowing and not visibly glowing. Noticed in oven that newer stalactites were on NE side where the eddy of NE wind would be strongest.

Seven fountains in pit. Fountaining puddle at base SE wall and another SW wall. Much of the September veneer still in place. No apparent change in level. Talus on top of SE end of S crag. Dusty floors and s eparate pools.

November 8. Pit has dense smoke.

November 9.
9:16 a.m. A brilliant salmon-colored cloud rolled up from N side of pit due to unusually large avalanche. Alec says the source was a fall of September veneer from SW side of pit.

9:30 to 10:00 a.m.

Fume has greatly thinned. Whole bottom visible from time to time. Hissing blow-cones on crust. Eight fountaining patches. Rock falls frequent. Wall-crack puddle NW back of talus. Lower veneer stripping and upper clinging. Deep tunnel and pool inside at SW rift.

Platforms around lakes about 2 feet high. Central lake lies N of central island and has two W arms. W pond, W cove pond, S peak pond and SW wall-crack pool all separate. SW bay all platform. N cove connected by narrow channel with central lake. SE arm pool disconnected. E pond fountaining.

Rift wells have increased their blowing, small pebbles thrown in are rejected from the oven. Lower well has become somewhat noisy. Mostly hot air coming up. Fume from rift mostly between pit and oven.

Elongate open patch with bubble fountaining in S end E pond with streaming against wall of pit.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date November 9, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:30 a.m.								
	S saddle	SW	0					
	SW	S saddle	0					
	S sad	S crag	R 32 58	-29 10	0	410	-229	
	SW	same	L 22 28	-21 26	0	581	-228	
	S sad	Central fountain	R 30 43	-27 57	0	664	-353	
	SW	same	L 47 29	-37 19	0	459	-350	

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

Hawaiian Volcano Observatory

JOURNAL

Day Friday Date November 11, 1921
Saturday " 12, "
Sunday " 13, "

November 11.
5:00 p.m. SW rift oven blowing but not visibly glowing even in twilight. Lower well occasionally flares on the overhanging wall from a cone or fountain far below. Hot air and gas rising.

Fifteen fountains in Halemaumau counted from S saddle; about sixteen or seventeen in whole pit. Crusted pools. Largest fountaining area near center. Some rocks falling and large avalanches reported last night. Nothing new in general appearance.

November 12. Fume markedly thin during day from time to time.

November 13.
11:15 a.m. No apparent change. Avalanches falling, one dusty one seen. Fountains about ten in number. Red dust on stalactites of SW oven. Fume very troublesome and thicker than yesterday

T A J

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SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Sunday Date November 13, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11:15 a.m.	SW	Central fountain		-37 32		459	-352	
		S crag		-21 45		581	-232	
								T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date November 15, 1921

9:00 a.m. Strong thinning of the fumes from time to time so that whole far wall of Halemaumau is in view from E station. At 12:40 p.m. the clearing up was remarkable, without any corresponding event of rising liquid visible.

There is certainly a general diminution of condensed fume which happens rapidly at such times. Taluses which were smoking stop smoking. This ought to be recordable with a movie film rigged to expose every 5 minutes or so. It would be of interest to see whether there is a rhythm to the thinnings. On this day the air was calm with drift from E and SE, but the clearings were definitely not due to eddies, for in such case a thick column of vapor would be seen on one side or the other. There was no such thick column, while at other times the fume was dense and obscured the whole pit. The occurrence just at noon suggested the presence of the noon rise. A self-exposing movie film night and day from observatory would give ratio of rhythms of fuming and glowing.

Everything in the pit was as before except that possibly the gas pressure was a little higher; there was hissing NE and NW, and about eight fountaining puddles. There was cracking and foundering in the central and SW bay pools. The SSW wall-crack pool was now obliterated by talus. Rocks fell from time to time. There was veneer vertically striated below the veneer horizontally shore-marked at the N wall. The veneer was cracked and had fallen away for 2 to 3 feet of thickness from the lower wall. This showed the horizontally bedded old wall beneath. The talus lower down against wall N and NE was fuming in hot jets. Lakes had black surfaces freshly overflowed against dusty intervening platforms a foot or two high. E pond had an E-W strip of open lava 50x10 feet with bubble fountaining. S crag appeared much higher than NW crag, but the whole bottom area appeared low.

