passed, at eight miles distance, the chasm that divides the Hilo from the Puna district. As the darkness set in, we began to experience the difficulties we had anticipated from our late start: the bustle and noise became every moment more audible along the whole line as the night advanced: what added not a little to our discomfort, was the bad road we now had to encounter, rendered worse as each native passed on in the tracks of those preceding him, until at last it became in places quite miry.

We continued on, however, until we found most of the natives had come to a stand, and were lying about among the grass by the road-side near a few grass-houses. One of these was hired for our accommodation and to protect us from the heavy dew, to which the natives seemed accustomed: here we proposed to stay until the moon arose, and in the interim to get what little rest we could.

After it became sufficiently light we again set out with a part of our host. The cloud of the volcano of Kilauea lay before us like a pillar of fire, to guide us on our way. We reached Olaa, the habitation of Pea, about half-past four.

Here we found Messrs. Waldron and Drayton, who had preceded us, taking their breakfast on a large round of *bœuf à la mode* and coffee, in which we all cheerfully joined. We concluded to stop here until eight o'clock, to allow time for the natives to cook their food and serve out the rations of poe.

It will scarcely be possible to form a full idea of our company: that of my Lord Byron is described as a sort of triumphal procession; ours was very different from this, and was more allied to a May-day morning in New York, or a vast caravan. It consisted, as my friend Dr. Judd informed me, of two hundred bearers of burdens, forty hogs, a bullock and bullock-hunter, fifty bearers of poe (native food), twenty-five with calabashes, of different sizes and shapes, from two feet to six inches in diameter. Some of the bearers had large and small panels of the portable house on their backs; others, frying-pans or kettles; and others, tents or knapsacks. Then there were lame horses, which, instead of carrying their riders, were led by them; besides a large number of hangers-on, in the shape of mothers, wives, and children, equalling in number the bearers, all grumbling and complaining of their loads; so that wherever and whenever we stopped, confusion and noise ensued. I felt happy in not understanding the language, and of course was deaf to their complaints. It was very evident that the loads were unequally divided; and I must do the natives the justice to say, they had reason to complain, not of us, but of each other. It was impossible for the thing to be remedied at once,

although it was not a little provoking to see several natives staggering under their loads, while one or two would be skipping along with a few pounds' weight only. At first, many of them preferred the hog-driving business; but I understood that they afterwards found out that it was no sinecure to drive a hog either of large or small size, and still less so to have charge of the bullock, who was half wild. The terror and fright he produced among the natives, proved a source of much amusement to us; and some droll scenes took place as the natives rushed in all directions to get beyond the reach of his horns, throwing down their loads without regard to the consequences. This was, however, prevented afterwards, by sending on the bullock, with his *attachés* or drivers, in front.

I found Olaa to be one thousand one hundred and thirty-eight feet above the level of the sea; and the temperature there was 72°.

While we were getting a slight nap, Dr. Judd was engaged in superintending the distribution of food to the multitude, during which time much confusion and noise existed. The natives put me in mind of wild beasts in this respect; they seldom make any noise unless their appetite and ease are in some way concerned.

Among the party we had several white men as interpreters, besides our native guides, who formed as it were a connecting link between ourselves and the natives proper. The whole was in keeping, for all had set out for a hard and rough journey; and knowing we had an arduous task to perform, we were all appropriately clothed for work.

The dress of the natives consisted of the maro and a light piece of tapa-cloth, worn as a shawl, which, when working, was usually wrapped around their bodies. In order to protect the feet, they were each furnished with a pair of raw-hide sandals, which they tie on their feet as boys do their skates. These are put on so as to cover the palms of the feet. For want of hide, some made sandals of ti-leaves, which answer the purpose quite as well for a time, though they are not so durable, and walking in them causes an awkward gait.

The whole company was a sort of mob, each moving after his own fashion, and straggling occasionally out of the path to save a few yards of distance. The chief Pea and his body-guard brought up the rear, to pick up stragglers and assist the weary.

After leaving Olaa, we had no distinct path to follow; for the whole surface became a mass of lava, which retained all its metallic lustre, and appeared as if it had but just run over the ground—so small was the action of decomposition. There were only a few stunted bushes on our track; but some dense patches of wood were observed on the

right. The day was warm, with a bright sun; and when we passed pools of water standing in the lava rock, as we frequently did, the natives would rush into them like overheated dogs, and seemed to enjoy the temporary coolness brought about by the evaporation.

The lava had a peculiar metallic appearance, and had evidently run over the surface in a melted state. The natives call this smooth kind pahoihoi, which is the same word they use for satin. This, after running smooth for some distance, would assume a wrinkled or wavy form, showing that the mass had been pressed forward, in cooling. The melted rocky stream, in places where the descent was rapid, appears to have been urged forward with some velocity, and as the surface cooled and became fixed, the melted matter has run out from beneath, leaving a kind of trench or tunnel, which, in some places, is of considerable size. The localities of the tunnels are pointed out by the hollow sound experienced in passing over them.

At 3 P. M., we reached Kapuauhi, which consists of a few houses, and is about fifteen miles from Olaa. The temperature, on our arrival, was found to be 80° in the shade, while in the sun it stood at 84°; the whole extent around was black lava; indeed there was no place where we could pitch a tent of six feet by eight, and as it looked like rain we concluded to occupy one of the houses that was offered to us; but it taught us a lesson we remembered for some time, for all our blankets and clothes became infested with fleas, and those of the most voracious kind.

Dr. Judd, finding that some of the natives were overloaded, sent back for a reserve of thirty men, to overtake us as soon as possible. Several of the packages were unwieldy, and others, though small, were much complained of; among the latter was a small iron mortar, or eprouvette, which I was taking up to try some experiments on sound, in the rarefied air: this had been a great pest to the natives, and they had made every endeavour to get rid of it. As there was some difficulty in getting our host awake, and ready for a move betimes, it was proposed that the mortar should be fired at early dawn: although small, yet with a well-adjusted plug driven into it, it made the noise of a great gun. It was accordingly fired the next morning to the wonder of all, and soon aroused the mob. Such was the effect this had upon the bearers of it, that no more complaints were uttered, and they joyfully shouldered their burden, having become men of great consequence in the eyes of their fellows, and subjects of the day's talk. Many now would have exchanged loads for the honour of being the bearers of it.

The height we had now attained was two thousand one hundred and eighty-four feet; the thermometer, 72°; the lowest temperature in the night, 58°. A slight shower of rain fell during the night.

At 8 A. M., we left Kapuauhi, or what our company called "Flea Hall," after having passed a most comfortless night. Nothing could be more annoying than the swarms of fleas that attacked us, and I believe all the native houses are thus unpleasantly infested. In about three hours we reached the Okea tree, known as the boundary of the territory of Pelé, or the goddess of the volcano. In bygone days no native dared venture beyond it without an offering to Pele, under penalty of her vengeance. Many strange traditions are told of her, and of the combats she waged with the ancient warriors of the island, in which she destroyed whole armies by her "floods of fire." Dr. Judd and myself, while at the volcano, listened to one of these long traditions from a young man named Kiwe, a descendant of one of the "tradition bearers," who were employed specially to hand down the traditions in their family, and were thus the depositaries of the oral archives of the nation. Kiwe came from Panau, in the neighbourhood of this district of fire, and we were, of course, very desirous of obtaining any information he could give. As he had come to offer himself as guide, he was sent for to our hut, and was asked to take a seat. Kalumo, the chief scribe, before spoken of, was sent for, and began to question him relative to the traditions. Kiwe began by describing various great chiefs and their genealogies, but nothing relating to their feats or actions, except that the great chief of Papapala and the goddess Pele had quarrelled about a surf-board, which ended in his being consumed, after having attempted to cross the fiery lake upon it. Many interrogatories were put to him, but he soon became sullen and refused to answer; he told us he had discovered our intention, and that he knew we were going to put what he said in a book, that every body might read it, and therefore he would give us no further information. This I hope will be received as a sufficient apology for my not giving the histories and details of these marvellous personages; for, according to Kiwe, by relating them he would lose his occupation as soon as they were printed.

Soon after we left Kapuauhi, we met with soil formed upon the lava by volcanic ashes; the bushes became thicker and more thrifty, rising into small trees; quantities of strawberry-vines were perceived, but the natives searched in vain for some straggling fruit. The time for its bearing had passed, but they are said to be found in great abundance, and of very fine flavour, at the proper season. Okea was the principal wood, and there was some koa (Acacia). A curious plant

was pointed out, the sap of which blisters the skin, and with which the inhabitants produce a sort of tattooing in large and small round lumps. I did not learn how durable they were. This plant is called mau-a-laili.

Our course, since we left our resting-place, was nearly south-south-west, and the inclination on which we ascended was not as rapid as it had been. The country on our left was one entire rock, while that to the right was still occupied by the line of forest I have before spoken of, which bounded our view to the west.

Just as we reached the great plain of the volcano, we approached the southern limit of the wood, and, on turning its corner, Mauna Loa burst upon us in all its grandeur. The day was extremely fine, the atmosphere pure and clear, except a few flying clouds, and this immense dome rose before us from a plain some twenty miles in breadth. I had not, until then, formed any adequate idea of its magnitude and height. The whole dome appeared of a bronze colour, and its uninterrupted smooth outline was relieved against the deep blue of a tropical sky. Masses of clouds were floating around it, throwing their shadows distinctly on its sides, to which they gave occasional relief and variety. There was a bluish haze resting on the plain, that apparently gave it great distance, though this was partially counteracted by the distinctiveness of the dome. I now, for the first time, felt the magnitude of the task I had undertaken.

So striking was the mountain, that I was surprised and disappointed when called upon by my friend, Dr. Judd, to look at the volcano; for I saw nothing before us but a huge pit, black, ill-looking, and totally different from what I had anticipated. There were no jets of fire, no eruptions of heated stones, no cones, nothing but a depression, that, in the midst of the vast plain by which it is surrounded, appeared small and insignificant.

At the further end was what appeared a small cherry-red spot, whence vapour was issuing, and condensing above into a cloud of silvery brightness. This cloud, however, was more glorious than any I had ever beheld, and the sight of it alone would have repaid for the trouble of coming thus far.

We hurried to the edge of the cavity, in order to get a view of its interior, and as we approached, vapour issuing from numerous cracks, showed that we were passing over ground beneath which fire was raging. The rushing of the wind past us was as if it were drawn inwards to support the combustion of some mighty conflagration.

When the edge is reached, the extent of the cavity becomes apparent, and its depth became sensible by comparison with the figures of

some of our party who had already descended. The vastness thus made sensible, transfixes the mind with astonishment, and every instant the impression of grandeur and magnitude increases. To give an idea of its capacity, the city of New York might be placed within it, and when at its bottom would be hardly noticed, for it is three and a half miles long, two and a half wide, and over a thousand feet deep. A black ledge surrounds it at the depth of six hundred and sixty feet, and thence to the bottom is three hundred and eighty-four feet. The bottom looks, in the daytime, like a heap of smouldering ruins. The descent to the ledge appears to the sight a short and easy task, but it takes an hour to accomplish.

We pitched our tents in full view of the volcano, on its western side, and the natives busied themselves in building temporary huts to shelter them from the cold blast that rushed by. All this was accomplished, and we had time to take another view of the crater before dark.

All usual ideas of volcanic craters are dissipated upon seeing this. There is no elevated cone, no igneous matter or rocks ejected beyond the rim. The banks appear as if built of massive blocks, which are in places clothed with ferns, nourished by the issuing vapours.

What is wonderful in the day, becomes ten times more so at night. The immense pool of cherry-red liquid lava, in a state of violent ebullition, illuminates the whole expanse, and flows in all directions like water, while the illuminated cloud hangs over it like a vast canopy.

The bank, near us was covered with half-naked natives, two hundred or more in number, all gazing, with affrighted looks and savage wonder, on this surprising phenomenon. Their ancestors would not have dared thus to look upon and into this dreaded abode of the malicious goddess Pele, never having approached it without the greatest fear and awe, and then only to deliver their offering by casting it into the burning pool, to secure a safe transit through her territory.

We sat on its northern bank for a long time in silence, until one of the party proposed we should endeavour to reach the bank nearest to and over the lake; and having placed ourselves under the direction of Mr. Drayton, we followed him along the edge of the western bank; but although he had been over the ground the day before, he now lost his way, and we found ourselves still on the upper bank, after walking two or three miles. We then resolved to return to the first place that appeared suitable for making a descent, and at last one was found, which, however, proved steep and rugged. In the darkness we got many a fall, and received numerous bruises; but we

were too near the point of our destination to turn back without fully satisfying our curiosity. We finally reached the second ledge, and soon came to the edge of it; we were then directly over the pool or lake of fire, at the distance of about five hundred feet above it, and the light was so strong that it enabled me to read the smallest print. This pool is fifteen hundred long by one thousand feet wide, and of an oval figure.

I was struck with the absence of any noise, except a low murmuring, like that which is heard from the boiling of a thick liquid. The ebullition was, (as is the case where the heat is applied to one side of a vessel,) most violent near the northern side. The vapour and steam that were constantly escaping, were so rarefied as not to impede the view, and only became visible in the bright cloud above us, which seemed to sink and rise alternately. We occasionally perceived stones, or masses of red-hot matter, ejected to the height of about seventy feet, and falling back into the lake again.

The lake was apparently rising, and wanted but a few feet of overflowing its banks. When I began to reflect upon the position we were in, its insecurity, and the vast and deep fires beneath, with the high basaltic walls encompassing us on all sides, the sulphurous fumes and broad glare, throwing such enormous masses of stone in strong relief by their own fusion, I found it difficult to comprehend how such a reservoir can thus be pent up, and be viewed in such close proximity, without accident or danger. The whole party was perfectly silent, and the countenance of each individual expressed the feeling of awe and wonder which I felt in so great a degree myself, and which the scene was so well calculated to excite.

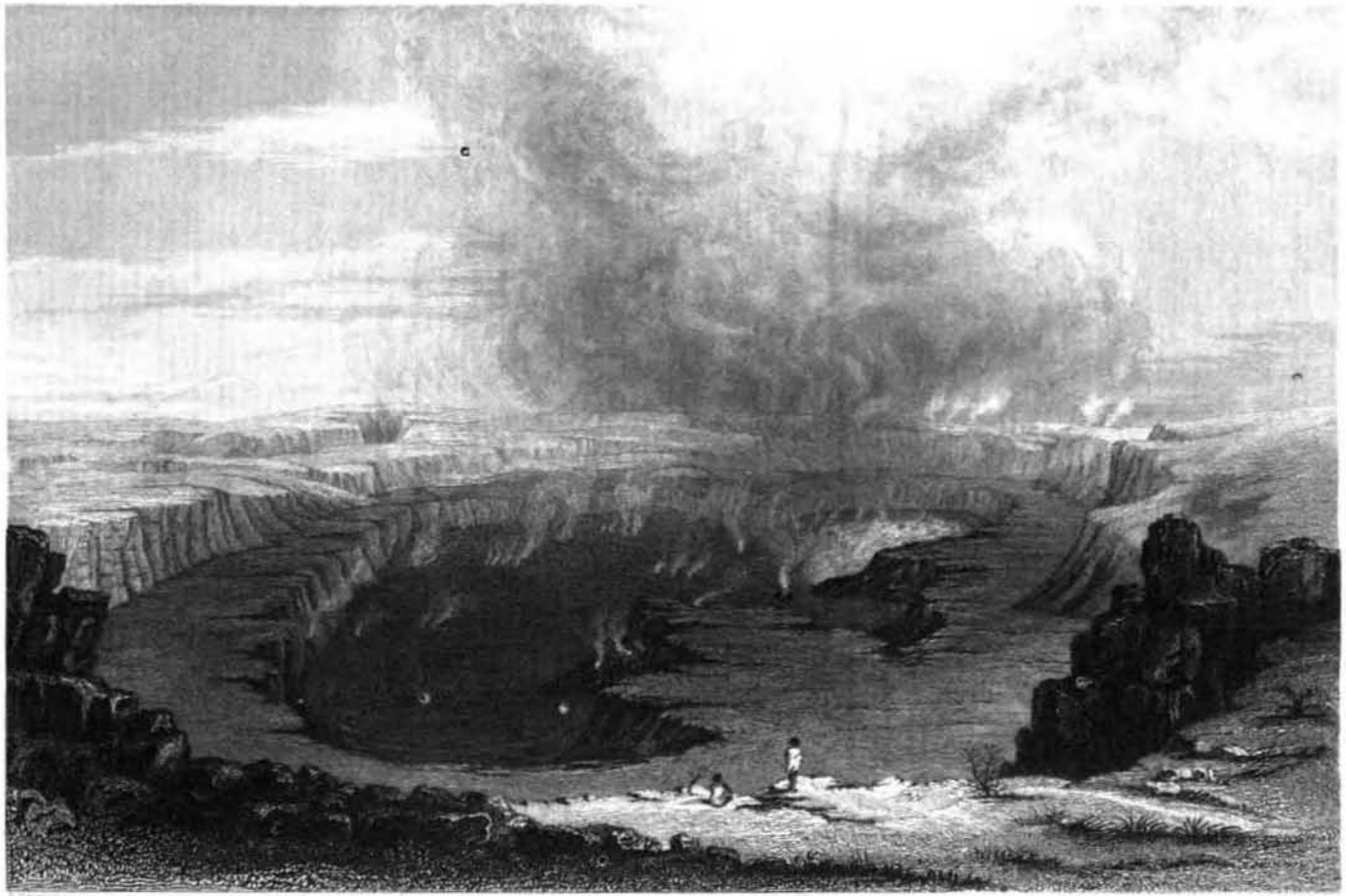
No one can see all this and yet doubt the theory of the igneous fluidity of the centre of the earth. All combustible causes that we are acquainted with, are totally inadequate to produce such an effect. The whole seemed boiling up like a fountain, differing only in density and colour.

