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UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, DIRECTOR

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RESULTS OF SPIRIT LEVELING
IN HAWAII

1910 TO 1913, INCLUSIVE

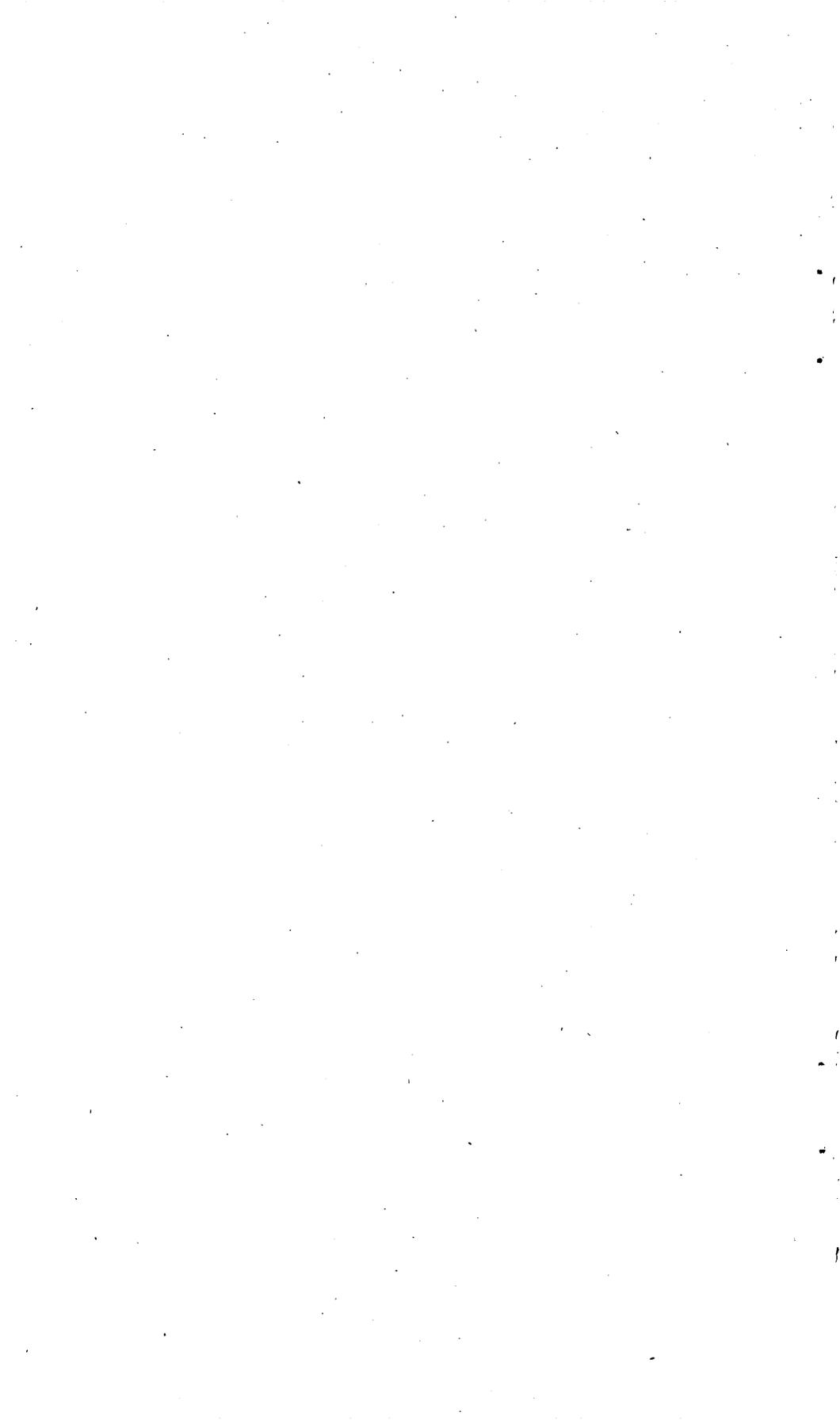
R. B. MARSHALL, CHIEF GEOGRAPHER

Work done in cooperation with the Territory of Hawaii, W. F. Frear, Governor
Marston Campbell, Superintendent of Public Works



WASHINGTON
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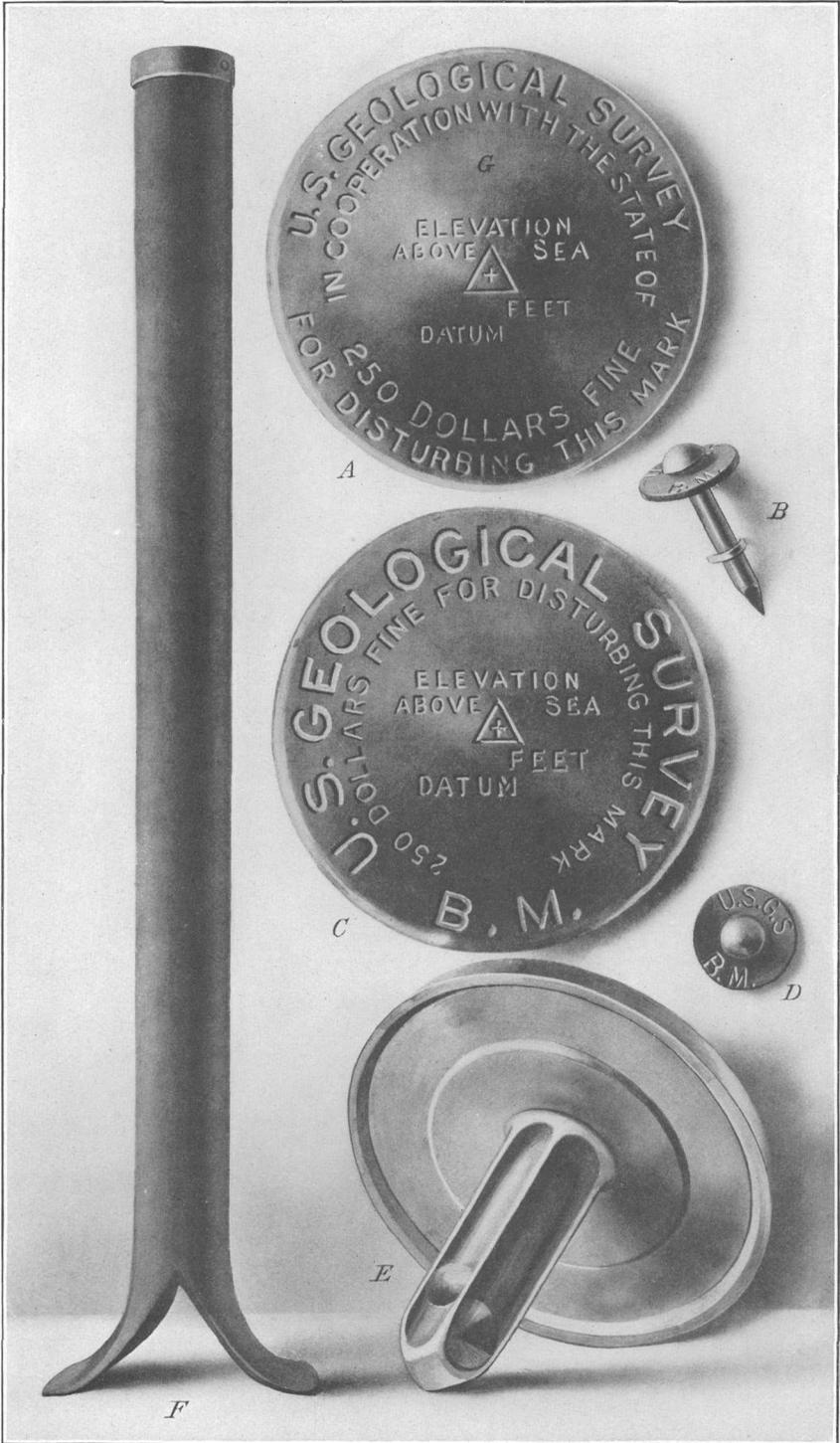
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GEOLOGICAL SURVEY BENCH MARKS.