Nothing new in the two rift wells; southwestern one is red with dust or iron oxide down its main shaft.

T A J

PHOTOGRAPH RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date November 15, 1921

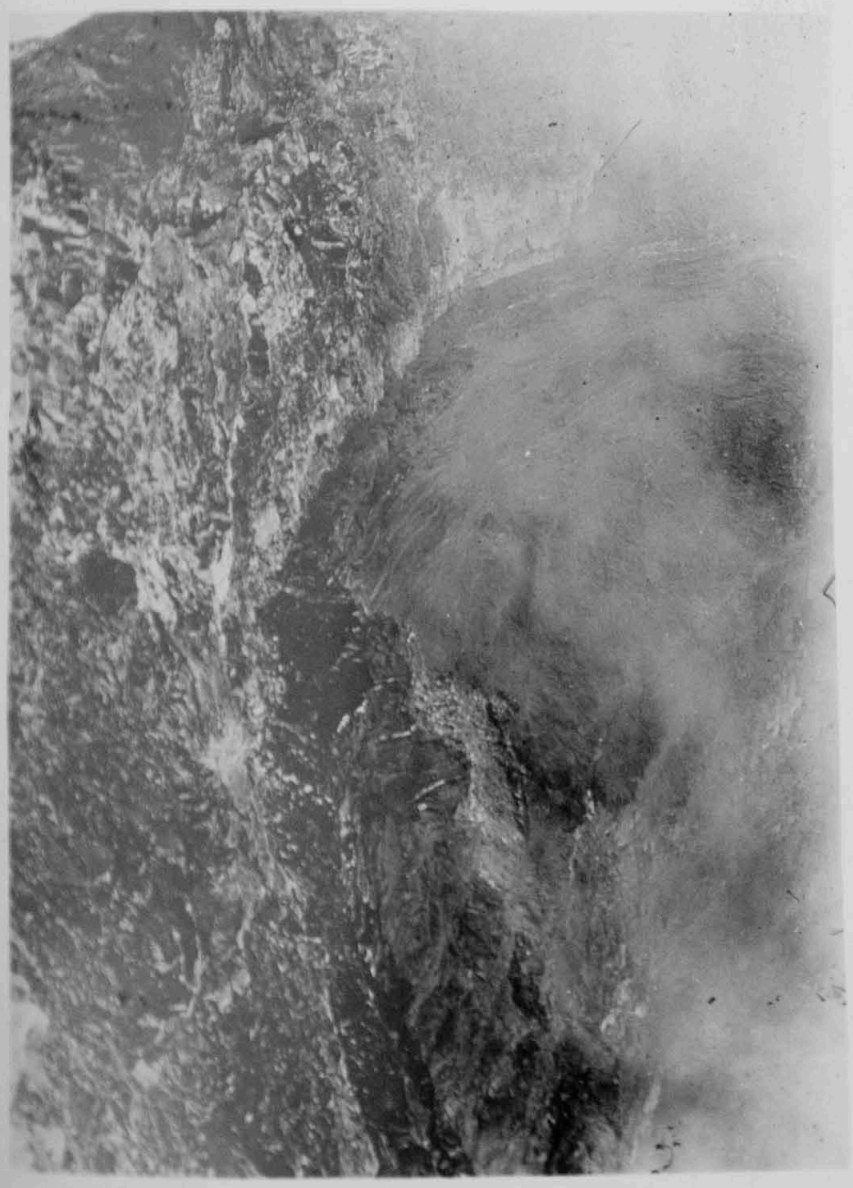
t	sta	subject	no	pl	scr	stop	ex	cam
9 a.m.	E	Base N wall	1	Ilford panchr.	8x	f/11	1/4	P
	W	NW crag	2	"	"	"	"	"
	W	NW wall	3	"	"	"	"	"
		SW rift oven (blowing vigorously)	4	"	"	f/8	"	"
		Second well, SW rift, looking NW	5	"	"	f/11	"	"
	E	S crag	6	"	"	"	"	"