The apparent flow to its southern part, is only because the ebullition on the north side causes it to be higher, and the waves it produces consequently pass over to the opposite side.

We returned to our tents towards midnight, much fatigued, but found sleep impossible after the excitement of such a scene.

At daylight the thermometer stood at 43°, and there was much deposit from the steam-holes. The barometrical height of the encampment on the west side of the crater, was found to be three thousand nine hundred and seventy feet.

The mortar was again fired, and soon after a rebellion was found to



exist among the natives in the camp, that threatened to upset all our plans; and, in consequence of it, we were obliged to defer our departure. Dr. Judd soon detected the ringleaders, one in particular, who was holding forth to the Kanakas, advising them, as they now had me in their power, to strike for higher wages; for, if they did so, we should be obliged to pay them double, or any thing extra they might ask for. He was at once made an example of by being turned out of the camp, and sent away.

This had the desired effect, and the rest signified their willingness to go forward; but as many of them desired rest on account of their sore shoulders, we assured them we would remain for a while, provided there was no further difficulty.

From this I well knew that no confidence was to be placed in the natives. I at once despatched an order to Lieutenant Carr, on board the Vincennes, to send on a detachment of fifty men, under officers, as quickly as possible, and likewise to forward an extra supply of provisions with them to meet our wants.

I now employed the day in making observations for the longitude and latitude. Some of the officers were engaged in distributing the loads more equally, and others in descending into the crater.

As I proposed remaining here a few days on my return, I determined to await until then for the exploration of this volcano. Some of the observations then made will be noticed at present, that the nature of the lavas may be more fully understood. This day was employed in becoming acquainted with its paths, and in making sketches. One made by Mr. Drayton, with the camera lucida, is very characteristic, and was taken from one of the best positions for viewing this wonderful place, on the north bank, near its west side. These sketches I conceived would enable me to ascertain if any, and what, alterations should take place between our two visits, for I could not but imagine it must be constantly undergoing change. For this purpose we multiplied our camera lucida drawings, and I descended again nearly to the black ledge for this purpose. The pathway leads down on the north-east side, over frightful chasms, sometimes on a mere edge of earth, and on rocks rent asunder to the depth of several hundred feet. Through these fissures steam issues, which as it reaches the upper part, condenses, and gives nourishment to masses of ferns, and an abundance of small bushes (Vaccinium), bearing a small berry of an agreeable flavour, called by the natives ohela. The descent, however, is not in reality difficult, except in a few places, where it requires some care in passing over the basaltic blocks, that are here piled in confused heaps. On approaching the black ledge, which from above appeared

level and smooth, it is seen to be covered with large pieces of lava, rising in places into cones thirty or forty feet high, which are apparently bound down by huge tortuous masses, which surround them like cables. In other places these are stretched lengthwise on the level ledge, and look like hideous fiery serpents with black vitreous scales, that occasionally give out smoke, and in some cases fire.

The immense space which I have described the crater as covering, is gradually filled with the fluid mass of lava to a certain point, above which the walls, or the surrounding soil, are no longer able to bear the pressure, it then finds vent by an eruption, previous to which, however, a large part that is next to the walls of the crater has in a measure become cooled, and remains fixed at the level it had attained. After the eruption, the central mass therefore alone subsides three or four hundred feet, and leaves the portion that has become solid, forming a kind of terrace or shelf: this is what constitutes the "black ledge," and is one of the most striking features of the crater. Its surface is comparatively level, though somewhat uneven, and is generally coated with a vitreous and in some places a scoriaceous lava, from half an inch to an inch thick, very iridescent and brittle. In walking over this crust, it crumbles and cracks under the feet; it seems to be easily decomposed, and in some places had lost its lustre, having acquired a grayish colour and become friable. There was another variety of the vitreous lava, which was smooth and brittle: this occurred in the large hollow tunnels or trenches, the insides of which were rough, and full of sharp and vitreous points. On the turnings and windings small swellings were met, which on being broken off, had a strong resemblance to the bottom of a junk-bottle; at another place, fragments appeared to have been scattered around in a semi-fluid state, in an endless variety of shapes, and so brittle as to be preserved with difficulty. Underneath these was to be seen the real lava or basalt, as firm and solid as granite, with no appearance of cells, and extremely compact; it is seen separated into large blocks, but none that I saw were of a regular figure, though in some places it was thought by others to approach the hexagonal form.

There is a third kind of lava, fibrous in its texture, of quite recent ejection, and procured from the bottom of the crater; this had somewhat the appearance of a dark pumice, but was dense in comparison. On the black ledge the absence of all *debris* from those high perpendicular walls, cannot fail to be remarked; we endeavoured to find an explanation of this, but I was not satisfied with the only one which presented itself. This was to suppose that the fluid mass had recently risen above the ledge, altogether concealing it from view, and that it

had entirely fused its surface. The appearances did not satisfy me that this had been the case, nor did the supposition account for the fact, that none had been collected within the last few months; besides, it might be supposed that some portion of the former accumulation ought to have been discoverable, which it was not.

To walk on the black ledge is not always safe, and persons who venture it are compelled for safety to carry a pole and feel before they tread over the deceitful path, as though they were moving on doubtful ice. The crackling noise made in walking over this crisp surface (like a coating of blue and yellow glass) resembles that made by treading on frozen snow in very cold weather. Every here and there are seen dark pits and vaulted caverns, with heated air rushing from them. Large and extended cracks are passed over, the air issuing from which, at a temperature of 180°, is almost stifling; masses are surmounted that it would seem as if the accumulated weight of a few persons would cause to topple over, and plunge the whole into the fiery pool beneath.

On approaching the large lake at the southern end of the crater, the heat becomes almost too stifling to bear. I shall not soon forget my employment therein, in measuring a base to ascertain the extent and capacity of the lake, of which some account will be given hereafter. At about two-thirds of the distance from the north end are extensive sulphur banks, from the fissures in which much steam is continually escaping: in these fissures are seen many beautiful crystals, adhering to their sides; while on the bank itself, some specimens of sulphate of copper, in beautiful blue crystals, were found.

From many places on the black ledge a bluish smoke was seen issuing, smelling strongly of sulphur, and marked by an efflorescence of a white tasteless powder among the cavities: this it was difficult to to detach without scalding the fingers. There were many cracks, where our sticks were set on fire, and some places in the vaulted chambers beneath, where the rock might be seen red hot.

The black ledge is of various widths, from six hundred to two thousand feet. It extends all around the cavity, but it is seldom possible to pass around that portion of it near the burning lake, not only on account of the stifling fumes, but of the intense heat. In returning from the neighbourhood of the lake to the point where we began the ascent, we were one hour and ten minutes of what we considered hard walking; and in another hour we reached the top of the bank. This will probably give the best idea of its extent and the distance to be passed over in the ascent from the black ledge, which was found six hundred and sixty feet below the rim.

To the bottom of the crater, there was a descent at the northwest angle of the black ledge, where a portion of it had fallen in, and afforded an inclined plane to the bottom. This at first appeared smooth and easy to descend, but on trial it proved somewhat difficult, for there were many fissures crossing the path at right angles, which it was necessary to get over, and the vitreous crust was so full of sharp spiculæ as to injure the hands and cut the shoes at every step. Messrs. Waldron and Drayton in their descent were accompanied by my dog Sydney, who had reached this distance, when his feet became so much wounded that they were compelled to drive him back; he was lamed for several days afterwards, in consequence of this short trip into the crater.

These gentlemen, after much toil, finally reached the floor of the crater. This was afterwards found to be three hundred and eighty-four feet below the black ledge, making the whole depth nine hundred and eighty-seven feet below the northern rim. Like the black ledge, it was not found to have the level and even surface it had appeared from above to possess: hillocks and ridges, from twenty to thirty feet high, ran across it, and were in some places so perpendicular as to render it difficult to pass over them. The distance they traversed below was deceptive, and they had no means of ascertaining it but by the time it took to walk it, which was upwards of two hours, from the north extreme of the bottom to the margin of the large lake. It is extremely difficult to reach this lake, on account of its overflowing at short intervals, which does not allow the fluid mass time to cool. The nearest approach that any one of the party made to it at this time was about fifteen hundred or two thousand feet; they were then near enough to burn their shoes and light their sticks in the lava which had overflowed during the preceding night.

The smaller lake was well viewed from a slight eminence: this lake was slightly in action; the globules, (if large masses of red fluid lava, several tons in weight, can be so called,) were seen heaving up at regular intervals, six or eight feet in height; and smaller ones were thrown up to a much greater elevation. At the distance of fifty feet no gases were to be seen, nor was any steam evident, yet a thin smoke-like vapour arose from the whole fluid surface: no puffs of smoke were perceived at any time.

At first it seemed quite possible to pass over the congealed surface of the lake, to within reach of the fluid, though the spot on which they stood was so hot as to require their sticks to be laid down to stand on. This idea was not long indulged in, for in a short time the fluid mass began to enlarge; presently a portion would crack and exhibit

a bright red glare; then in a few moments the lava-stream would issue through, and a portion would speedily split off and suddenly disappear in the liquid mass. This kind of action went on until the lake had extended itself to its outer bank, and had approached to within fifteen feet of their position, when the guide said it was high time to make a retreat.

John, the pilot, who was now acting in the capacity of guide, was satisfied they had stayed long enough, and had often "repeated that there was no safety in the bottom of the crater for one moment," and that "the fire would often run over ten or more acres in a few moments." In such a case destruction would be inevitable, and from what I myself have seen, I can readily believe that his opinion is correct. The usual course is for the lake to boil over, discharge a certain mass, and then sink again within its limits. It is rarely seen to run over for more than a day at a time.

John and the natives who are in the habit of frequenting it with strangers, tell many stories of the escapes they have made.

One trip to the floor generally satisfies the most daring, and as long as a person remains there, he must feel in a state of great insecurity, and in danger of undergoing one of the most horrible of deaths, in being cut off from escape by the red molten fluid; yet a hardihood is acquired, which is brought about by the excitement, that gives courage to encounter serious peril, in so novel a situation.

One of the remarkable productions of this crater is the capillary glass, or, as it is here called, "Pele's hair." This is to be seen in the crevices like loose tufts of fine tow; it is to be found also over all the plain, adhering to the bushes. The fibres of this glass are of various degrees of fineness; some are crimped or frizzled, others straight, with small fine drops of glass at one end. These adhering to the berries in the neighbourhood, make one sensible of its presence in eating them. On the leeward side of the crater, the glass is so abundant that the ground, in places, appeared as if covered with cobwebs.

Where Pele's hair is found in quantities, a very fine and beautiful pumice prevails; it usually occurs in pieces about the size of a hazel-nut, of a greenish yellow colour, not unlike small pieces of new dry sponge, but so much lighter as to be blown about by the wind. The southern bank of the crater is covered with this product for some depth, and the sand blowing over it renders it stationary.

The day we remained at the volcano was employed by the natives in preparing their food, by boiling it in the crevices on the plains from which the steam issues; into these they put the taro, &c., and close the

hole up with fern-leaves, and in a short time the food was well cooked. All the water for drinking is obtained here by the condensation of the stream, which gathers in small pools, and affords a supply of sweet and soft water. From the numbers in the camp who used it, this supply became rather scanty, but it did not entirely give out.

The crater, at night, was extremely beautiful, and we sat for a long time watching its changing and glowing pool. The shadows thrown by the walls of the crater seemed to reach the heavens, and gave it the appearance of being clothed in a dark cloud; but on looking at it more attentively, and shutting off the glare of the crater, the stars were perceived shining brightly.

About four o'clock a loud report was heard from the direction of the boiling lake, which proved to have been caused by a large projecting point of the black ledge near the lake having fallen in and disappeared.

The lowest temperature, during the night, was 48°. There was a light wind and no dew.

At dawn on the morning of the 18th, the signal called us to make preparations for our journey, and as all things had now been more systematically arranged, we anticipated less difficulty in our onward journey. The natives seemed to be all in good spirits, and moved with alacrity.

Our camp hitherto (as all camps are) had been beset with hangers-on, in the shape of wives, mothers, and children, who were not only much in the way of those to whom they belonged, but were great consumers of the food the natives had supplied themselves with for the journey. As we already entertained apprehensions of a scarcity prompt measures were taken by Dr. Judd to get rid of our troublesome guests, which we succeeded in doing, though not without some difficulty, and a low monotonous growling, that indicated much displeasure on the part of the fair sex.

The divisions now set off, and our host was less mob-like, partly owing to the impossibility of going in squads, the paths having become more contracted.

The water that I have mentioned as being found in the small pools, the product of condensation, was exhausted before we left the crater. This was in consequence of the natives having filled their calabashes; and we had particularly instructed our servants and the sailors to do the same. The former provided themselves; but the latter, sailor-like, preferred to take their chance of meeting with it on the road, rather than carry a load for their future supply. I discovered, after we started, that they were unprovided, but was informed that there was, within about two miles, an old canoe which would be found full of

water. On our arrival at it, we found that the natives, who had preceded us, after supplying themselves had emptied out the rest.

Our route was taken at first and for a few miles in a due west line, for the top of Mauna Loa, over the extensive plain surrounding the volcano; it then deviated to the southward, over an ancient lava-bed, very much broken, that appeared never to have been traversed before. We now became for the first time acquainted with clinkers. To describe these, it is merely necessary to say, they are like the scoria from a foundry, only instead of being the size of the fist, they are from one to ten feet square, and armed on all sides with sharp points; they are for the most part loose, and what makes them still more dangerous, is that a great deal of the vitreous lava is among them. Of the origin of these immense masses and their extent, I shall have occasion to speak hereafter: suffice it for the present to say, there never was more difficult or unpleasant ground to travel over.

Our guide Puhano of Puna, who we understood had accompanied Douglass and Lowenstern on their ascents, now took the lead, but it soon appeared that he knew little of the route. I therefore, in company with Mr. Brinsmade, took the lead, compass in hand; and after walking over the broken and torn-up ground, we turned again towards the hill-side, and began a rapid ascent through a belt of long grass, where the rock was covered with white clay, and seldom to be seen. This part appeared to have suffered much from drought; for in passing along we came to several narrow and dry water-courses, but met with no water.

At two o'clock we had nearly reached the upper limit of the woods, and as the clouds began to pass over, and obscure the path, we determined to halt and encamp. We made several fires along the route, in order to guide those behind, and as a mark for the stragglers, bushes were also broken off, and their tops laid in the direction we were going, by the natives; and I likewise had the trees blazed, as a further indication, well known to our men. Chronometer sights were taken here, and the altitude by barometer was five thousand and eighty-six feet.

During the day, the reason that had induced the natives to empty the water out from the canoe, became evident in their anxiety to sell us water. My friend the consul had hired an especial bearer for his calabash of water, determining that he would have a sufficient supply. By our watching and cautioning the old man who had it in charge, he became somewhat alarmed and unsteady, as I thought also from fatigue. When he had arrived within a short distance of the camp, he stumbled on a smooth place, fell, and broke the calabash into numerous pieces. Those who were coming up, seeing the accident, rushed to partake of its contents, but the fluid quickly disappeared in

the loose and absorbent lava. This was a dreadful blow to my friend's feelings, and produced much laughter among us, in which the consul himself at length joined; although I must confess I was somewhat of his opinion, that it had been done designedly, either to secure the sale of that belonging to others, or to get rid of the load, which had been a great annoyance and trouble to the bearer all day, and for which he had already been paid.

On the baggage coming up, Mr. Eld reported a deserter, who was brought up for trial, and an investigation had, in order to make an example of him. He was a swarthy and diminutive-looking person, with rather a good countenance, but it was just then so distorted with fright, that it was impossible to look at him without laughing. It appeared that he had been left by his chief at the crater, to superintend some hogs and provisions that belonged to the party; while thus employed, Mr. Eld, the officer in charge of the rear, wanted another person to carry on the clock-case, as one of the four that were attached to it had not been forthcoming; he in consequence had pressed the culprit into the service against his will, taking him from the station where his chief had placed him. On the route over some of the roughest part, seeing this man somewhat fatigued, Mr. Eld kindly relieved him for a few moments, of which he took advantage and disappeared. Mr. Eld immediately left the load and gave chase, but in a few moments he stumbled and fell over the clinkers, by which he received a contusion on the knee; rising with the prospect of having to aid in transporting the clock, he discovered the delinquent concealed under a neighbouring bush, and immediately forced him to return to his load, and thus brought him on. Mr. Eld, on hearing the facts of the case told by the native, interceded in his behalf, and Dr. Judd, after giving him an admonition, set him at liberty to return to his charge at the volcano.

We were now for a long time enveloped in mist, for we had reached the region of clouds. The thermometer at 6 P. M., stood at 54°; the dew-point at 44°. Instead of trade-winds from the northeast, we had a mountain breeze from the west, which caused the temperature to fall to 43°, and produced a feeling of great cold, being a fall of forty degrees since we left the coast.

The men whom we had hired just before leaving Hilo, belonged, as will be recollected, to Kanuha's district, and engaged to find themselves in food; but many of them had been so improvident of their supply that it was now found to be gone, and as many as twenty of them were without any thing to eat. When this became known, we proposed to supply them with rations at the original cost of the poe,

which we had for the men hired of Pea; but no argument would induce them to accept it on these terms, and they went round begging and borrowing all they could from those who were supplied. The reason that they would not buy the poe I found was, the dislike they had to take up any of their wages before the whole became due, and in consequence many of them went hungry. It was amusing to watch some of these, who frequently would seat themselves near a party who were eating; but it did not produce any effect upon those who had plenty, as they knew the reason of their being without food. From what I saw of these islanders on this trip, I am not disposed to believe them so hospitable, or so thoughtful of each other, as the Tahitians or Samoans. Selfishness is a predominant trait in the character of the Hawaiians, and when they are thus associated together, it shows itself more strongly than at other times.

At sunrise on the 19th, we had the temperature at 48°.