- A, Tablet used in cooperating States. The State name is inserted at G.
- B and D, Copper temporary bench mark, consisting of a nail and copper washer.
- A, C, and E, Tablets for stone or concrete structures.
- F, Iron post used where there is no rock.

RESULTS OF SPIRIT LEVELING IN HAWAII, 1910 TO 1913, INCLUSIVE.

R. B. MARSHALL, Chief Geographer.

INTRODUCTION.

Cooperation.—The Territory of Hawaii contributed financially to the work during the years 1910 to 1913 inclusive. W. F. Frear was governor and Marston Campbell superintendent of public works during this period.

Scope of the work.—All results of spirit leveling in the Territory of Hawaii by the United States Geological Survey are included in this report, arranged by quadrangles. All of the elevations are based on tidal bench marks of the Coast and Geodetic Survey, the Corps of Engineers, United States Army, and the Hawaii Railroad Co.

Personnel.—The field work of 1910 and 1911 was done under the direction of T. G. Gerdine, that of 1912 and 1913 under the direction of G. R. Davis, all under the general supervision of R. B. Marshall, chief geographer.

Credit is given to the respective levelmen in the introductions to the several lists. The office work of computation, adjustment, and preparation of lists was done mainly by S. S. Gannett, geographer, and D. H. Baldwin, topographer, under the general direction of E. M. Douglas, geographer.

Classification.—No precise leveling has been done by the United States Geological Survey in this territory. For primary lines prism and wye standard levels are used; lines are run in circuits, with an allowable closing error in feet represented by $0.05 \sqrt{D}$, in which D is the length of the circuit in miles, sufficient care being given the work to maintain this standard. For circuit closures careful office adjustments are made, the small outstanding errors being distributed over the lines.

Bench marks.—The standard bench marks are of two forms. The first form is a circular bronze tablet (C and E , Pl. I), 3.5 inches in diameter and one-quarter inch thick, having a 3-inch stem, which is cemented in a drill hole in solid rock in the wall of some public building, a bridge abutment, or other substantial masonry structure. The second form (F , Pl. I), used where masonry or rock is not available, consists of a hollow wrought-iron post 3.5 inches in outer diameter and

4 feet in length, which is set about 3 feet in the ground. The bottom is spread out to a width of 10 inches, in order to give a firm bearing on the earth. A bronze or aluminum-bronze cap is riveted upon the top of the post. A third style of bench mark with abbreviated lettering (*B* and *D*, Pl. I), is used for unimportant points. This consists of a special copper nail 1.5 inches in length driven through a copper washer seven-eighths inch in diameter. The tablets, as well as the caps on the iron posts, are appropriately lettered, and State cooperation is indicated by the addition of the State name (*G*, Pl. I).

The numbers stamped on the bench marks described in the following pages represent the elevations to the nearest foot as determined by the levelman. These numbers are stamped with $\frac{3}{16}$ -inch steel dies on the tablets or post caps, to the left of the word "FEET." The office adjustment of the notes and the reduction to mean sea-level datum may so change some of the figures that the original markings are 1 or 2 feet in error. It is assumed that engineers and others who have occasion to use the bench-mark elevations will apply to the Director of the United States Geological Survey, at Washington, D. C., for the adjusted values, and will use the markings as identification numbers only.

Datum.—All United States Geological Survey elevations are referred to mean sea level, which is the level that the sea would assume if the influence of winds and tides were eliminated. This level is not the elevation determined from the mean of the highest and the lowest tides, nor is it the half sum of the mean of all the high tides and the mean of all the low tides, which is called the half-tide level. *Mean sea level is the average height of the water, all stages of the tide being considered.* It is determined from observations made by means of tidal gages placed at stations where local conditions, such as long, narrow bays, rivers, and like features, will not affect the height of the water. To obtain even approximately correct results these observations must extend over at least one lunar month, and if accuracy is desired they must extend over several years. At ocean stations the half-tide level and the mean sea level usually differ but little. It is assumed that there is no difference between the mean sea levels determined from observations in the Atlantic Ocean, the Gulf of Mexico, and the Pacific Ocean.