T A J

396

1921, Nov. 1

1



3

2

Jag

1921, Nov. 1

4

5

6

Jaf

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date November 17, 1921
Saturday " 19, "

November 17.
9:30 a.m. About eight fountaining patches. Much avalanching followed by quiet towards noon. Best seeing from E and NE. Large area of crag magma is striking, filling NE half of pit. Hissing. E pond low in its cup. S crag all covered with talus dust and talus slopes over all the former SSW channel and mantling over the crag. Falls SW have been especially strong. Rapid cracking and foundering of W cove seen, connecting cove with lake. Fume abundant. Wind SW light. SE arm crusted. SE wall pool fountaining. Two fountains in E pond, one in W pond, N cove crusted, one fountain in central lake, one in SW channel, one in SW bay pool. Occasional clanking noise.

Transparent hot air rising through SW wells, not noisy. Sulphur smell and fume between oven and pit.

November 19.
11:15 a.m. Same as before. Hissing and plashing. Six or eight fountains. Veneer off wall SW, showed whitened and cracked surface at rift and high cavern below. Dusty platforms around lake. Hot air at rift wells. Rift chasm 90 feet high at base SW wall of pit with black lava pool in bottom. Small grotto and puddle with raised edge at SW corner SE arm pool. Some rock falls.

This morning U.S.G.S. surveyors saw from Uwekahuna an avalanche SW side of pit, and then the dust rose out of the two rift wells. Proving connection pit and wells.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Saturday Date November 17, 19, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
November 17.								
9:30 a.m.	SSW	S saddle	0					
	NE	" "	0					
	NW	SW	0					
	NE	S crag	R 27 47	-17 41	+1	731	-234	
	SSW	same	L 44 31	-25 15	+1	465	-219	
	NE	Fountain W of center	R 41 49	-24 11	+1	821	-371	
	SSW	same	L 71 25	-38 10	+1	455	-358	
	NW	same	L 32 59					
	NE	Central fountain	R 47 59	-25 14	+1	756	-358	
	SSW	same	L 72 23	-31 50	+1	558	-347	
	NW	same	L 39 13					
								T A J
November 19.								
11:15 a.m.	S saddle	Central fountain		-28 28	+1	669	-364	
		W central fountain		-31 24	+1	607	-372	
		S crag		-30 14	+1	411	-240	
								T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date November 22, 1921
Thursday " 24, "
Friday " 25, "

November 22.
3;15 p.m. Seven fountains seen. Fall of large rocks heard NE, with clanking noises. Windy, rainy and fumy. Everything else appears same. Cracking and foundering SE pool. Rift wells blowing and red with avalanche dust. SW well blowing hardest, and gray down inside as though hot.

T A J

November 24.
1 to 2 p.m. Bottom of pit was partially revealed from time to time. Eight fountains in action. One fountain each in SW, W and E arms surrounded by open lava with streaming to fountains. Small avalanches from the crags.

Oxidized wall(?) material scattered for a short distance around lower rift well; pieces weighing as much as a $\frac{1}{4}$ ounce were found.

R H F

November 25.
4:20 p.m. Seeing fair from E in spite of recent storm. Eleven fountains. Small avalanches. Puffing and plashing sounds heard. September veneer all gone from NE and S walls. Pools are SE wall-crack pond, E pond, SE arm, between SE arm and central lake, central lake, SW pool, and W pond.

No marked changes.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date November 22, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
3:15 p.m.	S saddle	S crag		-30 14		411	-240	
		W crag fountain		-31 48		607	-377	
		Central fountain		-28 45		669	-368	
		S crag 233 feet below	NE					
		Lake 366 " "	"					
								T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date November 28,1921
Tuesday " 29, "

November 28.
4:00 p.m. Very little fountaining in the six open places observed, but streaming and rapid breaking up of the thin crust persistent. Hissing vents plainly heard, apparently near E central part of pit. No avalanches heard.