As the ascent was now becoming laborious, we selected and left the things we had no immediate use for, to follow us by easy stages. We then took a diagonal direction through the remaining portion of the woods. By one o'clock we had lost all signs of trees, and were surrounded by low scraggy bushes: the change of vegetation became evident, not only in species, but in size; we also passed through extensive patches that had been destroyed by fire. Sandalwood was seen, not as a tree, but a low shrub.

During the day we had passed extensive caves, in all of which I had search made for water. These often lead a long distance under ground, and some of the men passed in at one end and out at another.

Intending to stop on Sunday not far above these caves, calabash-tops were left in one or two where water was found to be dropping, in hopes by this means to procure a small supply; but on returning the next day, it was found that very little had accumulated. These caves or tunnels had apparently been caused by a flow of lava down the side of the mountain, which on cooling had left the upper part arched or vaulted, the fluid running off at its lower extremity or opening and spreading itself over the surface. The opening into them was formed by the roof having fallen in, and partly blocked up the tunnel. At no great distance from the opening, the floor on each side was smooth and closely resembled the flow of the lava on the surface. These openings were usually known by the quantity of raspberry and other bushes around them; and they reminded me of the caverns in limestone districts.

Between two and three o'clock, we again became enveloped in clouds, and it was necessary for us to redouble our precautions against

losing the track. Fires were again resorted to, which at short distances could be seen in the intervals of mist.

Deeming it advisable to make an early halt, we stopped shortly after three o'clock, to allow all the baggage to come up. Notwithstanding the size of our party, there was no perceptible track left or any thing by which to be guided, but the smoke of the fires, or occasionally a broken shrub, as a finger-post. All the ground was hard metallic-looking lava, and around nothing but a dreary waste. The voice too became fainter, as the atmosphere grew more rarefied. Our encampment was called the Sunday Station, on account of our having remained quietly here on that day. The altitude given by the barometer was six thousand and seventy-one feet, at which we found ourselves above the region of clouds, and could look down upon them.

At night, on pulling off my clothes, I noticed the quantity of electrical fluid elicited, which continued for some time to affect the objects about me, particularly a large guanaco-robe I had to sleep in.

This afternoon, we found that it would be impossible to drive the bullock any further; for the animal began to suffer from fatigue and the want of water, our supply of which was almost exhausted; he was accordingly killed. The natives were now hawking water about the camp at half a dollar the quart. I am not aware that they sold any at that extravagant price; but I saw some of them in possession of handkerchiefs and old shirts, which I understood had been given for it.

Ragsdale, one of our guides, who had been despatched to Papapala from the crater to purchase provisions, now joined us, with two more guides. He brought information that he had obtained forty goats, and that we should receive full supplies. This was encouraging news, for I felt somewhat doubtful from the first in relying on the natives, and their behaviour at Kilauea was not calculated to raise my opinion of them. I found also, as we ascended the mountain, that even light loads had become heavy, and those of any weight, insupportable; that our time was rapidly passing, and we had a long way yet before we reached the summit; and that the native food was nearly exhausted, while the supply for our own men was rapidly consuming.

The two guides that Ragsdale brought with him, were perfectly familiar with the mountain. One of them was a celebrated bird-catcher, called Keaweehu, who had been the guide of Lowenstern, and knew where water was to be obtained; but it was ten miles distant. He said, that if he was furnished with calabashes and natives to carry them, he would be able to bring us a supply by the afternoon, if he left before the day dawned; and that it would be two days before we could

get any snow, even if it were found on the mountain. It had never crossed my mind, that there was any probability of this latter resource failing us; I had in truth relied upon it with confidence, and concluded that in the event of only one snow-storm we should be enabled to find some place for a deposit, to save enough water for all our wants.

We now numbered nearly three hundred persons in camp, with but a few small calabashes containing five or six gallons of water; and all, more or less, felt the effects of the rarefied air. Mr. Brackenridge had a violent attack of the mountain-sickness, although one of the stoutest of the party; many of the natives felt unwell; and we all began to experience great soreness about the eyes, and a dryness of the skin.

At midday I found it impossible to obtain the dew-point with one of Pouillet's hygrometers, but after the clouds reached us in the afternoon it was found at 10°.

Dr. Judd had his hands full administering to the wants of all; but his spirits, always buoyant and cheerful, made every one comfortable and happy around him.

Old Keaweehu told us that we had taken the wrong road to the mountain, and that Puhano was not at all acquainted with the right road,—a fact we had long before discovered; that if we had come by way of Papapala, he would have been able to conduct us by a route we should have found water every few miles. Ragsdale was now sent off to meet the party from the ship, with orders for them to take the route now indicated, and for him to act as their guide.

Sergeant Stearns, in his excursions on the flanks of the party, shot some mountain geese, and whether to impute it to the appetite created by the mountain air, or the flavour of the bird, they certainly proved a great delicacy.

The 20th, being Sunday, was a day of rest: the natives requested that it might be so, and I readily yielded to their wishes. I was anxious, however, to ascertain the state of the mountain, and whether there was any snow to be had on its top, for I now felt satisfied that the want of water would prove the greatest difficulty I should have to encounter, in remaining there as long as I intended.

Lieutenant Budd received orders to set out with a few attendants at daylight; but after making his preparations, and having all things ready, the natives refused to accompany him on account of its being Sunday, as they said. I am, however, inclined to believe that fear had something to do with it, for they never knew of any one having gone up this mountain before, and thought me mad for taking so

much trouble to ascend it. They said that I must be in pursuit of gold and silver, or something to sell for money, as I never would take so much trouble, and spend so much money, unless it were to acquire great riches. In the morning Dr. Judd had religious service with the natives, and the day was passed without work. It was a most beautiful day: the atmosphere was mild, and the sun shone brightly on all below us. We enjoyed a clear and well-defined horizon, the clouds all floating below us in huge white masses, of every variety of form, covering an area of a hundred or more miles; passing around as they entered the different currents, where some acquired a rotary motion that I had never before observed. The steam-cloud above the volcano was conspicuous, not only from its silvery hue, but by its standing firm, like an immense rock, while all around and beneath it were in motion. The vault overhead was of the most cerulean blue, extending to and blending with the greenish tint of the horizon; while beneath the clouds, the foreground and distant view of the island was of a dark green. The whole scene reminded me of the icy fields of the Southern Ocean; indeed the resemblance was so strong, that it seemed only to require the clouds to have angular instead of cumular shapes, to have made the similarity complete. It was perceived, that as masses of clouds met they appeared to rebound, and I seldom saw them intermingle; they would lie together with their forms somewhat compressed, and their outlines almost as well preserved as when separated and alone. After three o'clock, when the sun was retiring, the clouds advanced up the mountain-side, and finally we became immersed in them. This happened on both days at nearly the same hour.

During the day, I succeeded in obtaining sets of observations for latitude and longitude. I experienced for the first time much fatigue in holding the instruments. The barometer and thermometer were observed throughout the day at the hours arranged with the observatory at Hilo.

In the evening we were much gratified at receiving fifteen gallons of water, which the natives had brought ten miles in open-mouthed vessels, over the rough mountain roads: this they do by placing some fern-leaves on the top of the water, when it carries as well as a solid, and will bear much agitation without spilling. Though a very small supply for our necessities, it was a great satisfaction to know that it was now within reach of us. Partially relieved from this pressing difficulty, our attention was turned to the fuel, and I at once saw the necessity of providing some means for procuring a supply, as we were now at one of the last points where it was to be obtained. We were

certainly two, if not three days' journey from the summit, and an ascent of eight thousand feet was still to be accomplished.

After dark the mist cleared off, when we saw the majestic cloud of the volcano hanging as though illuminated in its position. This is one of the best guides for the mountain, both by night and by day; any one who visits Mauna Loa, and the crater, cannot but admire this constant emblem of the destructive elements below, fitted as it is, from its purity, grace, and majestic appearance, to blend harmoniously with the blue vault above.

It was determined to fix a post here, in order to forward supplies of wood and articles of provision as they came from below. Pea, our chief, was accordingly ordered to select a site which would answer this purpose.

On Monday, 21st, we set out at an early hour. The ascent now became much steeper than any we had hitherto experienced, for the whole face of the mountain consisted of one mass of lava, that had apparently flowed over in all directions from the summit. The sun shone brightly, and his rays seemed to fall with increased power on the black lava. No wind was stirring, and the exhaustion consequent on the rarefied air we were breathing, made the labour of climbing very fatiguing; many suffered from nausea and headache, and the desire for water redoubled in both whites and natives. For water they could no longer find a substitute in berries, as they had previously done, for that fruit had disappeared, and the only vegetation left was a few tufts of grass.

About noon, Dr. Judd volunteered to proceed with the guide to ascertain if there was any snow, and at what distance. It was agreed that we should continue to move on in the same direction, and encamp when we found we could get no higher. Most of the party were now lying about on the rocks, with the noonday sun pouring on them; a disposition to sleep, and a sensation and listlessness similar to that produced by sea-sickness, seemed to prevail. I felt the former strongly myself, and enjoyed as sound an hour's sleep on the hard lava as I have ever had. The burdens had become intolerably heavy, and all complained of their inability to carry them. The use of the sextant had become still more fatiguing than the day before, causing me much pain to hold it. From what I myself experienced, I was satisfied that every one's strength had decreased nearly one-half.

We managed, after an hour's rest, to go on two miles further, and then encamped. No place offered where we could drive a peg for the tents, and loose blocks of lava were resorted to, to confine the cords. The principal inducement for stopping at this spot was the discovery

of a large tunnel, or cave, in which the men could be accommodated, and which was at a sufficient distance from the Sunday Station for a day's journey. This station was afterwards known as the Recruiting Station, because all the sick and wounded from the higher stations were sent here as to an hospital.

Long after we had finished our arrangements for the night, and even after it had become dark, we looked in vain for Dr. Judd and his companion. We therefore lighted our fires as a signal to him, and were soon rejoiced to see him safely back. He brought with him a small snow-ball, and the agreeable intelligence that we should find abundance of snow on the top of the mountain, provided we reached it next day; for he told us it was melting fast. He had travelled for more than four hours and a half before he reached the snow, and had been an hour and a half returning down hill, on a run. The point where he met the snow appeared to him to be about equidistant from our present camp and the summit of the mountain.

I now felt that the troubles of my scientific operations were beginning, for I found that one of the iron cross-bars of the lower part of the pendulum-frame, which had been entrusted to a native to carry, had been broken into two pieces. To provide, however, for mishaps of this description, I had brought the armourer of the Vincennes with me. There would have been no difficulty in his mending it under favourable circumstances; but, fearing that in our present position he might not succeed, I at once despatched a messenger to the ship, with orders to have a new one made and forwarded as speedily as possible.

Although it was somewhat encouraging to know that snow had been found, yet we were apprehensive it might disappear before we could reach it. On holding a consultation, it was thought best that all those who were not absolutely needed for the intended operations on the mountain should make a hasty trip to the top, or terminal crater, and then return to the coast; for our provisions, as well as water, were so low, as in all probability to reduce us to a very short allowance. It was, therefore, determined, that the consul, Mr. Brackenridge, Mr. Drayton, and Mr. Elliott, should each be supplied with a day's allowance, and go on at an early hour to the summit, unencumbered, in order to satisfy themselves with a sight of it, return before night to the Recruiting Station, and thence proceed down the mountain. I resolved to go on with a few of the instruments, to choose an encampment on the summit.

The Recruiting Station was left under charge of Lieutenant Budd, and it was afterwards made a depot for our stores, &c.

All the parties set out at an early hour on their several tracks and

duties, while some of the officers forwarded the heavy articles; for we now found the necessity of advancing, step by step, towards the summit. The main difficulty was the want of water at the depot, but this I was in hopes might be supplied from above by the return of the parties who were to carry up the instruments, provisions, and wood.

My party consisted of the guide, Keaweehu, twelve Kanakas, and seven of our own men, including the sergeant. At about twelve o'clock we reached a spot where the guide pointed out a few half-burnt sticks, as the place where Lowenstern had cooked his dinner. As the two Kanakas who had charge of the bundles of wood had contrived to lighten their loads very much by dropping part of it by the way, I gave them orders to take the wood he had left to cook our supper.

Mr. Brackenridge passed me on his way from the crater. From him I ascertained we were yet three and a half miles from the terminal point. I gave him instructions to repair to the lower country, as there was nothing for him to do in this barren region.

The wind blew a strong gale from the southwest, and was piercingly cold: the thermometer, at 3 P. M., showed 25°. For some time previous, I had been obliged to keep the Kanakas before me, to prevent them from throwing their loads down and deserting; but I found them unable to go any further; being nearly naked, they were suffering much. Seeking a place of shelter under a high bank of clinkers, partly protected from the wind, I allowed them to deposit their loads, and gave them permission to return, upon which they seemed actually to vanish; I never saw such agility displayed by them before.

As soon as the natives who were on the road saw those from the upper party coming down, they could no longer be induced to face the cold, and all deserted at once. The mountain became in consequence a scene of confusion; being strewn with instruments, boxes, pieces of the portable house, tents, calabashes, &c., which the natives had dropped.

I now found myself with the guide and nine men, with nothing for a covering but the small tent used for the instruments, and the coming on of a snow-storm made it very necessary to have something to protect us. The thermometer had gone down to 18°, and most of the men were much affected with the mountain-sickness, with headache and fever, and were unable to do any thing. I felt quite unwell myself from the same cause, having a violent throbbing of the temples and a shortness of breath, that were both painful and distressing. With the few men that remained able to work, I began

building a circular wall of the clinkers, to enable us to spread what little canvass we had, over it; all the blankets we could spare were hung inside, which I hoped would keep us from being frozen. After succeeding in this, which occupied us till dark, we made a fire to prepare our scanty supper, and some tea for the sick. I now discovered that three of the men were absent; and on inquiry, found that they had gone down, in hopes of finding my tent, which they supposed had been left about a mile below. One may judge of my uneasiness, as it was pitchy dark, and there was no trace whatever of a track, or any thing by which they could find their way back, over many dangerous chasms. I had barely wood enough to heat the water for the sick, and no more than a piece or two of candle, without any lantern, and therefore no obvious means of making a signal. However, as necessity is the mother of invention, I turned my clothes out of the calabash, and fastening a piece of a cotton shirt over it, made quite a respectable lantern: this was placed on the most conspicuous point. After the light had been extinguished several times, and a series of difficulties encountered in relighting it, we succeeded in establishing our lighthouse; and though a feeble one, it had the desired effect. The men, when they first saw it, had already strayed off the track; and had it not been for the lantern, would not have been able to join us again. They came back, crawling on their hands and knees; and had travelled thus for most of the distance. The whole time they had been absent, was two hours and a half. Although I felt very much displeased with their departure without permission, I could not find fault with them,—so much was I rejoiced to see them in safety; and when I knew they had incurred all this fatigue and risk to make me more comfortable.

The snow now began to fall fast. My steward, from his thoughtfulness, had an ample supply of tea, which he had carried in his knapsack to save it from being plundered; and consequently we had enough to supply all.

The supper being ended, we stowed ourselves away within the circular pen; and while the men kept passing their jokes about its comforts, the wind blew a perfect hurricane without. I was glad to find the spirits of those who were sick, began to revive. The thermometer had fallen to 15°. The height found by the barometer was thirteen thousand one hundred and ninety feet.

All were soon fast asleep; and although there was scarcely a foot of level rock, they seemed to rest as comfortably as possible. I had little inclination to sleep; for difficulties seemed to increase upon me, and I

felt some uneasiness about one of my men, named Longley, who had not come up with us. The men all said, that he had returned to the Recruiting Station; having been unwell and unable to proceed.

At about four o'clock in the morning, the snow had accumulated in such quantities on our canvass roof, that it broke in upon us, bringing down also some of the stones. This was a disagreeable accident; and after escaping from beneath the ruin, it became necessary to take the covering off and clear the snow out of the pen, which was nearly full. This was the work of nearly an hour of unpleasant labour; but it was much more easily accomplished, than getting ourselves warm again. I need scarcely say, I passed a most uncomfortable night.

When daylight came, the storm had somewhat abated in violence, and I despatched the men for the tents and wood, a part of which had been dropped by one of the natives within half a mile of our position. A man soon returned with the wood, and another brought forward a calabash, in which we fortunately found some provisions, and we soon had what we little expected, something to eat, and what the men called a comfortable breakfast.

It was very pleasant to find the sick ones reviving, and good-humour and cheerfulness so predominant among them that they seemed ready for further exertions. We had now all that was necessary to push on to the summit. I left a flag on a rocky peak near by; and this was afterwards called the Flag Station.

About eleven o'clock we set out, and were obliged to cross a mass of clinkers, which our guide had hitherto endeavoured to avoid. When, after two hours' laborious walking, we reached the top or terminal crater, it still continued snowing in squalls, with a keen southwest wind driving in our faces; the ground being covered a foot deep with snow, rendered it more dangerous and irksome to pass over such loose and detached masses.

From intelligence that had been brought me by the gentlemen who had gone before and taken a hasty look into the crater, it was thought that the descent into it would prove easy, and that I might encamp on its floor; but I found after travelling a long distance over the rugged surface, that it was impossible to succeed in making a descent. I was, therefore, compelled to return, and choose the smoothest place for our encampment I could find. It was after four o'clock, and but little time was left for the men to return. As soon as they had pitched the tent, within about sixty feet of the ledge of the crater, using large blocks of lava to confine its cords, I sent them off under charge of the guide to the Flag Station, and remained with my servants only.

By six o'clock I thought that we had made ourselves comfortable

for the night, and that the storm had so far moderated that it would not trouble us; but a short hour proved the contrary. Our fire was dispersed, candles blown out, and the tent rocking and flapping as if it would go to pieces, or be torn asunder from its fastenings, and disappear before the howling blast. I now felt that what we had passed through on the previous night was comfort in comparison to this. The wind had a fair sweep over us, and as each blast reached the opposite side of the crater, the sound which preceded its coming was at times awful; the tent, however, continued to stand, although it had many holes torn in it, and the ridge-pole had chafed through its top.