The connection with tidal stations for bench marks in certain areas that lie at some distance from the sea coast is still uncertain, and this fact is indicated by the addition of a letter or word to the right of the word "DATUM" on tablets or posts. For such areas corrections for published results will be made from time to time as the precise-level lines of the United States Geological Survey or other Government organizations are extended.

PRIMARY LEVELING.

HAWAII ISLAND.

Hamakua, Honomu, Kohala, and Waipio quadrangles.

HAWAII COUNTY.

The elevations in the following list were determined by primary leveling, based upon mean sea level. At Hilo one year's observations by the Corps of Engineers, United States Army, by automatic tide gage, June 1, 1911, to May 31, 1912, were used, and at Mahukona observations for six months in 1910 from notes by Mr. Elgin, of the Hawaii Railroad Co. These were the principal tide gages, but observations were also made at Kawaihae, January 4 to 15, 1911, which though inadequate have been used because checked by leveling from Mahukona, but comparison with the Hilo gage for same dates indicates that the bench-mark elevation at Kawaihae should be lowered 0.5 foot to agree with the year's mean. A single low-tide reading was made at Pololu Gulch which was not used because of a discrepancy of 1 foot with the line from Kohala, and a single low-tide reading was made at Laupahoehoe on December 12, 1910, from which by simultaneous comparison at Hilo a mean sea-level elevation was obtained which was accepted on account of check by level line from Hilo. The error adjusted between Hilo and Kawaihae was about 1 foot, but if it becomes necessary to decrease the elevation at Kawaihae the adjustment will be greater. On account of this possibility most of the error has been adjusted east of Honokaa, the field results west of that point being practically undisturbed.

The leveling was done in Honomu and Hamakua quadrangles in 1910 by W. H. Barringer, in Waipio quadrangle in 1910 and 1911 by Barringer, and in Kohala quadrangle in 1911 by Barringer and S. H. Birdseye. Additional leveling in Honomu quadrangle was done in 1912 by Birdseye and J. S. Taylor, and in Kohala and Waipio quadrangles in 1913 by Birdseye.

Barringer's lines were run with yard rod and prism level and Birdseye's lines with New York rod and wye level, the latter consisting of rerunning Barringer's line from a point 13 miles south of to a point 5.5 miles south of that place and thence south to Kauhola lighthouse.

HAMAKUA QUADRANGLE.

[Latitude 20°-20° 15'; longitude 155° 15'-155° 30'.]

From Laupahoehoe northwest along road to Honokaa.

Laupahoehoe, 0.8 mile northwest of, 100 feet north of Japanese settlement, 50 feet south of Waipunalei Gulch, mountainward side of road; copper nail in tree trunk, aluminum tag stamped "333".....	Feet. 333. 63
Laupahoehoe, 2 miles northwest of, south edge of Kaawalii Gulch, on edge of pali and at turn in road into gulch; copper nail in top of fence post, aluminum tag stamped "249," painted "U. S. B. M.".....	248. 93

Laupahoehoe, 2.5 miles northwest of, north edge of Kaawalii Gulch, seaward side of road, 75 feet southwest of first telephone pole, top of small railroad rail driven in ground and projecting about 3 inches (rail is used to hold pipe line, and is painted with red and white paint); aluminum tag on fence post 3 feet from rail is stamped and post painted "U. S. B. M." ..	Feet. 245. 22
Laupahoehoe, 3.8 miles northwest of, 0.5 mile south of Ookala, at summit of hill between Kaawalii Gulch and Ookala, 300 yards north of plantation railroad crossing, mountainward side of road in deep cut, in shelf of rock; bronze tablet stamped "450" (painted "U. S. B. M.").....	450. 434
Ookala, 200 feet east of, northwest corner of Ookala school lot, on outside of fence, 1½-inch iron pipe used as land mark; top of pipe, aluminum tag stamped "434," fence painted "U. S. B. M.".....	433. 94
Ookala, 0.7 mile northwest of, east side of south end of bridge over Kaula Gulch, iron bolt on mountainward side; aluminum tag stamped "560," painted "U. S. B. M."	562. 19
Ookala, 1.5 miles northwest of, in railing on mountainward side of masonry culvert over Kaholo stream; copper nail, aluminum tag stamped "735," painted "U. S. B. M."	736. 46
Keehia schoolhouse, 0.5 mile northwest of, 2.5 miles south of Kukaiaua, cut in road below Chinese truck garden, seaward side of road, in cement in shelf of rock 4 feet above ground; bronze tablet stamped "900" ("U. S. B. M." painted on adjacent rocks).....	901. 995
Kukaiaua, 1.25 miles southeast of, on white wooden covered bridge over Kaala Gulch, east side of south end of bridge; copper nail in floor beam, aluminum tag stamped "918," painted "U. S. B. M."	919. 34
Kukaiaua, 0.25 mile southeast of, on white wooden covered bridge, east side of north end of bridge; copper nail in floor beam, aluminum tag stamped "806," painted "U. S. B. M."	807. 79
Kukaiaua, 0.25 mile northwest of, 300 feet north of Japanese store at bend of road, north side; copper nail in root of tree, aluminum tag stamped "808," tree painted "U. S. B. M.".....	810. 09
Kukaiaua, 0.6 mile northwest of, east side of north end of wooden bridge over gulch, in concrete abutment; bronze tablet stamped "759," painted "U. S. B. M.".....	761. 752
Paauiilo, 1 mile southeast of, 200 feet north of Paauiilo schoolhouse, southwest corner of wooden railing at culvert; copper nail in top of end post, aluminum tag stamped "758," painted "U. S. B. M.".....	759. 21
Paauiilo, 300 feet west of, west side of north end of bridge, in masonry abutment; bronze tablet stamped "764"	765. 648
Paauiilo, 0.5 mile northwest of, west side of south end of wooden bridge over stream, in top of third post of railing from Paauiilo side; copper nail, aluminum tag stamped "703," painted "U. S. B. M."	704. 39
Paauiilo, 1.8 miles northwest of, 300 yards northwest of Kalopa Church, on south side of small culvert over Kaumoali Gulch; copper nail in railing, aluminum tag stamped "752," painted "U. S. B. M.".....	753. 06
Paauiilo, 2.3 miles northwest of, 300 feet south of Kalopa saloon, south end of small culvert over Alilipali Gulch, in concrete arch; bronze tablet stamped "734 1910," railing painted "U. S. B. M.".....	735. 887
Kalopa saloon, 0.5 mile northwest of, at forks of second-class road to Paauhau and opposite sign "To Paauhau," on wooden railing on south side of road; copper nail in top of post, aluminum tag stamped "748," painted "U. S. B. M."	749. 09