R H F

November 29.
10:45 a.m. Nine fountains seen. Live pool in SW rift cavern. Fresh overflow lava on the floors. Hissing and crackling at SW talus. Fume patch NW talus. No avalanching. Streaming SW in SW arm of central lake. S peak has been cracking and tumbling on its W face. Separate round ponds SW and W of it. W cove an oval pond. W pond has two terraces on NW crag side (E) and an extension or cove W with fountain.

Clearing spells with most of pit visible. Central island still in place. Fountain in SE arm pool and also in E pond and N cove. Thud, plash and puff, and steady hissing, all the noises more lively. Much September veneer still persists.

Both rift wells red with dust and red fragments six inches in diameter and many small pebbles around SW well. Appears to be whirlwind product. SW well blowing hardest.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Tuesday Date November 29,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10:45 a.m.	S saddle	SW	0					
	SSW	S saddle	0					
	S sad.	S crag	R 33 03	-30 21	+2	405	-238	
	SSW	same	L 44 29	-25 21	+2	468	-220	
	S sad	Fountain under E central crag	R 43 00	-30 07	+2	630	-367	
	SSW	same	L 62 32	-28 09	+2	638	-343	
	S sad	W central fountain	R 25 59	-31 17	+2	592	-361	
	SSW	same	L 68 51	-36 23	+2	462	-341	
	S sad	Summit E central crag	R 55 49	-21 44	+2	720	-289	
	SSW	same	L 60 00	-18 43	+2	809	-278	
	SW	S saddle	0					
	SW	Summit NW crag	L 73 20	-29 57	+2	465	-268	
	SSW	same	L 87 33	-19 57	+2	682	-249	

T A J

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU

JOURNAL

Hawaiian Volcano Observatory

Day Thursday Date December 1, 1921
Friday " 2, "
Monday " 5, "
Wednesday " 7, "
Friday " 9, "

December 1.
3:00 p.m. Smoky. Little seeing. Six or seven fountains. Same conditions. No avalanches, but some reported two nights ago. Hissing less.
Glow over pit dull at night.

T A J

December 2.
6:00 p.m. Seven fountaining patches. Cracking and foundering of crust in E pond and SE arm. Some puffing and jetting of spray through small pots. Fume thick. No avalanches heard. No apparent changes. Glowing pool in rift chasm back of talus ridge.
Rift well No. 2 making loudest blowing but not visibly glowing. Rift oven No. 1 shows a glowing crack about 100 feet down.

T A J

December 5.
1:00 p.m. Eight or nine hissing vents around the edges of lakes. Seven fountaining areas in SE, SW and central pools. E and W ponds crusted over. Liquid lava down a foot or so from its level a few hours earlier.

R H F

December 7.
2:00 p.m. Fume the same as on the 5th and preceding days. Eight fountaining areas including one in E pond and one in W pond. Hissing less than on the 5th. Liquid lava about 3 or 4 feet down with reference to the lake banks.

R H F

December 9.
3:00 p.m. Fume moderately thick. Gas hissing a little more loudly than on the 7th. Eight fountaining areas. Lakes down about 5 or 6 feet with reference to their banks. An avalanche had recently fallen from SW wall, though no rock slides were heard.
During brief clearing spells the entire pit floor could be seen.

R H F

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Saturday Date December 10,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
2 p.m.	S saddle	SW	0					
	SW	NW	0					
	NW	SW	0					
	S sad	N side fountain central pool	R 26 20	-30 39				
	SW	same	71 34	40 21	ca			
	SW	S crag peak	87 16	-21 57				
	SW	Lake near E central crag, center side	70 24	-35 55				
	NW	N point S crag peninsula	L 46 50	-27 38				
		S crag old distance	237 feet					
		Lake from SW	368±					
		" " S saddle	361					
		Lava " NE	357					
		S crag from NE	229					

R H F

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Saturday Date December 10, 1921
Monday " 12, "
Thursday " 15, "

December 10.
2:00 p.m. Lakes a foot or two higher with reference to their banks than on the 9th. The cracking of lake crusts made a very loud noise several times. Only three permanent fountaining areas though other places would exhibit fountains for a while and then crust over. Gas hissing on the increase.

R H F

No change in rift wells. Very drak at night over pit.