It was truly refreshing, after the night we had passed, to see the sun rising clear. It seemed quite small, and was much affected by horizontal refraction, as it appeared above the sea, forming a long horizontal ellipse of two and a half diameters, first enlarging on one side and then on another. After it had reached the height of two diameters above the horizon, the ellipse gradually inclined on the right, and in a few moments afterwards its longer axis became vertical, and it then enlarged at the bottom, somewhat in the form of an egg.

My servants fruitlessly attempted to make a fire; after they had exhausted all their matches without success, we each took turns to ignite a stick, after the native fashion, but with no more success; the nearest approximation to it was plenty of smoke. After making many vain attempts, and having had but little sleep, we took to our blankets again, to await the coming of some of the party from below.

At about eleven o'clock on the 23d, Drs. Judd and Pickering pulled open the tent, and found us all three wrapped up in our blankets. They had passed the night at the Flag Station.

On inquiry, I found that Longley had not been seen for the last two days and nights; and fears were entertained that he had missed his way and perished.

It might, at first view, appear strange that any one could be lost on a bare mountain side, with nothing to impede the sight; but, shut out the lower country, and one would be very much at a loss in which direction to go; the surface is so much broken, and so many spots resemble each other, that even an accurate observer might soon become bewildered.

The last time Longley had been seen was by Mr. Brackenridge, who encountered him near the path, sick, and had carried him to a sheltered spot, and covered him with some of his warm clothing. Lieutenant Budd, on being informed of it, had endeavoured to persuade several natives to go in search of him; but none could be induced to do so, as they thought it impossible to find their way back in the dark.

A search was set on foot in the morning, but had continued without success.

The storm which with us had been snow, was rain at the Recruiting Station, and they were in hopes of getting from it a supply of water; but in the morning the lava-rock appeared as dry as before.

The news Dr. Judd brought was far from encouraging. Besides the disappearance of Longley, I learned that nearly all the natives had deserted the boxes; that many of them had not even reached the Recruiting Station, and that Ragsdale and his forty goats had not come; nor were there any tidings of the party from the ship. The natives hearing of our distresses, and probably exaggerating them, had refused to furnish any thing unless at exorbitant prices. The officers had very properly rejected the whole that was offered; for, although our allowance was small, we trusted that the provisions from the ship would arrive in a day or two at farthest.

I despatched a messenger to desire that the men coming from the ship should be employed first in hunting up Longley, although I entertained little hope of his being found alive, exposed as he must have been to two such severe nights and days, without food or covering from the storm.

After getting a fire lighted, and something to eat, Drs. Judd, Pickering, and myself, set out to reconnoitre the crater for a more suitable place in which to establish the tents; but, after much search, we found none that offered so many facilities as that I had accidentally chosen the first night. Dr. Pickering parted from us, and was the first to make a descent into the crater.

Nothing can exceed the devastation of the mountain: the whole area of it is one mass of lava, that has at one time been thrown out in a fluid state from its terminal crater. There is no sand or other rock; nothing but lava, on whichever side the eye is turned. To appearance it is of different ages, some of very ancient date, though as yet not decomposed, and the alternations of heat and cold, with rain and snow, seem to have united in vain for its destruction. In some places, it is quite smooth, or similar to what has already been described as the pahoihoi, or "satin stream;" again, it appears in the form of clinkers, which are seldom found in heaps, but lie extended in beds for miles in length, sometimes a mile wide, and occasionally raised from ten to twenty feet above the surface of the surrounding lava.

The place where these clinkers appear to me to have been formed is in the crater itself; there they have been broken up by contending forces, and afterwards ejected with the more fluid lava, and borne

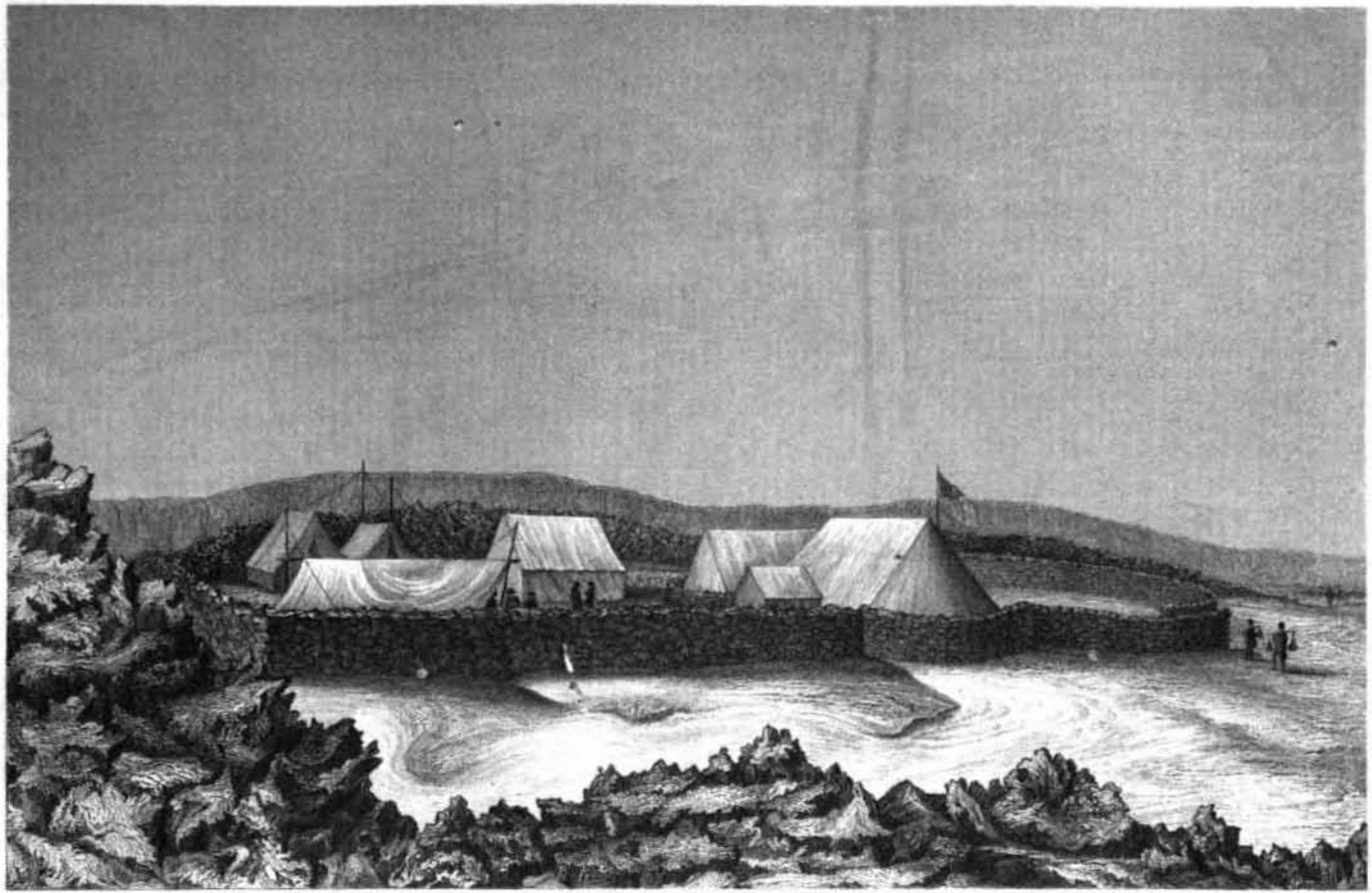
upon its surface down the mountain side, until they became arrested in their course by the accumulating weight, or stopped by the excessive friction that the mass had to overcome. In this way the beds, or rather streams, of them might have been formed, which would accumulate for miles, and continue to increase as the crater discharged this description of scoria. What strengthened my opinion in this respect was, that there were, apparently, streams of pahoihoi coming out from underneath the masses of clinkers wherever they had stopped. The crater may be likened to an immense cauldron, boiling over the rim, and discharging the molten mass and scoriæ which has floated on its top.

This day we received news of the arrival of Lieutenant Alden at the Recruiting Station, with the detachment from the ship; but he had brought no provisions, and none had yet reached the station. This arrival, therefore, instead of supplying our wants rather increased them.

The small transit was brought up this day, and, to add to my vexations, on opening it I found the level broken. I did not stop to inquire by what accident this had happened, but within ten minutes despatched an order to the ship for another, which was distant sixty miles.

We received a supply of wood from below, and sent down water in return. John Downhaul, a native, who was one of the party, desired permission to return to the ship, as, according to his own account, he was almost dead. Dr. Judd had met him with a number of natives in a cave, as he came up, the morning after the storm. It appeared, from John's account, that he had advised some of the natives to stop and take care of him in their hasty retreat, but that he had only retained them with him by threatening them with the evil spirits of the mountain. When morning came, they left him. He had been very sick, vomiting and bringing up blood, and felt unable to move any further up the mountain; but having my portfolio, he did not wish to intrust it to the care of another. Dr. Judd prescribed for him, and sent him down, with directions to proceed to Hilo. On his way down, Downhaul met one of the carriers of the provisions for the consul's party, whom he stopped and began to question; finding that he was loaded with provisions, and being quite hungry, he told him to put down the load, for he was the "tommodore's man," and must be obeyed, and accordingly helped himself without stint, inducing the native to partake also. When the man reached Mr. Brinsmade, the articles were found to be very much diminished in bulk, and on inquiry, the native at once told the whole truth, and how he had been deceived.

In the evening, at 6 P. M., the thermometer stood at 29°, and during the night it fell to 22°.



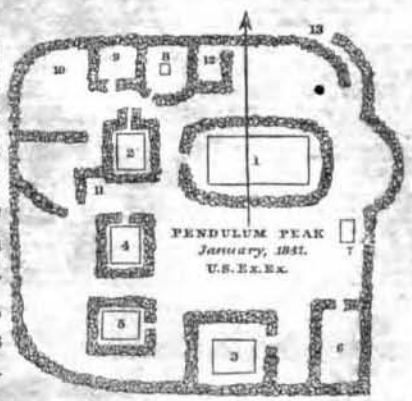
Christmas-day set in quite stormy, with snow and a gale from the southwest; it was very cold, and the only way we had of keeping warm was to wrap ourselves up with blankets and furs. We had just wood enough to heat a little chocolate.

The small instruments having arrived, I began some of the observations.

While the rest were employed in making our tents as tight as possible, in the one Dr. Judd and myself occupied, we discovered a great deposit of moisture, which, on examination, was found to be caused by steam issuing through a crack in the lava. On placing a thermometer in it, it rose to 68°. The tent was forty feet from the edge of the precipice of the crater, and it was not surprising that the steam should find its way up from the fires beneath. As it somewhat annoyed us, we pounded and filled the seam full of broken pieces of lava. This circumstance led to the discovery of a small piece of moss, the only living thing, either animal or vegetable, that was found within six miles distance, or within four thousand feet of the height of the terminal crater. This moss was here nourished by the steam that escaped, which supplied it with warmth and moisture.

This day we made many experiments on the temperature of boiling water: the mean of the observations gave the boiling temperature at 188°, being five hundred and sixty feet to each degree of temperature. At the volcano of Kilauea, I had found it less than five hundred and fifty feet to each degree; while the result of careful experiments at the Sunday Station, gave five hundred and fifty-five feet to the degree, and at the Recruiting Station, five hundred and fifty-eight feet.

We also employed ourselves in building a high stone wall around a space large enough to contain the houses and tents, when they should all arrive, having found the necessity of it to protect ourselves from the violent winds. Besides this, each tent was to be surrounded by a separate wall, up as high as the eaves, when completed. The plan was as exhibited in the annexed wood-cut.



1. Pendulum-house. 2. Captain Wilkes's tent. 3. Officers' tent. 4, 5 and 6. Men's quarters. 7. Magnetic house. 8. Observatory. 9. Store-house. 10. Wood-house. 11. Kitchen. 12. Thermometer and barometer house. 13. Entrance.

On the morning of the 26th, news was brought that Longley had been found by Messrs. Alden and Eld: when discovered, he was almost unable to speak, and quite delirious. He was carefully attended to by these officers, who were fortunately provided with the means of making him comfortable at once from their stores, a circumstance which probably saved his life. Suitable men were allotted to watch over him. He was found lying in a hole in the rock, with his hat, pea-jacket, and mittens on: his water-flask was hanging to his neck, just as he had left the encampment three days before. He complained constantly, in a low tone, that some person had driven him out of his house.

I cannot give a better idea of the state of this mountain, than the fact, that Longley, who had been missing three days and three nights, was finally found lying near the route which had been travelled over by thirty or forty men twice or three times each day, many of whom were actually in search of him.

Some of the boxes now began to make their appearance, by the aid of the sailors from the ship; but the provisions had not arrived, and the allowance was again reduced. Most of the men were reported as without shoes, having worn out those they left the ship with; and being barefooted, could not move over the sharp vitreous lava. Many of them were likewise said to be ill with the mountain-sickness. Wood was brought up, and water sent down to the lower station, in exchange.

The wind had been fresh throughout the day; but towards night it began to increase, and by eight o'clock we had another violent gale from the southwest. I do not think I ever passed such a night: it blew a perfect hurricane for several hours, causing an incessant slamming, banging, and flapping of the tents, as though hundreds of persons were beating them with clubs. These noises, added to the howling of the wind over the crater, rendered the hours of darkness truly awful.

The two other tents were blown down, but mine stood firm. The men lay under the fallen tents, and were made far more comfortable after the accident. It was impossible to stand against the gusts; and we watched all night, for no one could sleep. The thermometer fell to 17° inside the tent; and water in the bags, under my pillow, froze. About three o'clock, the wind began to moderate; and at sunrise, we found the temperature at 20°.

From the news received on the 25th, respecting the condition of the men, I determined to see them myself. Dr. Judd and I therefore set out on the morning of the 26th; and when about two miles from

the summit, we met Lieutenant Alden, Dr. Pickering, and Mr. Eld, who were coming up to see me, to report the condition of the men. The account they gave of them was any thing but cheering. On the arrival of Lieutenant Alden, I had directed that he should take an intermediate post between Lieutenant Budd's Recruiting Station and the summit crater, in order that the men belonging to one station might be able to bring up their loads and return before night. This, Lieutenant Alden informed me, he had done: his station was at the height of eleven thousand eight hundred feet.

I now saw more strongly the necessity of my going down, in order to ascertain the exact situation of things, give the men encouragement, and renew the spirit with which they had left the ship, as volunteers. I have always found that sailors are easily encouraged; and by putting a light heart and cheerful face upon the times, they quickly reassume their good spirit; and this I found to be the case in the present instance.

We parted; Lieutenant Alden, Dr. Pickering, and Mr. Eld going up to the terminal crater, while Dr. Judd and myself continued to descend for about four miles. There we found a large number of men in a temporary tent, lying on the panels of the portable houses: some of them were suffering from mountain-sickness, others vomiting; some had attacks of diarrhœa, others had not got over their forced march, and showed me their bleeding feet and shoeless condition; all were looking half-savage, with overgrown beards, dirty and ragged clothes, —so totally different from their trim and neat appearance on board ship, that I was shocked at the change produced in so short a time.

Whilst Dr. Judd administered to the sick, I spoke to those who were well, and succeeded in animating them: they all assured me they were "good pluck," and such I afterwards found them. They set about mending their shoes and making sandals; and by the next day, many were transporting small loads up the mountain side.

Poor Longley had shelter in the hollow of a rock, under a sail, carefully attended by four of his messmates. It was affecting to see these simple-hearted fellows depressed in spirits, and looking as if cast away, superintending the sick man with all the care possible, illy provided with things to make him comfortable, yet contented to wait until they could receive relief. This we promised would reach them before night.

I have always admired the care and attachment which sailors show for each other; even the most reckless are constant in their attentions to their messmates, when ill. I have never yet seen them neglect each other under these circumstances. Many instances of their disinterest-

edness and feeling that came under my observation on the mountain might be mentioned, did I not feel it would be a digression from the course of the narrative, that would not be allowable.

The only account that Longley could give me was, that being sick, he had lain down near the path, and was unable to move afterwards: he endeavoured to make signals to those he saw passing, but could attract no attention.

At about four o'clock we reached the Recruiting Station, having encountered the boxes and various articles, together with pieces of the portable house, strewed along the way. These had been left by the natives, who deserted *en masse* when those who had left me the first night came down giving exaggerated accounts of the cold, and other difficulties of the journey. I found Lieutenant Budd quite well, and only a few of the men that were with him sick: they had little or no provisions.

The difference of temperature between the altitude of fourteen thousand and nine thousand feet was very apparent: we could now enjoy sitting in the open air without feeling cold; it was as if we had passed at once from winter to spring. Although, ten days before, I had looked upon this spot as particularly barren, being destitute of vegetation and without water, yet, by comparison with the upper station which we had just left, every thing now appeared comfortable. It had been chosen, as I have said before, for a very remarkable cave, which had now become our hospital, and which was found dry, warm, and large enough to have accommodated the whole party. All the sick were immediately transported here, and placed under the superintendence of Dr. Judd and his assistants. The men here had procured a large turtle-shell from the natives, and in commemoration of their jaunt, engraved on it all their names, and nailed it to a staff which they erected at the mouth of the cave.

We passed the night with Lieutenant Budd, and although the lava floor of the tent was a rough bed, we seldom enjoyed so sound a sleep.