Kalopa saloon, 1 mile northwest of, 100 yards south of Japanese houses, on west side of south end of black wooden bridge over Kuikuipapa Gulch; iron bolt painted with circle, aluminum tag stamped "793," painted "U. S. B. M."	Feet. 791. 58
Honokaa, 3.25 miles southeast of, 1.75 miles northwest of Kalopa saloon, 100 feet south of point where Hawaiian Irrigation Co.'s flume No. 6 crosses gulch, on west side of north end of Black Bridge over gulch; copper nail in floor beam, aluminum tag stamped "909," painted "U. S. B. M."	906. 93
Honokaa, 2.5 miles southeast of, on wooden railing to concrete culvert, south side of road, in top of fifth post from Kalopa end; copper nail, aluminum tag stamped "1031," painted "U. S. B. M."	1, 029. 65
Honokaa, 2 miles southeast of, on north side of overhead railroad crossing, at sign "F 3"; copper nail on lower timber of north bent.....	1, 062. 42
Honokaa, 1.5 miles southeast of, bridge over undergrade double-tracked railroad crossing, southwest side and west corner of bridge, in abutment; bronze tablet stamped "1107 1910," painted "U. S. B. M." on bridge floor.....	1, 105. 037
Honokaa, 0.75 mile southeast of, 400 feet northwest of road forks to Paaupahu, on bridge over Kahaupu Gulch, east side of north end of bridge; copper nail in lower chord; aluminum tag stamped "1091"	1, 089. 78
Honokaa, 250 yards east of, 200 feet east of road leading to Volcano Stables, southeast corner of Rickard's hotel lot, in south end of concrete culvert; bronze tablet stamped "1116"	1, 113. 871
Honokaa, 250 yards west of, forks of roads to Waimea and Kukuihaele, in northwest corner of road turn on bank, 3 feet above road surface; copper nail in root of tree marked "1102"	1, 100. 36

From Honokaa southwest along road to Ahualoa Homesteads.

Honokaa, 2 miles southwest of, 200 feet north of junction of new road and short cut, east edge of Portuguese homestead lands, southeast corner of wooden bridge, in concrete abutment; bronze tablet stamped "1767" ...	1, 765. 000
Honokaa, 2.5 miles southwest of, 200 yards west of Ahualoa saloon, forks of road to Ahualoa schoolhouse on seaward side of road, 50 feet north of gate house; copper nail in top of fence post, aluminum tag stamped "1909" painted "U. S. B. M."	1, 907. 58
Honokaa, 3.25 miles west of, 100 yards northwest of native house, northeast corner of black wooden bridge over small drain; top of bolt head painted with circle and "U. S. B. M.," aluminum tag stamped "2056"	2, 053. 94

From Honokaa northwest along road to Kawela.

Honokaa, on front step of plantation engineer's office; copper nail.....	1, 117. 20
Honokaa, 1.25 miles north of, 100 feet east of Ahualoa triangulation station, mountainward side of road; chisel point on rock, painted "U. S. B. M. 1145"	1, 143. 36
Honokaa, 1.25 miles north of, at Ahualoa triangulation station, top of small bare knoll, 100 feet south from road, in cement pier; bronze tablet stamped "1177," rock monument painted "U. S. B. M."	1, 174. 844
Honokaa, 2.1 miles north of, 350 feet south of overhead flume crossing and road leading mountainward, in top of fence post on seaward side of road opposite Japanese camp; copper nail, aluminum tag stamped "1182," painted "U. S. B. M."	1, 180. 79

HONOMU QUADRANGLE.

[Latitude 19° 45'-20°; longitude 155°-155° 15']

From point near Hilo north and northwest along road to Laupahoehoe.

Hilo, 3 miles north of, Hilo R. R. long trestle over Kaiwiki stream, east side of south end of trestle; copper nail in stringer, aluminum tag stamped "96".....	Feet. 96. 11
Hilo, 4.3 miles north of, Hilo R. R. concrete bridge over Pahoehoe stream, parallel to county steel bridge, west side of north end, in concrete coping; bronze tablet stamped "156".....	156. 423
Hilo, 4.8 miles north of, 0.2 mile southeast of Papaikou, north end of east side of Hilo R. R. trestle over Kapue stream; copper nail in stringer, aluminum tag stamped "167".....	167. 57
Papaikou, 1.8 miles north of, 100 yards northeast of small rice mill, in cement on southeast abutment of concrete county bridge over Kalaoa stream; bronze tablet stamped "162 1910".....	162. 309
Papaikou, 3 miles north of, 200 yards north of Japanese store, east side of north end of county bridge over stream; copper nail in stringer, aluminum tag stamped "159".....	159. 68
Papaikou, 4 miles north of, 1.5 miles south of Pepeekeo store, blacksmith shop, and camp, west side of north end of county steel bridge over Kawainui stream, in concrete abutment; bronze tablet stamped "213 1910".....	213. 030
Pepeekeo store, 0.5 mile south of, near Japanese houses, east side of south end of concrete bridge over Waiama Gulch; chisel point, painted "U. S. B. M. 379".....	379. 01
Pepeekeo store, in front of, southwest corner of porch; center of 1-inch square hole in concrete gutter, painted "U. S. B. M. 458".....	458. 35
Pepeekeo store, 1.4 miles north of, on south end of bridge over Kapehu stream; bronze tablet stamped "342".....	342. 02
Honomu, 175 feet southwest of, in front of Honomu Meat Market, in top of 4 by 4 inch post projecting 3 inches above ground; copper nail, aluminum tag stamped "282," painted "U. S. B. M.".....	282. 65
Hakalau, 300 feet north of, in front of Hakalau Mill cable hoist, just north of tracks to mill; the most southerly point of top of 6-inch pipe which projects 18-inches out of ground, painted "U. S. B. M.".....	161. 45
Hakalau, 1.5 miles north of, covered county steel bridge over Umauma stream, east side of north end of concrete abutment, in cement; bronze tablet stamped "298 1910".....	298. 176
Hakalau, 2.3 miles north of, on county road; chisel point on concrete culvert over Peleau stream, painted "U. S. B. M.".....	321. 06
Honohina store, 1 mile north of, west side of south end of county steel bridge over Piha Gulch; rivet head with circle painted around it, aluminum tag stamped "214," "U. S. B. M." painted on railing.....	205. 22
Pohakapuka schoolhouse, 500 feet north of, southeast abutment of steel bridge over Manaloa Gulch, in cement; bronze tablet stamped "233"....	233. 565
Pohakapuka schoolhouse, 1.25 miles north of, west side of north end of county steel bridge over Pohakapuka Gulch; rivet head with red and white circle painted around it, painted "U. S. B. M.".....	283. 03
Maulua Gulch, south edge of, where road from Hilo turns, 75 feet southeast of overhead flume crossing, beside telephone pole, in top of fence post; copper nail, aluminum tag on post stamped "255," adjacent rocks painted "U. S. B. M.".....	255. 19