December 12.
3:10 p.m. No observed change. Ten fountains. Plash, puff and hiss heard. Green-yellow sulphur patch between SW oven and pit, making sulphur smell. Oven stalactites a light terracotta color. Lower well blowing as before.

Lakes appear fixed and dusty. Some streaming to W at W pond. N cove appears cut off. There is still much of the upper shelf of September veneer; lower part has scaled off.

December 15.
9:45 a.m. Some rising of liquid though crags appear low. "Artesian" standing fountain NW side of SW pool making lead-colored glassy snakes of pahoehoe and apparently draining the higher lava of SW rift cavern which lies on the other side of a rocky ridge lifted athwart entrance of cavern. Live pool in cavern. Numerous heavy avalanches in cavern and vicinity.

Six fountains in pit. Pool surfaces fresh and black. All topography seen from SW during clearing spells. Fuming patches N and NW walls. Blowing in E pond region. Talus slopes look low as though possibly sinking into the wall crack. Slickenside surface NNE wall. September veneer has fallen from lower wall everywhere, but shelf remains. The general arrangement of NE escarpment, N crags, NW peninsula, central island, and all the features NE recently obscured by smoke is quite as it was in October.

Lake margins 3 to 5 feet high. SW rift wells covered with terracotta dust and blowing as before; transparent fume.

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Thursday Date December 15,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
9:45 a,m.	S saddle	SW	0					
	"	Artesian fountain SW	R 5 20	-30 27	2	598	353	
	SW	same	L 11 14					
	S sad	S crag	R 32 43	-30 03	2	404	-234	
	SW	same	L 21 58					
	S sad	Fountain SE arm	R 55 09	-39 28	2	419	-345	
	SW	same	L 28 06					
	S sad	NW crag	R 29 58	-16 16	2	870	-256	
	SW	same	L 73 28					

Lake 342 feet below NE
S crag 227 " " "
NW crag 249 " " "

T A J

SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Friday Date December 16,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
11:45 a.m.	S saddle	Fountain locality						
		SE arm		-39 40	±	419	-347	
		S crag		-30 03		404	-234	
		NW crag		-16 12		870	-253	
		Lake 340 feet below		NE				
		S crag 227 " "		"				
		NW crag 246 " "		"				
								T A J

JOURNAL

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Friday Date December 16, 1921
Saturday " 17, "
Monday " 19, "
Tuesday " 20, "

December 16.
11:45 a.m. Cracking and foundering of crust in SE arm. Fume thin at times. Lakes heavily crusted. Snapping in E pond. Hissing SW. Five or six fountains. September shelf all gone on E side of pit. Blue fume at top of gas column from lower SW rift well.

December 17.
10:10 a.m. Pit remarkably free from fume. Hissing and plashing. Three fountaining patches -- in E pond, central lake and W pond. Benches around lake 4 feet high. Puddled fresh pahoehoe SW covers a considerable platform. Bright colors above SW rift cavern. Stripping of wall veneer of September NE and SW at rift localities all the way up. Fume patches W and NE. At E central valley the cones are sulphur stained and cracked. Small crag in N cove has toppled over against N crag. Some trace of rift cracks in wall both NE and SW, zone of small cracks rather than a single crack. Only talus between SW rift cavern and lake platform, not a ledge.

Increase of terracotta dust on rift wells. Hot blowing. Some booming or snapping at E pond.

December 19.
11:00 a.m. Same conditions. Fume denser. Hissing and four or five fountaining patches. Sulphur stained hissing cones on SW crusts. Note that the September shelf is gone under S pressure ridge.

December 20.
3:15 p.m. Fume thin. Avalanche dust seen today at SW wells. Orifices of these wells increasingly red with dust. Southern well blowing. Cannot see fire down oven.

South wind. Eight fountains. Cracking and foundering of crust in SE pool. Fresh flow from SW "artesian" vent. Ponds have all been breaking up and stand 2 to 3 feet below their recent rims. Avalanches have buried the SE wall pool.

Moorhead, U.S.G.S., finishes topography of Kilauea floor, scale 1/31680, 10-foot contours.