After arranging every thing relative to the provisions, when they should arrive, and visiting the sick with Dr. Judd, I determined to return to the top. The doctor remained for a day or two, to arrange matters with the natives at the lower station, so as to have our supplies more regularly forwarded; and also for the transportation of Longley to the ship. Taking with me James G. Clarke, a seaman, I again started for the summit, heavily laden with provisions. Longley was found better, and some of the men able to move about; and in order to prevent any accident by losing the direction, small flags were placed, as we went up, within sight of each other. We reached the observatory

at the terminal crater at four o'clock, after a hard walk of six hours. We had now three stations, viz.: the Recruiting Station, Lieutenant Alden's, and the Flag Station, under the sergeant of marines. These made it a more easy task to get the loads up, although it would require a longer time.

I found they had built some part of the wall around our encampment on the summit, and being apprehensive that we were again to have bad weather, we all joined to secure the tents more effectually against the anticipated storm.

The cold, this day, to our feelings was intense, although the temperature was not lower than 26°. All our exertions in carrying stone for the wall, and violent exercise could not keep us warm. Dr. Pickering came in, towards dark, half frozen, having made the circuit of the three craters, which had occupied him nearly all day. The stream of the last eruption, some sixty years since, was from the north crater.

The two chronometers, with the pendulum clock, and some of the pendulum apparatus, had reached the top during the day; and I was rejoiced to find, on examination and comparison with the one I had, that no difference of rate had yet taken place.

We found the experiment of enclosing the camp in with a stone wall to succeed admirably, protecting us very much from the south-west wind. The temperature during the night fell to 17°.

On the 28th the day dawned with fine weather. At sunrise the effect of refraction was very similar to that before described. I was again struck with the apparent smallness of the diameter of the sun when seen in the horizon. The day continued beautifully clear, with a very strong wind from the westward. We were employed in taking observations, and the transit was set firmly, to get the passage of the stars: a wall was also built around the observatory, to protect it from the wind.

Finding there was no longer any necessity for the Flag Station to be continued, I ordered the sergeant and party up to Pendulum Peak, and directed Lieutenant Alden to remove to the Recruiting Station, and that Lieutenant Budd should join me at the summit. This arrangement became necessary, as the men would now unavoidably be exposed to the cold, and had recruited so much that they could make the trip between the two stations during the day, with loads, sleeping at the upper or lower station. Dr. Pickering made a trip to-day into the crater on the west side, which he found no easy task. He brought back several specimens of lava. The night was clear, but very cold.

On the 29th we were busy putting up the pendulum apparatus. A short time after noon, Dr. Judd again joined us with the joyful news that the party from the ship had arrived, with sixty days' provisions

for as many men. I now felt that through our own perseverance we should succeed in obtaining our wishes, for with this supply we could remain sufficiently long to effect my object in visiting the mountain.

Dr. Pickering left us to descend the mountain, with the intention of ascending that of Mauna Kea with Mr. Brackenridge. The day was much warmer than we had felt it since reaching the summit.

The fine weather enabled us to build the wall to enclose the whole encampment, put up the houses and tents, and attend to the observations. In a note from Lieutenant Alden, he informed me that not more than half the men had shoes, and not more than that number were fit for duty, partly on that account and lameness, together with mountain-sickness. A supply of shoes, and sandals of raw hide, had been sent for, as the men had already worn out two pairs. It was exceedingly provoking to learn that there was much delay in getting these articles and the provisions from the ships; which arose, as I was informed by letter, in consequence of the refusal of the Rev. Mr. Coan to allow the natives to set out early on Sunday morning: he required the officer to state that he believed our necessities were urgent before he would consent to the natives going.

The temperature in the shade at noon was 47°; in the sun, 70°; and at night it again fell to 20°.

On the 30th we had another delightful day, and improved it to the best of our ability, by numerous observations.

The articles from below were now continually arriving. We took advantage of the fine weather to make an excursion to the northeast, for the purpose of seeing if I could effect a communication with the ship by simultaneous signals; after walking for about two hours, we found that no view down the mountain-side could be had, as the top of Mauna Loa was an extensive flattened dome, falling very gradually on its northern and eastern sides.

I therefore gave up this attempt, contenting myself with the determination of the meridian distance by three chronometers.

In returning, Dr. Judd and myself passed along the edge of the northeast crater, where we found, in a small cave that had been thrown up, a beautiful specimen of lava, the colour of the red oxide of iron. There was also some water in the cave.

At night, on our return, we had a visit from the old guide, Keaweehu, the bird-catcher, who gave us the name of the terminal crater, as Moku-a-weo-weo, and of that south of it as Pohakuohanalei. According to his statement, Moku-a-weo-weo emitted fire not long after Cook's visit, and again five years since, on the north side. When talking, the old man's face and appearance were so peculiar, that while he was in conversation with Dr. Judd, I thought it worth

while to obtain a camera lucida sketch of him, as he sat wrapped in his tapa.

KEAWEEHU.

Treble, the armourer, succeeded in mending the bar of the pendulum frame, and rendered it as good as it was originally.

The thermometer stood at noon, in the sun, at 92°; in the shade, at 55°; and at night it fell to 13°.

The 31st was another fine day, and we continued to receive provisions, wood, &c., from below, until we were well supplied. This enabled me to issue the full ration. We were also gladdened with letters from Honolulu, and news from the ship. They had experienced at Honolulu, on the nights of the 23d and 24th, a very heavy storm from the southwest, simultaneously with the one that annoyed us on the mountain. A greater degree of cold was experienced there than they had had for years. At Hilo, during this time, very light variable winds and calms prevailed.

We were employed this day in erecting the pendulum-house, over which was placed a thick hair-cloth covering, and outside of all, a No. 2 canvass tent, surrounding the whole house, and enclosing a stratum of air. On the outer side a wall was built up to the eaves of the house, and all the cords drawn tightly through it.

It was with some difficulty that any level spot was found sufficiently large to place even the pendulum-frame, and we were obliged to cut away with our axes and chisels, a portion of the lava that was uneven, until a suitable place was made.

The temperature at night was 17°; the weather clear and cold.

On the 1st of January, 1841, we were still erecting the pendulum-

houses, and building stone walls. Dr. Judd, the sergeant, and Brooks, descended into the crater: they made the descent on the east bank among large blocks of lava, and reached the bottom in about an hour. There they were surrounded by huge clinkers, and ridges running generally north and south in lines across the crater; between these was the pahoihoi, or smooth lava. They passed over these obstructions to the southwest, and found in places many salts, among which were sulphate of soda, and sulphate of lime. Four-fifths of the way across was a hill, two hundred feet high, composed of scoria and pumice, with fissures emitting sulphurous acid gas. To the west was a plain full of cracks and fissures, all emitting more or less steam and gas.

They found the west wall perpendicular: its lower strata were composed of a gray basalt. For three-fourths of the distance up, it had a dingy yellow colour. Above this, there are a number of thin layers, apparently dipping to the southwest, with the slope of the mountain.

They also visited many steam-cracks on the northeast side, from which fumes of sulphurous acid gas were emitted; no hydrogen was found in the gas, which extinguished flame without producing explosion.

Specimens of sulphate of lime, carbonate of magnesia, sulphate of ammonia, and carbonate of lime, were found in beautiful crystals by Dr. Judd, but it was found difficult to preserve any of them in a separate form, as they were all intermingled in their formation.

Half-past two o'clock having arrived, Dr. Judd began his return to the bank where he had descended, and reached it after walking an hour and a half; it required another hour to ascend. When they returned, they appeared exhausted with their day's trip: overloaded as they were with specimens, the ascent was more arduous.

This evening, at sunset, we had a beautiful appearance of the shadow of the mountain, dome-shaped, projected on the eastern sky: the colour of a light amethyst at the edges, increasing in intensity to a dark purple in the centre; it was as distinct as possible, and the vast dome seemed to rest on the distant horizon. The night was clear, with moonlight, the effect of which on the scene was beautiful: the clouds floating below us, with the horizon above them, reminded us of the icebergs and ice-fields of the Antarctic: the temperature lent its aid to the deception.

Lieutenant Budd, with a party, joined me this day, bringing with him the transit-level, from the ship. Towards evening I had another attack of mountain-sickness, with much tendency of blood to the head. My

steward was also attacked with severity, and several of the men; but, by aid of the remedies given us by Dr. Judd, the next morning found us all much relieved.

The dew-point could not be obtained with Pouillet's hygrometer (a capsule). Whenever this was the case, electricity was found to be easily excited: on moving any articles of dress from the person, it would develope itself in sparks. On examination, it was found that our pulses varied during the day, and were very easily excited. Dr. Judd's fluctuated from sixty to one hundred beats, Mr. Eld's from eighty-four to one hundred and twenty, and mine from seventy-two to one hundred and eight.

The night was favourable for observations, and we succeeded in making many. The wind was from the northeast. The thermometer at sunrise was at 20°. The sun did not rise clear, as I was in hopes it would have done, so as to afford me an opportunity of again seeing the refraction, and measuring it.

The 3d proved fine, and the pendulum-clock and apparatus being arranged and adjusted, the clock was put in motion, and a comparison made with the three chronometers every two hours.

It being Sunday, and a fine day, the men were allowed to wander about the crater; and some descended into it, bringing back many fine specimens of lava.

During our stay on the summit, we took much pleasure and interest in watching the various movements of the clouds; this day in particular [illegible] attracted our attention; the whole island beneath us was covered with a dense white mass, in the centre of which was the cloud of the volcano rising like an immense dome. All was motionless, until the hour arrived when the sea-breeze set in from the different sides of the island: a motion was then seen in the clouds at the opposite extremities, both of which seemed apparently moving towards the same centre, in undulations, until they became quite compact, and so contracted in space as to enable us to see a well-defined horizon; at the same time there was a wind from the mountain, at right angles, that was affecting the mass, and driving it asunder in the opposite direction. The play of these masses was at times in circular orbits, as they became influenced alternately by the different forces, until the whole was passing to and from the centre in every direction, assuming every variety of form, shape, and motion.

On other days clouds would approach us from the southwest, when we had a strong northeast trade-wind blowing, coming up with their cumulous front, reaching the height of about eight thousand feet,

spreading horizontally, and then dissipating. At times they would be seen lying over the island in large horizontal sheets, as white as the purest snow, with a sky above of the deepest azure blue that fancy can depict. I saw nothing in it approaching to blackness, at any time.

The light from the volcano of Kilauea was exceedingly brilliant this night. The temperature fell to 17°.

On the 4th, Lieutenant Budd began the survey of the summit of the mountain (including the four craters), by measuring bases and planting signals. On the return of the parties, they reported that an eruption had taken place on the southwest side of the mountain. This was almost too good news to be true, for to see this wonderful crater in action was scarcely to be expected. Early on the following morning, a party was sent to examine the spot designated.

Towards evening I began the pendulum observations, and found the temperature of the pendulum-house variable, for which I could not account, as the outward air seemed to be excluded, and yet it varied as though it were exposed. At daylight the thermometer had risen to 20°.

Dr. Judd returned towards evening from the southwest side of the mountain, but found no signs of an eruption; thus it turned out, as I had anticipated, a false alarm; it served, however, to give us more excitement.

Several large fissures were discovered on this jaunt, and a small crater lying south of the large one. The report of the eruption in all probability originated from the southwest clouds being illuminated by the setting sun, a phenomenon which was afterwards often observed.

This party also descended into the crater of Pohakuohanalei, into which a stream of lava had run from that of Moku-a-weo-weo. This stream looked like a cascade formed of iron, the fluid having been transfixed before it reached the bottom. The crater is of an oval shape; it is stratified, and seventy layers of basaltic rock were counted, which have evidently been deposited by the overflow of the large crater: the guides, however, from knowledge derived from their traditions, told us it was the oldest crater, though appearances led us to a contrary conclusion.

On the bottom of this crater the lava was found much pulverized. Dr. Judd, finding a place with moist and rich earth, planted two orange-seeds, which, should they take root and grow, may astonish some future visiter. On their return they passed a hillock of recent cinders, which was open at the top. On entering it, they found themselves in a beautiful cavern or hall, studded with stalactites of brown

lava, and whitened about the sides and bottom with sulphate of soda, in a state of efflorescence. A considerable quantity of this was taken up. It had been found in other places, but only in small quantities.

On the 5th, a large quantity of dry grass arrived from below, which I had sent for to thatch the house, in order to preserve a more equable temperature. This we used to stuff between the house and tent. I also laid a thick covering of the same material over the lava floor, as I thought it probable there might be some hollow tunnel or cavern beneath the house. All these precautions soon produced the desired effect by giving an equable temperature, although the outward variation still continued from 17° to 50° during the twenty-four hours.

As we were desirous of having a little fire, for the purpose of warming our fingers when calculating or writing, we took one of the calabashes, and by filling it with stones, converting it into a "brasero." This answered our purpose admirably, except that we were occasionally annoyed with smoke. Dr. Judd, not content with this rude contrivance, invented a fire-place and chimney, which he built in one corner of the tent, and which occupied all the spare room we had. We thus were enabled to enjoy the comforts of what, on the top of Mauna Loa, we called a good fire. How good it was, may be understood when it is stated, that our allowance of fuel was three sticks of wood per day; and that water froze within a couple of feet of the fire, when it was giving out the most heat.

In a former gale, one of our three barometers had been blown over, spilling the mercury, though not injuring the tube; being prepared for such accidents, I filled the tube again and took a careful comparison with the others, in the event of farther accidents.

The temperature of boiling water was again tried, and found 187°; the barometer stood at 18·384 in. No dew-point could be obtained. Electricity was developed in large sparks.

Brooks, who was employed in putting up signals around the old crater with Lieutenant Budd, brought in some fine specimens from the north crater; among them were some having almost the appearance of pure glass. He had found a small piece of fern in the rich earth of the crater, which was regarded by us all as a great curiosity.

The afternoon of the 6th, the atmosphere was heavy, causing much refraction; there was little air stirring at the time.

The 7th, we continued our observations; the temperature of the pendulum-house now continued equable at 40°.

On the 8th, we had a change to cold, raw, and disagreeable weather; snow began to fall, and a kona or southwest gale set in; the temperature fell soon to 20°.

At 10 P. M., I was unable to proceed with the pendulum observations; for such was the fury of the storm, that the journeyman-clock, with a loud beat, although within three feet of my ear, could not be heard. I was indeed apprehensive that the whole tent, house, and apparatus would be blown over and destroyed. The barometer indicated but little change. This storm continued until sunrise of the 9th, when it moderated. I have seldom experienced so strong a wind; it blew over and broke one of the barometers, although its legs had been guarded carefully by large stones; and the wind was so violent at times, that it was with difficulty we could keep our footing. We suffered the loss of three thermometers, by the frame being blown down on which they were fastened.

Towards morning, the wind having sufficiently lulled, the pendulum observations were continued.

Being desirous of obtaining the depth of the crater, we prepared a long line with a plummet; and Mr. Eld was also despatched below, to get altitude angles with a base on both sides for the elevation of the banks. He set out at ten o'clock, with the sergeant and two men, and passed down under the eastern bank,—the same route Dr. Judd had taken. He described it as so steep, as to threaten them, by a false step or the loosening of a stone, with being precipitated below. They reached the bottom in less than an hour: the plummet had been lowered, which Mr. Eld went in search of, but it had only reached about a third of the distance down, and on signal being made, it was lowered still further; but the cord soon chafed through, and the plummet, which was the top of the ship's maul, disappeared.

Mr. Eld obtained his base and the angles of elevation of the east bank, and then went over to the west side. The passage across the bottom of the crater he found much as Dr. Judd had described it; the ridges, from ten to fifty feet in height, alternating with deep chasms and smooth pahoihoi. They were two hours crossing over, and in imminent danger every moment of being killed by the falling of fragments of rocks, or of being precipitated down the fissures, that were crossed every few yards by jumping on their fragile edges, and threatening himself and men on breaking through, with one of the most horrible deaths. Some of the steam-cracks they were able to approach, but others were entirely too dangerous to admit of such proximity.

After finishing the observations, Mr. Eld directed his steps towards the bank or wall, where he had been told it was easier to pass along; but he found the path quite as rugged; and by the time they reached the place of ascent, they were all nearly unable to proceed from fatigue.

The prospect of remaining the coming night in the cold, was sufficient to spur them on to overcome the ascent. They were all completely exhausted when they reached the camp at sunset.

The banks of the crater were found, by Mr. Eld's observations, to be as follows:

West bank, ...	784 feet.
East "	470 "

On the 10th of January, we had snow again. The temperature rose to 32°: the snow melted fast, causing excessive dampness within and without, while other discomforts that may be imagined prevailed. Towards night, it cleared off, the wind hauling round to the westward. The temperature fell quickly to 16°, when for a few hours it blew a perfect hurricane. I thought the pendulum-house in great danger: it rocked to and fro, appearing at times to be lifted from the ground, and several of its staples were drawn out. Not a person in the camp could sleep until towards daylight, when the gale began to abate.

These gales reminded me strongly of those we experienced among the ice on the Antarctic cruise. I regretted I had no anemometer, to ascertain the direction, changes and force of the wind. It is remarkable that these severe gales all occurred during the night, beginning in the evening and continuing until the next morning. I attempted to ascertain the velocity of the clouds by the rate of progress of their shadow across the crater, marking the time of the passage; and the greatest velocity in many trials of those from the southwest, was about forty-seven miles an hour. It was, however, observed, in these experiments, that the swiftness of the clouds seemed to increase in passing over the apex of the cone or crater. Whether this was the effect of being able to compare their movements more nearly with fixed objects, I am not prepared to say; but I am inclined to believe that in some cases, as they touched the mountain-side, they were forced upwards and over the summit, with a much greater velocity for the first half of the crater than the last. The shortness of the time that elapsed in passing the diameter of the crater, little more than a mile, precludes the supposition that they had changed their form sufficiently to alter the figure of their shadow. The wind was blowing what would be termed a strong gale, when the experiments were made.