Maulua Gulch, in bottom of, at road crossing, west side of north end of county steel bridge, in cement of concrete abutment and wing walls; bronze tablet stamped "106 1910".....	Feet. 106.464
Maulua Gulch bridge, 0.5 mile north of, Laupahoehoe side of gulch, west side of north end of covered wooden bridge over stream; copper nail in floor beam, aluminum tag stamped "241," painted "U. S. B. M.".....	241.77
Maulua Gulch bridge, 0.7 mile north of, on mountainward side of road just inside of fence; Hilo R. R. bench mark consisting of iron pipe filled with concrete (railroad elevation 280.870, probably based upon a low water level).....	280.119
Maulua Gulch bridge, 1 mile north of, east side of north end of wooden bridge over Kapehu Gulch (seaward side); copper nail in floor beam, aluminum tag stamped "278," painted "U. S. B. M." on upright.....	278.72
Papaaloo, 400 feet mountainward of, east side of north end of covered wooden bridge over Kaiwihalahi Gulch, in concrete abutment; bronze tablet stamped "240 1910".....	240.212
Laupahoehoe, 200 feet north of, in concrete balustrade to concrete steps of side entrance to E. W. Barnard's hotel; bronze tablet stamped "108 1910"	108.482
Laupahoehoe Landing, in wharf floor at north leg of derrick; copper nail (on spur line), 7.65 feet above zero of gage.....	6.343
Staff reading on tide gage at 3.30 p. m., December 12, 1910, when low tide occurred, was 1.2 feet. (Low tide on that day was 0.107 foot lower than mean sea level from 1 year's observations at Hilo.)	

From Wainaku Mauka camp northwest to Kaiwiki, thence northeast to Onomea.

Wainaku Mauka camp, 0.5 mile mountainward from south end of covered wooden bridge, in beam; copper nail.....	646.49
Kaiwiki Homesteads road, at end of, 50 feet seaward from bridge over stream, in cement pier on south side of road; bronze tablet stamped "1719".....	1,719.256
Honolii stream, at upper trail crossing of, 0.4 mile south of Japanese camp, on north bank of Honolii gulch, near large lepua tree marked with flag, in top of stake; copper nail.....	1,281.07
Papaikou post office, 2 miles west of, at camp on main road mountainward from Papaikou, at fork of trail to south, in flume post; copper bolt.....	979.80
Papaikou post office, 2.5 miles mountainward from, at fence corner of third house from mountainward end of homesteads, where trail turns north, in cement pier; bronze tablet stamped "1115".....	1,115.008
Papaikou post office, 4 miles north of, steel bridge over Kawainue stream, in northwest abutment; bronze tablet.....	213.030

From point 1.5 miles northwest of Hakalau south and east to Pepeekeo.

Hakalau post office, 1.5 miles northwest of, south end of covered bridge over Umauma Gulch, in east abutment; bronze tablet stamped "298".....	298.176
Puaki, Japanese camp, at base of flagpole, in top of seaward post; copper bolt.....	489.56
Chin Chuck camp, 0.1 mile northwest of, on bridge over main Hakalau gulch, northwest end of bridge, on wooden bent; circle of white paint..	845.05
Chin Chuck camp, 0.7 mile south of, on south side of homestead road, at lot corner 2 feet above ground; top of iron pipe.....	840.87
Wooden bridge, 0.5 mile mountainward from, at bend in road 500 feet south-east of Japanese house, seaward side of road; in top of stake; tack.....	1,145.55

Akaka Falls, 0.4 mile north of, east side of forks of trail, in top of stump, mountainward side; tack.....	1, 275. 08
Akaka Falls, 0.3 mile southeast of, at end of rock trail beside flume, in edge of flume; copper nail.....	1, 224. 51
Honomu, 2.5 miles mountainward from, on main macadam road, at forks of stone trail to north, at foot of eucalyptus tree, in top of cement pier; bronze tablet.....	1, 178. 821
Alalaa triangulation station, 2 miles northwest of, at forks of macadam road and rock trail, on seaward side of road, in top of stake; tack.....	1, 088. 62
Alalaa triangulation station, 1.9 miles west of, at junction of main flumes, 15 feet seaward from small bridge over gulch, in top of stake; tack.....	1, 152. 74
Alalaa triangulation station, 1.1 miles west of, 100 feet southeast of stables at Japanese camp, at foot of rain gauge, in top of stake; tack.....	863. 46
Alalaa triangulation station, at top of Alalaa hill, in rock marking station; bronze tablet stamped "758".....	758. 432
Pepeekeo store, in front of, southwest corner of porch, at concrete gutter; 1-inch square hole, painted "U. S. B. M. 458".....	458. 35

From point near Waa Wao camp to edge of timber and return.

Chin Chuck camp, 0.8 mile west of, at junction of stone trails, 100 feet south of red roofed house, on seaward side of upper trail, in cement pier; bronze tablet stamped "1218".....	1, 218. 631
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From point 2 miles north of Honomu west to point 0.7 mile south of Chin Chuck camp.