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SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Wednesday Date December 21, 1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
10:25 a.m.	S							
	saddle	SW	0					
	SW	S saddle	0					
	S sad	Fountain SE pool	R 55 48	-38 37	1	438	-350	
	SW	Same	L 29 43	-25 36	3	732	-352	
	S sad	S crag	R 32 40	-29 51	1	401	-230	
	SW	same	L 21 42					
	S sad	NW crag	R 30 11	-15 54	1	865	-248	
	SW	same	L 72 47					
	S sad	W pond fountain	R 25 25	-18 10	1	1075	-352	
	SW	same	L101 01					
	S sad	Summit E central crag	R 56 09	-21 01	1	726	-280	
	SW	same	L 51 38					
	S sad	Central fountain	R 25 23	-29 20	1	620	-349	
	SW	same	L 39 39					
	S sad	Fountain W side E pond	R 73 32	-25 19	1	757	-360	
	SW	same	L 47 28					

Lake 346 feet below NE
S crag 223 " " "
NW crag 241 " " "

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Wednesday Date December 21, 1921
Thursday " 22, "
Friday " 23, "

December 21.
10:25 a.m. Six or seven fountains. Some rocks rolling. Fume rather thin. Hissing cones. Grottoes forming. Crack across W floor. September shelf N has peeled off all the way up. Cracking and foundering spell in E pond. Long festooned flow from SW "artesian" vent to depression SW of S peak.

Avalanche inside pit at SW rift cavern at 11 a.m. About a half minute later dust appeared rising red at SW rift oven, then at second well, and the gas columns at the two wells, hitherto transparent, remained more smoky than before for five minutes. The particles in the columns appeared to be nucleated vapor as well as dust. The reddening of the mouths of both wells is due to this avalanche dust. Evidently the rift cavern below is caving away. If this keeps on, the line of rift may fall in.

December 22.
11:00 a.m. Nothing new. Few fountains. Rainy and seeing was poor. Hissing at SW "artesian" vent and the flow there appears larger.

December 23. Fume appears thinner and lakes bright at night.

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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

Day Saturday Date December 24, 1921
Sunday " 25, "
Monday " 26, "
Wednesday " 28, "

December 24.
4:00 p.m. About nine fountains. SE arm again restored by collapse of partition. Benches 3 or 4 feet high. Crags look low and general situation suggests the beginning of a sinking spell. The SW pool around "artesian" vent is restored as a distinct pool and a fountain is spouting over the vent. Fume fairly thick.

December 25. Finch reports that in the evening the pit was smoky; fountain in E pond and in SE arm; nothing new; could not see to center.

December 26.
3:45 p.m. Streaming SW in central lake. Four or five fountains. Banks 3 to 6 feet high around lakes. Puffing and plashing heard. Fume moderate

December 28.
3:00 p.m. Seven fountains. Cracking and foundering in N and SW coves of central lake. Nothing new. Some rocks fell from E wall veneer. Fume variable but rather dense. Banks around lake 5 to 10 feet high as before.

In morning from Observatory fume appeared rather thin, afterwards thickening rather suddenly.

Note. Moorhead (topographer) suspects a lowering of 5 or 6 feet along old Volcano House trail NE of corral at Little Beggar, since Birdseye's survey of 1912. Perhaps this is due to weight of 1919 flows north.

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SURVEY RECORD

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory
Day Monday Date December 26,1921

t	sta	pt	hor	vert	lev	dist	elev	h. i.
3:45 p.m.	S saddle	Fountain SE arm		-38 07		438	-343	
		" E pond		-25 12		757	-358	
		S crag		-30 20		401	-232	
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U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU
Hawaiian Volcano Observatory

JOURNAL

Day Thursday Date December 29, 1921
Saturday " 31, "

December 29.
11:00 a.m. Five or six fountains, and bubble fountains in E pond. Crusted lakes. Moderate fume. Nothing new. Same landscape of crags, pools and talus slopes about 340 feet down. No slides or other evidence of motion. Crack athwart S crag.

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December 31.
1 to 2 p.m. Fume moderately thin and entire floor visible. Seven fountaining areas in all but central pool heavily crusted. Loud gas hissing near SW pond and comparatively quiet elsewhere. Lakes surrounded by banks about ten feet high.

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