On the 11th, having the eprouvette mortar with me, I tried some experiments on the velocity of sound, comparing it with our measured

bases and the sides of the triangles: these gave results as satisfactory as those usually obtained below. The great difference was in the sound itself: the report of the gun producing a kind of hissing noise. The eprouvette was of iron, and was fired with a plug driven into it very tightly after it was loaded. When fired near the level of the sea, it was necessary to close the ears when standing within twenty feet of it. The sound could be heard six miles, and the report was equal to that of a large gun. But on the summit we stood close to it without any precaution whatever, and the noise it there made was more like that of a squib. Although the reports of the eprouvette were heard at the opposite side of the crater distinctly, yet the sound was a faint one; but at the Recruiting Station, then occupied by Lieutenant Alden, about eight miles distant, the sound was loud and reverberatory.

This night we finished the pendulum, and all the dip and intensity observations, except those with Gauss's needle.

The temperature at night stood at 20°.

On the 12th, I joined Lieutenant Budd in the triangulation, and for this purpose made the circuit of the crater to occupy the western stations. The day was fine, and the lava covered with about five inches of snow. Having prepared our boots with hide sandals, Dr. Judd and myself set off at an early hour towards the south, and whilst Lieutenant Budd took the north side, we passed round Pohakuohanalei. In the vicinity of that crater are many fissures, of great depth, and with a fresh appearance, as though they had been in action only the day before. The matter which had been thrown out from them appeared to be pure obsidian, of a dark and shining colour, and very brittle. Beyond it was an extensive bed or stream of pahoihoi. The small crater to the south of Pohakuohanalei, is but a small pit, in comparison with the others, and does not appear to have ever discharged lava over its edge. It is of the kind that I shall hereafter designate as a pit-crater, and will be described when I come to speak of those that are near the new eruption.

In traversing these fissures we were in great danger, and experienced much difficulty in walking on the recent stream that seemed to have flowed from them, for the snow which covered the lava concealed the new and weak places. The idea of being precipitated down a chasm of one hundred and fifty or two hundred feet deep, was by no means agreeable. Our blood was occasionally stirred by breaking through with one leg or both; and I shall not soon forget my own descent into a vapour or steam bath, which on trial was found to be 169° of tempe-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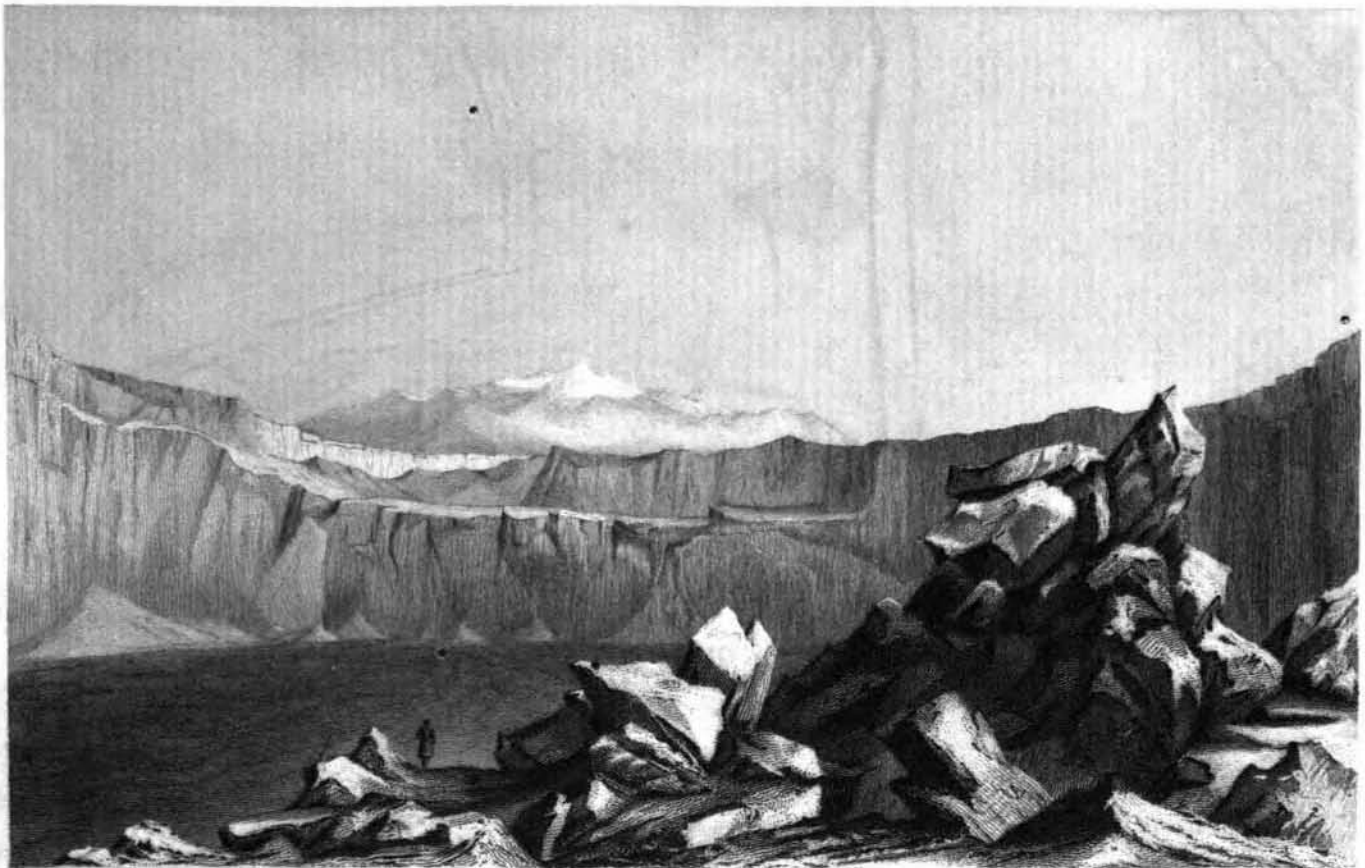


rature, although only a few moments passed before I was out of danger. The lava at the mouth of some of the chasms, appeared as though it had been thrown up and plastered on the edges in clots, which seemed of the consistency of tar or melted sealing-wax, of various colours, the most predominant a dark brown. One of these fissures we designated as the Great Steam-crack: it led from the top of the mountain a long distance down its sides, towards the south, and from it vapour was constantly issuing. On throwing a piece of lava down it, a sound was produced as if many pieces had been flung into an ordinary chasm, and the reverberation continued so long, as to lead to the belief that the mountain was rent to its very base.

Although we had scarcely accomplished one-third of the circuit, our sandals began to give way, and we were obliged to stop to mend them, in order to prevent ourselves from becoming barefoot before making the circuit and reaching the encampment. While Dr. Judd undertook the repairs, I made a sketch of the crater, looking into it from the south, with Mauna Kea in the distance, while all around us the lava was piled in huge blocks, confusedly thrown together by some mighty force.

This crater differs in several particulars from that of Kilauea. It has no black ledge, and has a great quantity of fallen debris around its walls. There is no boiling lake, although the evidences of fire, as has already been stated, are not wanting, and its outer walls are more broken down.

The glare from the snow in the strong sunlight had now become exceedingly uncomfortable to the eyes, which was felt by several who were in company with us.

About 1 P. M., we were at a station on the southwest side, from which I obtained the distance, by sound, from the observatory.

From this station we had a distant view of the hills on the coast.

After getting my observations with the theodolite, we proceeded on our way round, frequently passing numbers of large boulders of a grayish basalt, that were lying on the lava stream, and had apparently been ejected from the crater.

About two o'clock we reached the western side of the dome of Mauna Loa, which is here much more precipitous than it is on the east. On the western side there was no more than a slight sprinkling of snow, that scarcely covered the black lava. The weather was still and calm, and a deathlike stillness prevailed, which I dreaded to break, even by making a remark to my companions upon the splendour of the scene before us. The sight was surpassingly grand. In the distance, the island of Maui emerged from and broke the line of the deep-blue

horizon, while its lower side was dimmed by a whitish haze, that seemed to unite it to the island of Hawaii. The same haze enveloped the hills of Kohala on our right, and the western extremity of Hawaii. Nearer to us was Hualalai, the third great mountain of Hawaii, up whose sides a compact mass of white fleecy clouds was impelled by the sea-breeze. To our right rose in bold relief Mauna Kea, covered with its snowy mantle; and at our feet was spread out, between the three great mountains, the black plain of lava, overhung by a dusky pall of clouds. All these features were so blended into each other by the mist, as to exhibit a tone of harmony that could hardly be conceived, considering the variety of the forms, characters, and distances of the objects, and which seemed to blend earth, sea, and sky into one. I can never hope again to witness so sublime a scene, to gaze on which excited such feelings that I felt relieved when I turned from it to engage in the duties that had called me to the spot.

It was not without some nervous excitement that I placed my instrument on the highest point of Mauna Loa, within a few feet of its crater, and turned it upon Mauna Kea, to measure the difference in the height of these twin giants of the Pacific.

The very idea of standing on the summit of one of the highest peaks in the midst of this vast ocean, in close proximity to a precipice of profound depth, overhanging an immense crater "outrageous as a sea," with molten rock, would have been exciting even to a strong man; but the sensation was overpowering to one already exhausted by breathing the rarefied air, and toiling over the lava which this huge cauldron must have vomited forth in quantities sufficient to form a dome sixty miles in diameter, and nearly three miles in height.

I was still in doubt which mountain I should find the highest; for although previous measurements had given it in favour of Mauna Kea, yet I had found Mauna Loa about three hundred feet higher than it had been reported to be. Double the zenith angle was soon obtained, and decided it in favour of Mauna Kea, and subsequent calculations gave one cone of it as one hundred and ninety-three feet above the place where I stood. Although twin mountains, they are of very different character. Mauna Kea is a vast mound topped with cones, nine in number, whilst Mauna Loa is a smooth dome. On the former the frosts of winter prevail, while the latter has internal fires, and occasionally vomits forth its lava to the very point where the other begins to rise, covering its broad flanks with layers of rocks.

We had not much time to spare, and as soon as Lieutenant Budd joined me, we continued our route, in order to reach the encampment

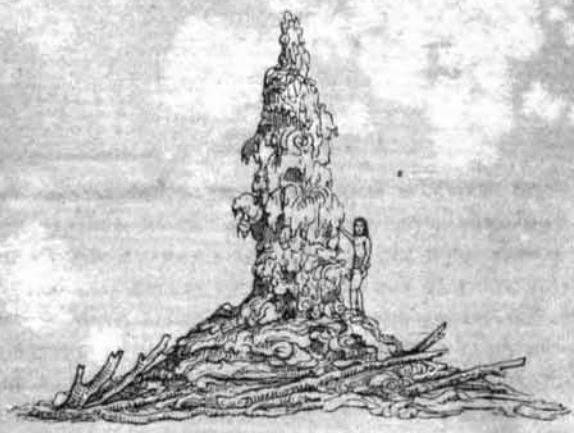
before dark, for otherwise we should be forced to pass the night among the blocks of lava. Our sandals of hide were worn through, and our shoes somewhat injured, so that it became a source of anxiety to us whether they would last long enough for us to reach our destination.

With rapid steps we passed along the north bank of the crater, descending on our hands and knees over some large blocks, where the wall had been thrown down as it were by earthquakes, filling chasms near it several hundred feet in depth. The way was difficult and dangerous, requiring the utmost caution in proceeding along the narrow edge that separated the north from the central crater; a false step, or the detaching of a small rock or stone, would have sent hundreds of the huge blocks headlong below. We passed over without accident; and blocks of stone that before I had conceived to be large, diminished to small stones, in comparison with those we were passing over by jumping from one to the other. Many of us sank down from exhaustion when we reached the opposite bank. How I accomplished the remaining two miles I am unable to say, unless it were by virtue of the stimulant that the prospect of being benighted gave me. When we arrived, the sun had set, and we were all completely exhausted.

On our return we found the village filled with half-naked natives, who had come up, lured by the fine weather, and in hopes of getting their loads to return immediately, for the following day had been originally fixed upon for breaking up our camp. It was impossible to allow them to return: the night had closed in, and it became necessary to accommodate some forty natives with lodging and comforts. Although I was worn down, this was too strong a case to go unattended to; and the only place where I could stow them was the pendulum-house. I therefore took down and packed away the clock and apparatus, and gave them the house to lodge in. With the dry grass on its floor and roof, and plenty to eat, they made themselves quite comfortable.

During the time I was thus engaged, I began to feel as if cobwebs had passed over my face and eyes, and found the same feeling prevailed with two or three of the men who had accompanied me during the day. To this feeling succeeded excessive irritation and inflammation of the eyes and eyelids, brought on by exposure to the strong glare from the snow. Dr. Judd was kind enough to make various applications, but none of these produced any effect, and I felt forcibly the horror of probable blindness; indeed I was so for the time, and notwithstanding all my fatigues, I passed a sleepless night in great pain. The night was stormy: the thermometer fell to 17°. I, how-

ever, determined to leave the station in the morning, if I had to be led down the mountain, which I thought very probable. One consolation, however, remained: my physical energies had not given way until every part of the objects of my ascent of Mauna Loa had been fully accomplished.



LAVA JET OF THE CRATER.

CHAPTER V.

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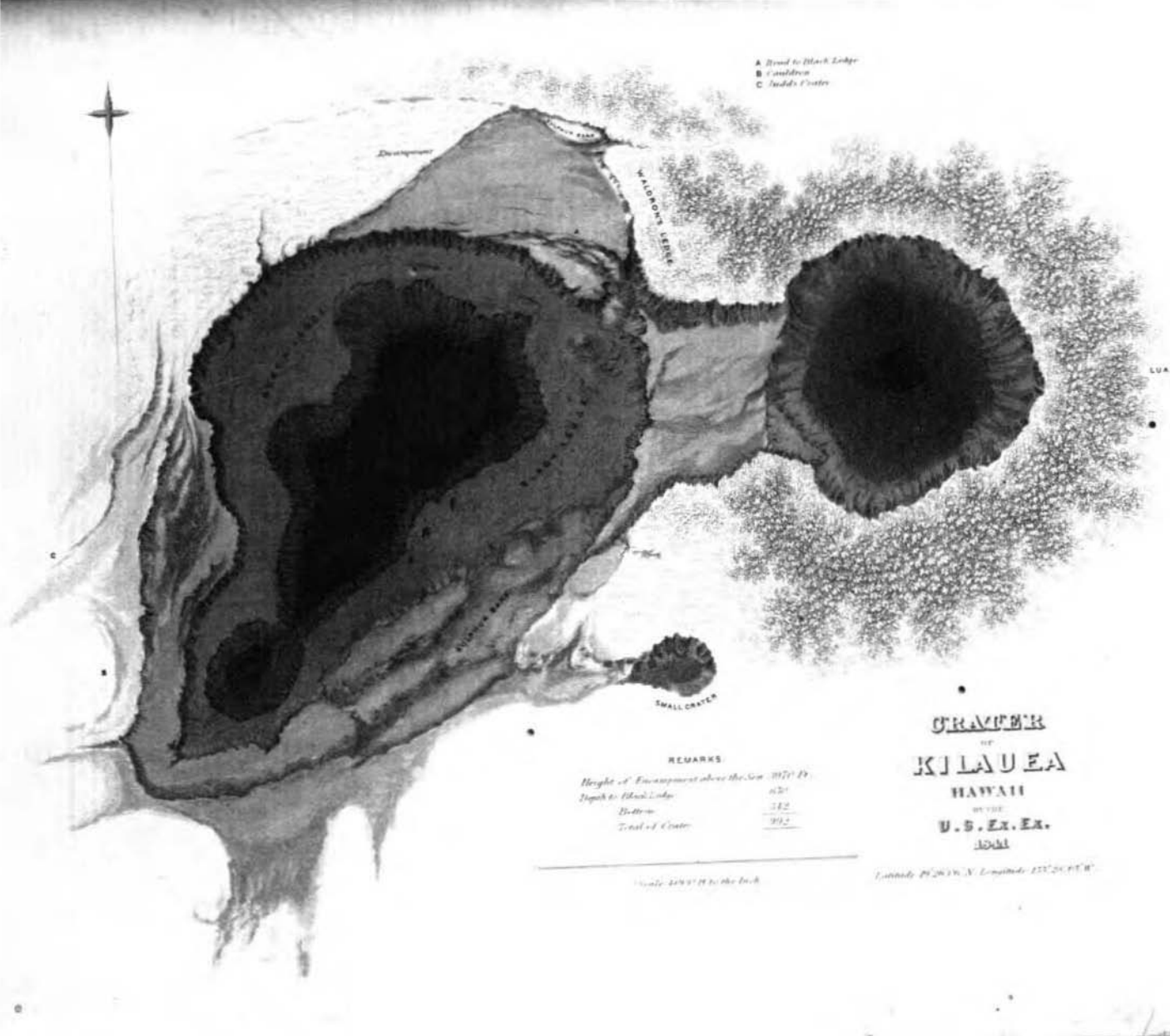
A Road to Black Ledge
B Cauldron
C Dudds Crater
WALDRON'S LEDGE
SMALL CRATER
REMARKS
Height of Encampment above the Sea 3970 Ft.
Depth to Black Ledge 820
Bottom 382
Total of Crater 990
CRATER
OF
KILAUEA
HAWAII
BY THE
U.S. Ex. Ex.
1841

CHAPTER V.

KILAUEA.

1841.

When day broke, on the 13th January, all was bustle on the summit of Mauna Loa. Every one was engaged in taking down and packing up the instruments and equipage, loaded with which the native labourers scampered off. Some of them, indeed, unable to bear the cold any longer, and hoping to obtain loads afterwards, withdrew without burdens.

At nine o'clock, Dr. Judd, myself, and six of the crew of the Vincennes, bade adieu to the walled village we had built. The men showed their delight at quitting this barren and desolate spot by three hearty cheers. It was no little gratification to me to be able to take my departure, after having successfully accomplished all the duties assigned to me here, without any serious mishap, except in the case of Longley, although all the party had been more or less sufferers from the mountain-sickness.