Homestead, at first house, in seaward end of third step; circle around nailhead.....	411. 51
Homestead, south end of old wooden bridge, top of rock; paint mark.....	583. 36
Road forks on Homestead road, at southeast corner of, 2 miles mountainward, south of main county road, in rock; bronze tablet.....	727. 173

From point 2.3 miles northwest of Hakalau post office west, northwest, and north to Pohakapuka schoolhouse.

Hakalau post office, 2.3 miles northwest of, concrete culvert on county road, seaward side of south end; chisel point painted "U. S. B. M.".....	321. 06
Honohina triangulation station, in cement pier marking station; bronze tablet stamped "702".....	702. 970
Waikamalo Gulch, upper covered wooden bridge over, seaward side of north end, in railing of approach; copper nail.....	1, 134. 07
Haiku triangulation station, 0.4 mile northwest of, where trail connects with old Government road, in top of stake; tack.....	571. 43
Puu Ohai triangulation station, 0.18 mile east of, at trail forks between two gulches, in top of stake; tack.....	608. 16
Pohakapuka schoolhouse, 500 feet north of, steel bridge over Monaloea Gulch, in southeast abutment; bronze tablet.....	233. 565

At point 1.4 miles west of Haiku triangulation station.

Haiku triangulation station, 1.43 miles west of, at Homestead house on edge of timber (on west side of Ninole Gulch) at bottom of front steps, in top of cement pier; bronze tablet stamped "1403".....	1, 403. 485
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At Puu Ohai triangulation station.

Puu Ohai triangulation station, in top of cement pier, station mark; bronze tablet stamped "735".....	735. 619
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KOHALA QUADRANGLE.

[Latitude 20°-20° 15'; longitude 155° 45'-156°.]

From Mahukona northeast along road to point near Kohala post office.

Mahukona Landing, just northwest of most northern one of bolts used as anchor bolts for wall, 45 meters around wall north from corner at landing; cross on sea wall (C. & G. S. B. M. No. 6 described as 14.52 feet above zero of gage).....	Feet. 11. 327
Mahukona Landing, on west side of rock, cement covered walk, as close to wall as the rod could be held, alongside of hinges or plates of an iron gate (C. & G. S. B. M. No. 3 described as 15.67 feet above zero of gage).....	12. 521
Zero of gage from 6 months' readings in possession of Hawaii R. R. Co.....	-3. 171
Mahukona Landing, 150 feet north of, 100 feet west of Mahukona school-house, 175 feet southwest of Mahukona post office, top of sea wall, in concrete; bronze tablet stamped "11.41".....	11. 410
Mahukona, 0.5 mile east of, at fork of road to Puuhue; chisel point on lava rock, painted "U. S. B. M. 143".....	143. 22
Mahukona, 1 mile east of, at triangulation station, mountainward side of road; chisel point on boulder, painted "U. S. B. M.".....	257. 45
Mahukona, 2 miles northeast of, 1 mile south of rock crusher, seaward side of road; chisel point on rock, painted "U. S. B. M. 359".....	358. 72
Mahukona, 2.5 miles northeast of, on small rise; chisel point on rock.....	363. 20
Mahukona, 2.75 miles northeast of, opposite rock crusher which stands on seaward side of road, in boulder on mountainward side of road; bronze tablet, rock painted "U. S. B. M.".....	372. 176
Mahukona, 3.75 miles northeast of, 0.5 mile north of rock crusher, 200 feet southwest of mail box for Houoipu, mountainward side of road; chisel point on rock, painted "U. S. B. M.".....	448. 25
Mahukona, 4.75 miles northeast of, 300 feet east of forks of road to Houoipu, mountainward side of road, in rock; bronze tablet, rock painted "U. S. B. M.".....	531. 433
Mahukona, 5.6 miles east of, 6 miles west of Kohala, 0.5 mile east of road forks to Houoipu, seaward side and at end of deep cut in road; chisel point on boulder.....	570. 64
Kohala post office, 5 miles west of, west end of cane lands, 50 feet west of overhead flume crossing; tenpenny nail with copper washer set in rock, painted "U. S. B. M.".....	621. 70
Kohala post office, 4.3 miles west of, at forks of three roads, 150 feet west of overhead flume crossing, at forks of Hualua road and Mahukona-Kohala road, copper nail in top of post which projects 1 foot above ground, fence post painted "U. S. B. M.".....	629. 59
Kohala post office, 2.5 miles west of, 120 feet south of Bauzai Hotel, at corner of road leading to Hawi plantation stables; chisel point on rock, southeast corner of road forks, painted "U. S. B. M.".....	589. 84
Kohala post office, 1.2 miles west of, at forks of road to Waimea, black steel standpipe or strainer, concrete wall at outlet; chisel point on cemented rock, painted "U. S. B. M.".....	554. 11

From Kawaihae east along road 6 miles.

Kawaihae, 100 feet west of, end of sea wall on north side of wharf, 100 yards south of Kawaihae wireless station, northwest corner of sea end of approach to wharf; bronze tablet, 8.059 feet above zero of gage.....	5. 959
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	Feet.
Kawaihae, 0.75 mile south of, at bend of road where it turns east, beside a stone wall on north side of road; copper nail in root of tree, aluminum tag, painted "U. S. B. M.".....	5.08
Kawaihae, 1 mile southeast of; copper nail in top of milepost 11-1, aluminum tag, painted "U. S. B. M.".....	95.88
Kawaihae, 2 miles east of; copper nail in top of milepost 10-2, aluminum tag, painted "U. S. B. M.".....	382.65
Kawaihae, 2.75 miles east of, 0.25 mile west of milepost 9-3, at northwest corner of wooden bridge over gulch; copper nail in floor, aluminum tag stamped, painted "U. S. B. M.".....	623.68
Kawaihae, 3 miles east of; copper nail in milepost 9-3.....	678.33
Kawaihae, 3 miles east of, 50 feet northwest of milepost 9-3, in rock ledge; bronze tablet stamped "676".....	675.638
Kawaihae, 4 miles east of, south side of road; copper nail in top of milepost 8-4, aluminum tag stamped, painted "U. S. B. M.".....	976.18
Kawaihae, 5 miles east of, 7 miles west of Waimea, south side of road; copper nail in top of milepost 7-5, aluminum tag stamped, painted "U. S. B. M.".....	1,271.75
Kawaihae, 6 miles east of, 6 miles west of Waimea; copper nail in top of milepost 6-6.....	1,559.39
Kawaihae, 6 miles east of, 6 miles west of Waimea, 150 feet southwest of milepost 6-6, in concrete post on top of small rocky knoll; bronze tablet stamped "1562".....	1,562.006

From point 7 miles northwest of Waimea northwest along road to Kohala.