Dr. Judd remarked, in relation to the manner in which the natives were attacked by this disease, that the general symptoms were colic, vomiting, and diarrhœa; that one or two were affected with spitting of blood, and a few had fever and ague. A yellowness of skin, with headache and giddiness, were experienced by nearly all the party, while several were seized with asthma and rheumatism, and a few had scorbutic symptoms.

Dr. Judd always found that great hunger was felt, although the ability to eat at meals was wanting.

A variableness of the pulse during the day, which the least excitement would cause to rise, was experienced by all, the variation amounting to from thirty to forty beats.

During the whole time that we were above the height of nine thousand feet, there were only one or two days in which the electrical excitement of the atmosphere was not apparent, and those were exceedingly damp; the electroscope, in fact, was in constant action during our stay.

Previous to our departure, I had the words "Pendulum Peak, January 1841," cut in the lava within our village. J. G. Clarke, one of the seamen belonging to the Vincennes, who made these marks came to me and desired, on the part of the men, that I would allow them to add to it U. S. Ex. Ex., in order that there might be no mistake as to who had been there; to this I readily gave my consent. This was the same man who had been wounded at Malolo, and one of the best and most useful we had with us; in himself he united many employments, as a seamen, drummer, fifer, cook, and stone-cutter; knew a little of physic, sang a good sailor's song, and was withal a poet!

Lieutenant Budd and Mr. Eld were left, with a party of men, to repeat a few observations with the intensity needles, and to obtain angles for a distant position.

The wind, when we set out, blew very strong from the southwest, and flurries of snow were passing by every few minutes. In two hours we reached the Recruiting Station, where we found Lieutenant Alden and many Kanakas on their way up. After a rest of two hours, and obtaining new shoes, we went on and reached the Sunday Station at five o'clock, scarcely able to drag one foot after the other. Here we were soon enveloped in mist, and found the soft and delightful temperature of spring. I cannot venture to describe the effect this produced on us after our three weeks' sojourn on the cold, bleak, and barren summit. I felt for the first time in my life fairly broken down, and almost past the soothing effects of the loomi-loomi, which the natives at once offered as a relief to me: it may be called a lesser shampooing, and consists, as practised in the Sandwich Islands, of a gentle kneading of the limbs, which has a great tendency to restore the circulation, and relax the muscles and joints. The natives use it for rheumatism, headache, and all kinds of pains. It requires some skill to do it well, and there is the greatest difference in the performance between persons who are practised in it and those who are not. The chiefs generally have two persons employed at the same time. We soon had a good fire made before our Hawaiian hut; its warmth, together with an excellent supper, made us comfortable, and we were soon asleep on the dried grass.

The next morning, when I awoke, all nature seemed to be alive: the

songs of the birds, the cheerful voices of the natives, were delightful; the green foliage gave every thing an air of spring. We were so stiff as scarcely to be able to move, which was all that now remained to remind us of the scenes we had left, and the fatigues we had undergone. When we again set off, it was amusing to see the whole party moving along with their stiff and aching limbs, trying to appear but little fatigued. At twelve o'clock we reached the station where he had abandoned our chairs, and I never was more relieved than when I reached mine, for I was quite unable to walk any further. Here, also, we were met by the natives with fruit; indeed, every step we took seemed to be restoring us to the comforts of life. Late in the afternoon of the 14th we reached the crater of Kilauea, after an absence of twenty-eight days, eight of which had been consumed in travelling, six in going up and two in returning from the summit.

The dome of Mauna Loa looked full as beautiful to the eye as it did on our way up, but the experience we had had of its surface, and the difficulties we had encountered, were not so soon to be forgotten, and arrayed it in different colours to the mind. On passing down the last strip of Mauna Loa, we came to a spot which had apparently been a crater of large size. What we supposed to have been the bottom of it, is considerably below the extensive plain which surrounds Kilauea, and between them is a broad and deep fissure, running in a northeast direction, towards the sulphur-bank on the north side of the volcano of Kilauea, which terminates in a precipice from fifty to two hundred feet in depth, showing that the whole plain around Kilauea must have sunk at some remote period.

Wishing to be more protected from the cold wind that draws from Mauna Kea (on the north), we passed over to what I have called Waldron's Ledge (after Purser Waldron of the Vincennes), which is the usual and by far the most commodious point to encamp at, besides offering one of the most beautiful views of the volcano.

The day on which we left Lieutenant Budd and Mr. Eld at the crater, proved very stormy, and the night one of the severest they had experienced, being extremely cold, and the wind approaching a hurricane. The wind, according to these officers, came howling over the crater, and when the blast struck their tent, it resembled the discharge of light artillery, making the canvass quiver as if it would be rent in ten thousand shreds. After each blast a deathlike stillness followed, which served to make the roar of the succeeding one more awful. One of the tents belonging to the men was blown down, but they remained under it, as on a former occasion. In the morning, it was found that many of the panels of the pendulum-house had been hurled

several hundred feet, and some of them even broken into splinters. It blew so heavily throughout the day, that these officers were unable to accomplish the remaining duties.

The 15th proved a delightful day, and they succeeded at an early hour, in accomplishing the work which remained. Sixty or seventy Kanakas made their appearance, who were despatched with the remaining articles. They recollected the clock-case, which had given Mr. Eld so much trouble in ascending, but he now took measures to secure its going in advance, by sending it off first, borne by eight men. Some of these, however, absconded the moment they got out of his sight. It was at last placed under the special care of a chief, and gave Mr. Eld no farther trouble.

Previous to leaving the crater, Lieutenant Budd stationed a man at the flag-staff; three cheers were then given, and the flag hauled down. The walls were left standing, resembling those of a small fortress. There was not one of the party but felt a great satisfaction in leaving this dreary spot, where they had all suffered much from fatigue, cold, and hunger.

When about departing, these officers observed a Kanaka who, from his taking a wrong direction, appeared to be somewhat bewildered; but on being called, he gladly took the last remaining load, consisting of some camp equipage and mess utensils, with some provisions. They then left the summit and descended as far as the Recruiting Station, where they stayed over-night. By nightfall, all the articles, including the heavy clock-case, had arrived, but no one had noticed the Kanaka with the calabashes, or thought of him, except to suppose that he would come down in due season, or had actually gone on. Nothing, however, was ever heard of this man; and although diligent search was made for him for some days after by the natives, yet it resulted in no trace of him, or of any thing that could lead to a knowledge of his actual fate. It is supposed that he must have lost the track, and probably suffered a lingering death. With the exception of the misfortune of poor Longley, this was the only serious accident that occurred during our whole trip. Langley is a confirmed invalid, and as such has been allowed a pension by the government.

This party reached the volcano on the 17th. I had by that time spent a few days in making a survey of it, obtaining specimens, and examining its whole interior. On the day after our arrival, although we were not able to make much exertion, we visited the north sulphur-banks, and on passing to them by the plain, we found great quantities of a species of whortleberry, called by the natives ohelas, of an agreeable sweetish taste, and as large as cranberries.

The sulphur-bank is about one hundred and fifty yards in length by about forty wide, and is separated from the perpendicular basaltic rocks that bound the plain, by a chasm from which steam issues in quantities. By descending into it as far as the heat would permit, we obtained some beautiful crystallized masses of sulphur, which we found in small cavities. In some parts of the chasm, the temperature was at the boiling point. The bank seemed to be formed by the decomposition of the rock, through the agency of heat and water. Without the chasm, the bank was formed of an unctuous, red and blue clay, or rather marl, so nearly allied to a pigment, that I understood it had been used as a wash or paint by the missionaries. The steam from below seemed to be penetrating and saturating the whole bank. We returned to our encampment well laden with specimens.

During the day I had signals put up on the points surrounding the crater, and made every preparation for surveying it the next day. Dr. Judd volunteered to go down into the crater, with a party of natives, to endeavour to obtain some gases with the apparatus we had brought from the ship, (which we disinterred here,) and at the same time to procure some liquid lava, by dipping it up from the boiling cauldron. For this purpose we thought of many contrivances, but at last fixed upon one of the frying-pans, as the article best calculated to effect the object when lashed to a long pole.

On the 16th, Dr. Judd and I set out on our several tasks. The various instruments with which we were provided caused us much amusement; but I was somewhat uneasy and doubtful relative to his descent and prospect of obtaining the objects of his search, for I knew the state of the crater; but the doctor, always enthusiastic, parted from me in high spirits, with his party of natives, after receiving many cautions not to be too venturesome. I waited to see him pass over the edge of the bank, and then went to my work of triangulation.

The wind was strong from the northeast, and though clear, the weather was unpleasant. After measuring my base, I visited all the stations around the crater in their turn. The banks, like those on the south side, are formed of sand and pumice, of which the former is most abundant, and occurs in strata, of from six to eight inches in depth. On the southwest side of the crater we did not find the gases so perceptible or suffocating as I had been led to expect from the natives' account, who urged numerous objections in order to prevent my going there, for they imagined that they would have a difficult journey. They told many stories of persons falling through the sand: this I could not understand until one of my men suddenly sunk in up to his middle, which at once caused us to make a halt,

and examine the ground. The cause of this accident I found to be, that the sand and pumice had accumulated in the Great Steam-crack, that leads off in the direction of Papapala (nearly south), and had filled it almost to a level with the rest of the surface. It may easily be conceived how this could be done by these materials, possessing as they do somewhat of an adhesive quality, resulting partly from their glassy points and fibres. In treading on these places, the person immediately falls down, which prevents him from sinking farther. Such was the terror that came over him, that he crawled with great rapidity to a place where he could find a point of safety or firmer ground, to rise upon. The natives, in passing over these sands, were always desirous of feeling their way with a stick.

What is the most remarkable circumstance about this volcano is, that a short distance from it there is no appearance of such a phenomenon being near, and one cannot help expressing much astonishment on approaching the edge, to see it so close at hand. From every part of the bank, it is a wonderful sight; but the view from the northern side to me was the finest, as the whole of this mighty laboratory of nature is there embraced in one view. The oldest native traditions record it to have been in constant operation.

On the southeast side there are some loose blocks of lava, that have somewhat the appearance of having been ejected, but they are few in number. Stones were more numerous on this side, although they would not perhaps warrant the opinion that there has been an eruption of stones. There is but little doubt that the sand is thrown out at times in considerable quantities, and scattered around. This is the only way in which the plain surrounding the crater could be covered as it has been.

On my route I passed a third crater, the name of which I could not learn: the natives who were with me seemed to know little about it. There were several cones of coloured scoria, particularly a red one of large size within it. The dimensions of this crater were found to be three thousand feet in diameter, and about three hundred feet in depth. Finding that I had no time to spare, I was obliged to forego the idea of descending into it.

There is a tradition which relates that a whole army was once buried by the sand and ashes, while they were marching by, and that the shower was so great as to produce almost total darkness. This sand, I would here remark, bears a strong resemblance to that of the sand-hills caused by the late eruption at Nanavalie, which will be hereafter spoken of.

During the month that intervened between our visits, the black ledge

had undergone some change. This was ascertained by a comparison of the outlines of the lower pit, bounded by the ledge, on the two occasions. A large projecting point on the east side of the black ledge had disappeared. The lakes of fire continued nearly the same, though the small one in the larger area seemed less active.

At about three o'clock, when I had reached the eastern edge of Lua Pele, all the party who were with me remarked a large column of smoke rising from that crater, and we, in consequence, ran towards the bank; but the sulphur-banks concealed the bottom of the crater and black ledge from our view. It immediately occurred to me, that an outbreak had taken place, by which the whole bottom of the lower crater would be overflowed, and that my friend, Dr. Judd, would find himself in a dangerous position, as he must at the time be near it. Not being able to reach any place where we could relieve our apprehensions, we were forced to continue our route, and shortly after descended to what is known as Lord Byron's Ledge, which lies between the two craters, Lua Pele (Pele's Pit) and Kilauea. The position of the hut occupied by Lord Byron is close to the brink of Kilauea. I noticed this place as proving that a recent eruption has taken place on the ledge. A flow of igneous matter has evidently run into both craters, and has covered the ledge with large sheets of lava. These are here and there broken through, forming a kind of funnel or bridge, from beneath which the lava has flowed, leaving the soil in places uninjured. Numbers of ferns, having a luxuriant growth, were found under these immense slabs. In examining the edge of the bank, I became satisfied of the correctness of the above opinion, as the flow over the ledge seems to have come from beneath, and to have coursed down the sides, either in broad ribands, or in streams like large cables, coiling themselves in confused layers on the black ledge. The flow into the pit seemed to be less fluid, as it did not reach the bottom, and flowed in one broad stream. Passing on, we reached the bluff bounding Waldron's Ledge, which is the highest part around the crater: it is bold and projecting, and in some places the path leads close under it, among large blocks that have fallen from it, either by the shaking of earthquakes or decomposition by time.

The annexed plate is taken from a camera lucida sketch, by Mr. Drayton; and gives an idea of the stratification of the walls around the crater.

When we ascended the bank, it became evident that the eruption had taken place at the small crater: this gave rise to much uneasiness respecting the party that had gone down. I searched with my glass in every part of the crater, but saw no one, although I was convinced

that they could not have proceeded up before us. When I returned to the encampment, Dr. Judd was not to be found there, and nothing had been heard of him.

I therefore felt great relief, when in about a quarter of an hour I saw the party returning. On greeting Dr. Judd, I received from him the following account.

After he left me, he proceeded with the natives down the ravine into the crater; thence along the black ledge to its western part, where he descended by the same toilsome path that had been followed a month before. After reaching the bottom, he found a convenient steam-hole, whence a strong sulphureous gas issued; and he then arranged the apparatus for collecting it. This was found to answer the purpose, and was readily and completely absorbed by water. The gas was then collected in a phial containing red-cabbage water turned blue by lime, when it became intensely red.

Dr. Judd then sought for a place where he might dip up some of the recent and yet fluid lava, but found none sufficiently liquid for the purpose. Failing here, he proceeded towards the great fiery lake at the southern extremity of the crater. He found that the ascent towards this was rapid, because the successive flowings of the lava had formed crusts, which lapped over each other. This rock was so dark in colour, as to be almost black, and so hot as to act upon spittle just as iron, heated nearly to redness, would have done. On breaking through the outer crust, which was two or three inches thick, the mass beneath, although solid, was of a cherry-red. The pole with which the crust was pierced, took fire as it was withdrawn. It was evidently impossible to approach any nearer in this direction; for although the heat might not be so intense as to prevent walking on the crust, yet the crust itself might be too weak to bear the weight, and to break through would have been to meet a death of the most appalling kind. Dr. Judd, therefore, turned towards the west bank, on which he mounted to a higher level over stones too hot to be touched, but from which his feet were defended by stout woollen stockings and sandals of hide, worn over his shoes. When he had proceeded as far as he could in this direction, he saw at the distance of about thirty feet from him, a stream of lava running down the declivity over which he and his companions had ascended. Even this distance was too great to be reached over, and the intervening rocks had become so heated by the continual stream, that they could not be traversed.

At this time, they were very near the great lake, but could not see its surface, which was still about twenty feet higher than the spot where they stood. Jets of lava were, however, observed rising about

twenty-five feet, and falling back again into the lake. Dr. Judd now despaired of gratifying his own wishes and mine, by obtaining lava in the liquid state, and ordered a retreat.

On his return, the party passed the small crater which has been spoken of; and which, by comparison with the larger one, appeared cool. Smoke and a little igneous matter were issuing from a small cone in its centre; but with this exception, a crust of solid lava covered the bottom.

On the sides of this crater, Dr. Judd saw some fine specimens of capillary glass, "Pele's hair," which he was anxious to obtain for our collection. He, therefore, by the aid of the hand of one of the natives, descended, and began to collect specimens. When fairly down, he was in danger of falling, in consequence of the narrowness of the footing; but in spite of this difficulty, his anxiety to select the best specimens enticed him onwards. While thus advancing, he saw and heard a slight movement in the lava about fifty feet from him, which was twice repeated, and curiosity led him to turn to approach the place where the motion occurred. In an instant, the crust was broken asunder by a terrific heave, and a jet of molten lava, full fifteen feet in diameter, rose to the height of about forty-five feet, with a most appalling noise. He instantly turned for the purpose of escaping; but found that he was now under a projecting ledge, which opposed his ascent, and that the place where he had descended was some feet distant. The heat was already too great to permit him to turn his face towards it, and was every moment increasing; while the violence of the throes, which shook the rock beneath his feet, augmented. Although he considered his life as lost, he did not omit the means for preserving it; but offering a mental prayer for the Divine aid, he strove, although in vain, to scale the projecting rock. While thus engaged, he called in English upon his native attendants for aid; and looking upwards, saw the friendly hand of Kalumo,—who on this fearful occasion had not abandoned his spiritual guide and friend,—extended towards him. Ere he could grasp it, the fiery jet again rose above their heads, and Kalumo shrunk back, scorched and terrified, until excited by a second appeal, he again stretched forth his hand, and seizing Dr. Judd's with a giant's grasp, their joint efforts placed him on the ledge. Another moment, and all aid would have been unavailing to save Dr. Judd from perishing in the fiery deluge.

In looking for the natives, they were seen some hundreds of yards distant, running as fast as their legs could carry them. On his calling to them, however, they returned, and brought the frying-pan and pole. By this time, about ten or fifteen minutes had elapsed; the crater was

full of lava, running over at the lower or northern side, when Dr. Judd was enabled to dip up a pan of it; it was, however, too cold to take an impression, and had a crust on its top. On a second trial he was successful, and while it was red hot, he endeavoured to stamp it with a navy button, but the whole sunk by its own weight, being composed of a frothy lava, and became suddenly cold, leaving only the mark of the general shape of the button, without any distinct impression. The cake he thus obtained, (for it resembled precisely a charred pound-cake,) was added to our collections, and is now in the hall where they are deposited. This lake I have designated as Judd's Lake, and believe that few will dispute his being entitled to the honour of having it called after him. Dr. Judd now found that he had no time to lose, for the lava was flowing so rapidly to the north, that their retreat might be cut off, and the whole party be destroyed. They therefore at once took leave of the spot, and only effected their escape by running. When the danger was past, Dr. Judd began to feel some smarting at his wrists and elbows, and perceived that his shirt was a little scorched. By the time he reached the tents, and we had examined him, he was found to be severely burned on each wrist, in spots of the size of a dollar, and also on his elbows, and wherever his shirt had touched his skin. Kalumo's whole face was one blister, particularly that side which had been most exposed to the fire.

The crater had been previously measured by Dr. Judd, and was found to be thirty-eight feet deep by two hundred feet in diameter. The rapidity of its filling (in twelve minutes) will give some idea of the quantity of the fluid mass.

Towards evening, although very much fatigued, we walked down to the edge of the bank, to have a view of the eruption that was flowing from this small lake; and although I had thought it impossible that the appearance the great burning lake presented on my first visit could be exceeded, yet this far surpassed it. The most brilliant pyrotechnics would have faded before what we now saw. A better idea of the light given out by this volcano, will be obtained by the fact that it sometimes produces rainbows in the passing rain-clouds, one of which was seen by Mr. Drayton. The whole bottom of the crater north of Judd's Lake, upwards of a mile and a half in length and half a mile in width, was covered with fluid lava, running in streams, as though it had been water. These here and there divided, and then joined again, tumbling in rapids and falls over the different ledges. The streams were of a glowing cherry-red colour, illuminating the whole crater around; the large lake beyond seemed swelling and becoming more vivid, so that we expected every moment to see an overflow from it of greater gran-

deur. We sat watching the progress of both for many hours under great excitement, and saw the formation of pools of the igneous liquid, one after the other, until accumulating they overflowed the banks, and rushed on to fill some cavities beyond. We could not but feel ourselves identified with this spectacle, by the occurrences of the day, and in particular by the fortunate escape of our companion; and we sat speculating on the horrible situation of one cut off from escape by these red-hot streams. The sight was magnificent, and worth a voyage round the world to witness. It was with regret that I returned to our tent, determining in my own mind to have a nearer view of this overflow, in the morning.

We arose early, and our attention was immediately called to the crater. The large lake had sunk out of sight from our position, while the smaller one was seen to be still overflowing its banks, thus proving satisfactorily that their fires have no connexion with each other. Upon the whole I was glad to see this state of things, as it would afford me an opportunity of getting near the large lake, to obtain an accurate measurement of it.

At an early hour I started with a party, consisting of Lieutenant Budd, who had joined me on his descent from the mountain, and several men. We descended by the usual path, and on reaching the black ledge, we made measurements of its width, and took some angles to ascertain the height of its banks. Lieutenant Budd then, with some of the men, was ordered to descend to the bottom of the crater, and get similar observations for the altitude of the black ledge above the bottom, after which to ascend to the black ledge, and proceed by the west side towards its southern end.

The result of these observations gave six hundred and fifty feet for the height of the bank above the black ledge, and the latter was found to be three hundred and forty-two feet above the bottom: thus the total depth of the crater was nine hundred and ninety-two feet.

With some of the men I proceeded towards the great sulphur-bank, on the east side, fixing my positions as I went along, by observing on the signals which I had used the day before. When we arrived opposite to Judd's Lake, we went to the edge of the black ledge, where, in looking over, the heated air that arose might be said to be almost scorching. The whole area below was filled with fluid which appeared of a red heat, and still flowed to the north. Its surface was level, when compared with what Dr. Judd had found it the day before. Near this place were several holes in the black ledge, about two hundred feet in diameter, where it had caved in, exhibiting large

chambers of great depth. Beyond these holes were innumerable cracks, increasing as we approached the southern end, to which I was hastening, because I had concluded to finish this part of the work before we became exhausted. In passing over these cracks, it became necessary to put the hand over the mouth to avoid the heated blast, which, as we proceeded, became more stifling with fumes of sulphur.

We at last reached the extreme end, where we measured our line, and took the angles as quickly as possible. The lake proved, from my measurement, to be fifteen hundred feet in length, by one thousand in width, and I found that it had sunk about one hundred feet during the last night, supposing Dr. Judd's estimate of its being twenty feet below its edge to be correct. It now appeared to be but little agitated, and the rocks on its side were left as if spattered with pitch, probably by the same kind of lava as that we had observed on the top of the mountain.

Just as I had completed the measurement, the sergeant gave me notice that he had perceived a movement in the bank, upon which I ordered a hasty retreat. One of the men who was before stumbled in his hurry, and fell, disappearing from our sight; we instantly stopped, and my heart rose to my throat. I could scarcely believe my eyes when I saw him rise again from the crust of lava, through which he had fallen into a chasm.

As we approached the sulphur-banks, there was much more heat and many more signs of action near it; the sulphur-bank was seen to be constantly in action, if I may so express it, similar to the slaking of lime. Numerous specimens of sulphur were obtained here, and one of a sulphate of copper of a fine blue colour. These crystals of sulphur were by no means so beautiful as we had found them at the northern bank.

In several of the caverns were stalactites in the form of a long cone, of a black colour, from eighteen inches to two feet in length, and an inch in diameter at the base: these were found to be solid, and of a silicious matter.

To stand on the black ledge and look around on the desolation which appears on every side, produces a feeling similar to those with which the scene of some dreadful conflagration would be viewed. The same description of sadness is felt that such a prospect would create, while there is in addition a feeling of insecurity, arising from the fires that are raging around, and are known to exist underneath.

Although the black ledge has the appearance of being level when seen from the top of the wall, it is not found to be so. It varies in

width from six hundred to two thousand feet, and has been overrun in various directions by streams of lava, varying in size from that of a serpent to an immense trunk or tunnel, which, after spreading, pass down into some chasm and are lost. The view around has nothing earthly in it; one cannot comprehend how rock can be thus fused without the agency of fuel. Our notions of the solidity of stone must here undergo a total change; and there appeared nothing belonging to this world at hand with which to form a comparison.

Our party seemed absolutely lost in this immense pit. It takes some time before the eye can embrace the whole, or become in any way accustomed to the scene around; and I therefore ceased to wonder at the discrepancies in the descriptions I had heard of it. From this cause, and the want of any accurate drawings by preceding visiters, I was unable to arrive at any distinct knowledge of the changes it has undergone; but I hope that our observations and survey will prevent this from being the case hereafter.

The varieties of lava that are met with are not the least striking part of this phenomenon. The description which appears to predominate is of a dark hue, and metallic lustre; it lies in a layer a foot thick, and is quite solid: the others are less dense, more vesicular, and vitreous. Each separate flow seems to differ from the succeeding one, and can be easily recognised. It afforded us some amusement to trace the extent and character of the several beds. That which was ignited during our stay was in many parts so vitreous as to be almost obsidian. Pumice is generally found in small lumps on the plain above; but I do not now remember, nor does my note-book make any mention, that pumice had been seen in the crater.

As the layers or strata of basalt increase in thickness, they become more compact. The absence of clinkers and of any flow of lava on the plain, prove conclusively that Kilauea has never overflowed its banks.

The crevice to the south extends for a great distance, and may be traced by the steam issuing from it; it is not, however, to be considered as continuous, for the cracks are of different lengths, and sometimes overlap each other, and again are intermitted for hundreds of yards. Large quantities of Pele's hair was seen covering the plain.

In order to show how difficult it is to fix upon the recollection the actual state of the crater, and the position of things around, I may state, that one of our gentlemen insisted upon it that the large "blowing cone," near the north side of the black ledge, had been thrown up since our first visit, although it was then, as it continued to be, one of the most conspicuous objects in the crater, and likely to attract particular notice. It was difficult to convince him that it had been there

during his first visit, until I showed him a camera lucida sketch that I had taken of the crater, in which it appeared conspicuous in the foreground.

Our track from the sulphur-banks was directly to the place of ascent. Laden with specimens, we returned, quite worn out, to our encampment before sunset. Lieutenant Budd, who had not succeeded in reaching the end of the black ledge, returned shortly after us. On his side, the air was too hot and stifling to permit this object to be accomplished; and, although I was watching for him with my spyglass, I could see nothing of him after we parted.

In doing this, I perceived a curious effect of refraction, produced by looking over the lakes, when the line of sight passed through the heated columns of air as they arose from the fluid below. The opposite bank seemed at times in motion, dancing up and down, as the breakers on the sea-shore are sometimes seen to do. The stratification of the rocks seemed to be twisting and dancing up and down also.

After being at this volcano four days, I was as little disposed to leave it as at first; it is one of those places that grow in interest, and excite all the energies both of body and mind: the one to undergo the necessary fatigue, and the other to comprehend the various phenomena.

The discharge from the large lake during the night of the 17th, must have been equal to fifteen million cubic feet of melted rock; this, undoubtedly, found cavities to receive it on the lire of the eruption. It is impossible to calculate the discharge from the smaller, or Judd's Lake, but supposing it had continued as rapid as it was at the first filling, it would have thrown out, by the time I was there next day, upwards of two hundred million cubic feet of lava. It will readily be perceived, that with such a flood, it would be possible, within the lapse of a period comparatively short, geologically speaking, for a mound the size of Mauna Loa to be heaped up. However large the above numbers may seem to be, we have reason to suppose, from appearances, that the "boiling up" and overflow of the terminal crater of Mauna Loa must have been far greater, so much so indeed that the outpourings of Kilauea cannot bear a comparison with it. Its whole height, of more than six thousand feet above the plain of lava, appears, as I have before noticed, to be entirely owing to the accumulation of ejected matter.

All the parties having arrived, I despatched them to Hilo, with the exception of Lieutenant Alden, who was ordered to pass by the cone of Tulani, an old crater on the north flank of Mauna Loa, in order to

get a set of angles, to connect our stations at the volcano immediately with the ship at Hilo.

Previous to our departure this morning, we missed two small brass disks belonging to one of the instruments. I mention this as the only theft that had hitherto occurred, notwithstanding our instruments were necessarily much exposed, and a large number of natives always around us. Diligent search and inquiry were made for them, but without success.

As the parties were about setting out, Mr. Eld desired to descend into the crater, to satisfy his curiosity. He was also instructed to obtain the measurement, as I was desirous of proving my own as well as Lieutenant Budd's observations.

The measurements coincided within a few feet of each other.

Dr. Judd and myself took up our march about noon, in order to follow the line of pit-craters and the late eruption of lava on the east. Our company, on this route, consisted of about forty, including Dr. Judd, the servants, six seamen, and the Kanakas who were employed as bearers and carriers of the baggage, tents, &c. One half of these were well loaded with poe, as it generally requires one man to carry food for two, and without taking one's own supplies, it would be impossible to think of travelling in this country.

We were extremely fortunate in our Kanakas, who were a body of fine young men, that had come up from Kapoho, the southeast point of the island, with provisions for sale, when Dr. Judd engaged them to become our carriers. This was opportune, as they were all well acquainted with the road we were about to travel.

The first object we passed on our route, was Lua Pele, (the Pit of Pele,) to which the road approached within a few rods. We had a beautiful view of this crater, which is circular and nearly filled up with trees, with the exception of the bottom, where a patch of black lava was seen. The variety of the green tints of these trees produced a singular effect. This crater has long been in a state of rest, and seems to have been very different from the great crater of Kilauea, both in its mode of action and the character of its lava.

A little beyond Lua Pele we passed a deep crevice, about four feet wide: this runs towards a rise in the plain, of about sixty to eighty feet, which extends in a southerly direction, and is, apparently, the boundary of the crater-plain on the east side. This crevice is somewhat similar to that which I remarked on the western side, and so far as could be judged by the eye, seemed to be inclined towards the great crater.

We continued our route towards the southeast, over a plain partly covered with sand, and at the distance of two miles passed the pit-crater of Kalanokamo: this is the fourth from the crater of Kilauea in a southeast direction.

By the term "pit-crater," is meant that description of crater of which there is no appearance whatever until one is close upon it, and which never throws out lava. The formation of these might be occasioned by the undermining of the part beneath them. It will be seen, on viewing the map, that some of them have only a small part of their bottom covered with lava. The most probable conjecture, in relation to their origin, that occurred to us while moving over the ground was, that a stream of lava had passed underneath, and running off had left large cavities, into which the superincumbent rock above, not having support, had fallen, and when this had sunk sufficiently low, the lava had flowed in and filled the bottom. Some of these pit-craters are from eight hundred to one thousand feet deep, but none that I saw had the appearance of eruption within themselves.

There is another description of craters, which may be called cone-craters. These are hills of scoria and ashes, formed by the ejection of masses, which appear to be of the same description of lava as the clinkers of Mauna Loa, though they more nearly resemble the dregs from a furnace.

The first cone-crater we met with was about a mile beyond Kalauohana, and is called Puukehulu. This I ascended, and measured its height, which was eight hundred feet above the plain: it was nearly a perfect cone, both within and without, and covered with trees both outside and in. The ashes were in some places so light and dry, that I sank in them up to my knees. From the top of this cone I had a fine view of the surrounding country, and was enabled to see all the pit and cone-craters. There were eight pit-craters in sight: four between us and Kilauea, one at the foot of Puukehulu, and three more, further off, to the east-southeast: two cone-craters lay to the east of us. The steam was rising from the crevices along the line of the last eruption.

From this situation, angles were obtained on them all, and connected with the stations around Kilauea. Mr. Drayton, who had been over the route, sent me a map which he had constructed from his own observations, on which I was enabled at once to mark out my own position accurately.

The map of the southeast portion of Hawaii was constructed from the combined observations of Mr. Drayton and myself, with the addition of some cracks and eruptions from Dr. Pickering's notes. The country

to the southeast appears well covered with woods, while to the south it is bare and barren. The map, however, will give a better idea of it than can be derived from any description.

Nearly at the foot of Puukehulu, is the pit-crater of Alealea-iki, which has had a flow of lava into it: it is about five hundred feet in depth, and of an elliptical shape.

We continued our route towards Panau, passing over a rough lava country, on which was a young growth of sandalwood and okea trees. Before reaching Panau we found ourselves in a luxuriant growth of Cape gooseberries (Physalis Peruviana), which we found quite refreshing after our walk. The natives do not make any use of them, and seemed somewhat surprised to see us eat them.

At Panau we found a large clearing in the woods, and a village, consisting of three or four native houses. Here many canoes are built and transported to the sea, the trees in the vicinity being large and well adapted to this purpose. I was told that they met with a ready sale.

Dr. Judd, who had been somewhat unwell since his escape, was now seized with fever; and soon after the tent was pitched, went to bed, as he felt that he required rest. The burns he had received on his wrists had become very much inflamed; he, however, found himself much better the next day, and we concluded to proceed. Panau is two thousand six hundred and seventy-six feet above the sea, and was found by observations to be ten miles southeast of Kilauea.

In the morning, previous to starting, the men reported to me that their frying-pan had been stolen during the night. I therefore ordered immediate search and inquiry to be made for it. Great alarm in consequence was excited among the natives who attended us; so much indeed, that I ordered the men to desist, conceiving it very probable that one of the other natives, who had been flocking in numbers to see us, had carried it off. To judge from the scarcity of supplies, the inhabitants of this part of the island are very poor.

We left Panau after half-past eight o'clock, and passed on towards the east. After travelling about three miles, we came in sight of the ocean, five miles off. Our course now changed to the northeast, and before noon we reached an extensive upland taro-patch, where I sat down to get the meridian altitude. While thus occupied, I thoughtlessly picked a piece of taro-leaf, and put it into my mouth; in a few minutes I was almost gasping for breath, from its acrid juice. It was consequently with difficulty that I succeeded in getting my observations.

Our path now led through a sort of jungle, and over ground resembling a quagmire, for a mile or two. It appeared we had been

traversing an extensive basin, covered with a dense vegetation, which the sun was not able to penetrate. For the first time on our journey, we now had plenty of water. On passing beyond this basin, we entered upon one of the old lava-plains, where we encamped near a pool of water. This plain is covered with stunted shrubs, and the old lava seemed more broken than any we had yet passed over since leaving the crater. In consequence of a mist, the walking was wet and slippery. During the day one of the men fell and sprained his ankle, and it became necessary that he should be carried, which office his companions performed with an attention that pleased me much.

There are several peculiarities about the natives which we now noticed: among other things they are exceedingly proud of their skin, and take it as a great affront to be spattered with mud; if any thing could ruffle a native's temper, it would be this. The young are particularly careful to avoid all puddles or mud; indeed, I thought more so than we are with our fine clothes.

Our encampment was found to be two thousand two hundred and sixty-six feet above the sea. The temperature was 64°.

We had now reached the line of the recent eruption, and it was my purpose to strike the head of the flow. Mr. Drayton, our consul, and Mr. Brackenridge, had already visited the first outbreak of the late eruption, of May 1840, which is marked on the map near the pit-crater of Alealea-nui, and also that to the east of the Old Crater. The latter, with that of Kanemuo-kamu, were the largest of the pit-craters, always excepting Kilauea. Mr. Drayton considers Kanemuo-kamu as the deepest crater he saw on the island, and the Old Crater as the most regular.

As far as we were able to learn, the two eruptions to the east and west of Moku-opuhi occurred on the same day, and nearly at the same time.

On the 20th of January, it was nine o'clock before we could proceed on our journey. The weather was mild and pleasant, and it bade fair to be a delightful day. By noon we had reached the position of three cone-craters, of moderate height, the ground about which was much broken. We afterwards diverged from the direct path, our guide taking us across the country a distance of four miles, on the north side of Kalalua. This march proved to be an arduous undertaking, for what had appeared to us at a distance to be smooth to travel on, proved on a nearer view, to be rough lava clinkers, overgrown with grass and stunted shrubbery, that deprived us of the opportunity of discovering where we were going to tread. Every few steps some of the party fell, and we considered ourselves very fortunate