Waimea (Kamuela post office) 7 miles north of; copper nail in top of milepost 7-18, aluminum tag stamped "3470," painted "U. S. B. M.".....	3,449.64
Waimea (Kamuela post office), 7.8 miles north of, 125 feet from old shack near stone corrals, 10 feet from ditch crossing, mountainward side of road, in rock; bronze tablet stamped "3503," painted "U. S. B. M.".....	3,493.282
Waimea, 9 miles north of; copper nail in top of milepost 9-16, aluminum tag stamped "3538," painted "U. S. B. M.".....	3,528.70
Waimea, 10 miles north of; copper nail in top of milepost 10-15, aluminum tag stamped "3381," painted "U. S. B. M.".....	3,371.18
Waimea (Kamuela post office), 11 miles north of, 25 feet southwest of milepost 11-14, in rock on seaward side of road; bronze tablet stamped "3204," painted "U. S. B. M.".....	3,194.372
Waimea, 12 miles north of, in front of Kahua ranch house or Frank Wood's house, on mountainward side of road; chisel point on rock, painted "U. S. B. M. 3043.".....	3,033.18
Kohala, 12.7 miles south of, between telephone line and road, 200 feet west of road; copper nail in root of old dead tree (this tree is only one in vicinity), aluminum tag stamped "2906," painted "U. S. B. M.".....	2,896.30
Kohala, 10 miles south of, 100 feet south of gate on main road, 100 feet seaward of road, in rock with monument built around it; bronze tablet stamped "2613," painted "U. S. B. M." on monument.....	2,602.783
Kohala, 9 miles south of, at northwest corner of cultivated field; chisel point on rock, painted "U. S. B. M.," aluminum tag on fence post stamped "2408".....	2,397.74
Kohala, 7.5 miles south of, at junction of short cut and main road, mountainward side of road, opposite northeast fence corner; chisel point on rock.....	2,171.60
Kohala, 6 miles south of, 0.25 mile south of old gate at corner of cultivated field, on mountainward side of road; chisel point on rock, painted "U. S. B. M. and 1875".....	1,864.34

Kohala, 5.5 miles south of, opposite northwest corner of cultivated field, in boulder on seaward side of road; bronze tablet stamped "1780," painted "U. S. B. M.".....	Feet. 1,769.228
Kohala, 4.5 miles southwest of, 150 feet west of sharp turn in road, 20 feet east of fence corner, seaward side of road, midway between last two houses in homesteads on mountainward side of road; chisel point on rock, painted "U. S. B. M." on fence post.....	1,556.03
Kohala, 4 miles southwest of, small house on seaward side of road, in top of west post at green gate; copper nail, painted "U. S. B. M.".....	1,407.66
Kohala, 3.2 miles southwest of, small white house at edge of homestead lands, mountainward side of road, 100 feet south of gate to house; chisel point on large boulder, painted U. S. B. M.".....	1,227.92
Kohala, 2.2 miles southwest of, at culvert where Kohala ditch crosses under Waimea road, in makai wall of ditch and 1 foot from cone-shaped bench mark of Kohala Ditch Co.; bronze tablet.....	965.121
Kohala Ditch Co.'s cone-shaped bench mark (Kohala Ditch Co.'s elevation is 964.65 feet above high tide).....	965.86
Kohala, 1.5 miles southwest of, at entrance to Kingsley's house, 20 feet north of gate; chisel point on rock, painted "U. S. B. M.".....	723.41

From point 6 miles south of Kohala south to Kawaihae.

Puu Hue ranch house, 0.9 mile south of, 400 feet southeast of red-roofed house, 50 feet south of gate on mountainward side of trail; chisel point on rock in rock mound, painted "U. S. B. M. 1722".....	1,721.28
Puu Hue ranch house, 1.8 miles south of, at Kahua Gate on trail to Kawaihae, 30 feet south of gate; chisel point on rock in rock mound, painted "U. S. B. M. 1750".....	1,748.79
Kahua Gate on Kawaihae trail, 0.8 mile south of, on top of small rise on seaward side of trail; chisel point on rock, painted "U. S. B. M.".....	1,632.01
Kahua Gate, 1.9 miles south of, on small rise near large cactus bush, on west side of trail; chisel point on rock in mound of stones, painted "U. S. B. M. 1448".....	1,446.93
Kahua Gate, 2.9 miles south of, on top of sharp rise, due west of Puu Pili; chisel point in rock mound, painted "U. S. B. M. 1353".....	1,351.62
Kawaihae, 5.6 miles north of, forks of trail to Kahua and Puu Hue, small knoll just south of trail, forks on east side of Puu Hue trail, 30 feet northwest of rock monument 2.5 feet high; chisel point on rock, painted with circle and "U. S. B. M. 1171".....	1,170.81
Kawaihae, 4.5 miles north of, 100 feet south of large bunch of cactus, 3 small keawi trees on west side of trail, opposite bench mark; chisel point on rock east side of trail, painted with circle and "U. S. B. M. 852".....	851.29
Kawaihae, 3.5 miles north of, in rocky bed of Kapae Gulch at trail crossing, west side of trail, in huge boulder; bronze tablet stamped "643" (painted "U. S. B. M.").....	642.885
Kawaihae, 2.5 miles north of, top of small knoll, 200 feet west of a northwest fence corner, west side of trail, large monument built near bench mark, which is a chisel point on rock, painted with circle, monument painted "U. S. B. M.".....	490.94
Kawaihae, 2 miles north of, at summit of hill, east side of trail; chisel point on rock, painted "U. S. B. M.".....	320.11
Kawaihae, 1 mile north of, 200 yards north of Honokoa gulch, at top of sharp rise, east side of trail; chisel point on rock, painted "U. S. B. M.".....	154.72

From point 5.5 miles south of Kohala west 0.6 mile to Puu O Nale triangulation station (single spur line).

Puu O Nale triangulation station, on highest point of Puu O Nale hill, in top of granite post marking station; bronze tablet stamped "1779" . . . 1,777. 417 Feet.

From point 1.4 miles east of Kohala north to Kauhola lighthouse (single spur line).

Kauhola lighthouse, in top of Kauhola triangulation station which is granite post about 100 feet southeast of lighthouse; bronze tablet stamped "31" . . . 31. 381

From point 1.2 miles west of Kohala, east along road to Makapala (leveled twice).

Kohala, 1.2 miles west of, at forks of Kingsley road (road to Waimea), at foot of black steel standpipe, on concrete wall at outlet; chisel point, painted "U. S. B. M." 554. 11

Kohala, 250 feet northeast of, in lower concrete step of Mr. Stillman's old home on seaward side of road, opposite courthouse; bronze tablet stamped "475" 474. 666

NOTE.—Above standard bench mark will be moved because of change of grade on road.

Kohala, 180 feet northeast of, at Kamehameha's statute in courthouse yard, on northwest corner of concrete base; bronze tablet stamped "481" 481. 252

Kohala, 0.5 mile east of, at forks of road to Dr. Bonds office, southwest corner of road forks, on rock; chisel point, painted "U. S. B. M." 430. 12

Kohala, 1 mile east of, bottom of Waianae Gulch, seaward side of road on west side of gulch, in top of gate post 359. 29

NOTE.—The copper bolt has been removed.

Kohala, 1.4 miles east of, at junction of road to Kohala Mill with county road, in northeast corner of road forks, on rock; chisel point, painted "U. S. B. M." 344. 44

Kohala, 2.5 miles east of, on concrete culvert over Halawa Gulch, in mountainward side of west end of side wall; bronze tablet stamped "264" 263. 683

Kohala, 3.1 miles east of, on seaward side of road, culvert over Walaohia Gulch, on west end of concrete side wall; chisel point, painted "U. S. B. M." 211. 78

Makapala, 20 feet west of Lee Wan's store, in root of small eucalyptus tree, on seaward side of road; copper nail 219. 60

NOTE.—In running line it was impossible to hold rod on top of nail on account of growth of tree. Elevation doubtful ± 0.2 foot.

WAIPIO QUADRANGLE.

[Latitude 20°-20° 15'; longitude 155° 30'-155° 45'.]

From Ahualoa Homesteads west along road to point 5 miles east of Waimea (run twice).

Honokaa, 4.5 miles southwest of, on second post east of gate leading to Japanese vegetable gardens; copper nail in top, aluminum tag stamped "2259," painted "U. S. B. M." 2,257. 78

Honokaa, 5.25 miles southwest of, on small wooden bridge over gulch, at east end, mountainward side; copper nail in top of railing post, aluminum tag stamped "2391" 2,389. 03

Honokaa, 7 miles southwest of, 11 miles east of Waimea (Kamuela post office), 12 feet west of first gate to Parker ranch, opposite white house, mountainward side of road, in top of post which projects 3 feet above ground; copper nail, aluminum tag stamped "2551," painted "U. S. B. M." 2,549. 33

Waimea post office, 11 miles east of, rocks along road painted "U. S. B. M.," about 30 feet toward sea from road, set in rock with cement; bronze tablet, painted "U. S. B. M."	Feet. 2, 585. 182
Waimea post office, 10 miles east of, 100 feet downstream from old wooden bridge, set in mountain-side parapet of concrete bridge (20-foot span); galvanized spike with head marked +, bridge painted "U. S. B. M." ..	2, 705. 56
Waimea post office, 8½ miles east of, about 50 feet mountainward from road; bronze tablet set with cement in rock, painted "U. S. B. M." ..	2, 782. 06
Waimea post office, 7½ miles east of, about 30 feet mountainward from road, telephone pole on seaward side of road and rock on mountainward side of road, painted "U. S. B. M." with arrow, in rock; bronze tablet ..	2, 815. 434
Waimea post office, 7 miles east of; top of lower hinge of new gate to Parker ranch, painted "U. S. B. M."	2, 797. 037
Waimea post office, 6 miles east of, at seaward edge of road, set in rock with cement; top of short length of ¾-inch galvanized pipe, painted "U. S. B. M."	2, 804. 57
Waimea post office, 5 miles east of, 50 feet west of fork of road to Kukuihaele, 75 feet west of Hamakua ditch, in top of concrete headwall at seaward end of 24-inch pipe culvert; bronze tablet, headwall painted "U. S. B. M." ..	2, 814. 105
From Kawela northwest along road to Kukuihaele, thence south along road to point 5 miles east of Waimea (Kamuela post office).	
Honokaa, 3 miles northwest of, near old shack on seaward side of road, copper nail in root of blazed tree, on north side of road, painted "U. S. B. M.," aluminum tag stamped "1109"	1, 105. 36
Honokaa, 4.5 miles northwest of, 3.5 miles southeast of Kukuihaele, west bank of Malauahai Gulch, seaward side of road, 100 yards south of buildings of Japanese camp, in rock; bronze tablet stamped "980," painted "U. S. B. M."	977. 043
Bridge over Hamakua ditch, 0.4 mile west of above-described permanent bench mark, north end of east side of bridge; 1-inch square chisel hole in top of coping	962. 30
Kukuihaele, 2.5 miles southeast of, white covered wooden bridge over Kawaikalia Gulch, 50 feet west of, mountainward side of road to Japanese joss house; chisel point on rock, painted "U. S. B. M."	862. 99
Kukuihaele, 2 miles southeast of, northwest corner of Kaauhuhu school-house; chisel point on rock, painted "U. S. B. M."	851. 10
Kukuihaele, 1.5 miles southeast of, seaward side of road, near Honokaa end of rock fill, near cement culvert over Waikoloa Gulch; chisel point on rock, painted "U. S. B. M."	761. 42
Kukuihaele, 0.5 mile east of, at end of inclined railroad, 75 feet west of, on north side of road, Kukuihaele plantation warehouse; copper nail in root of tree, aluminum tag stamped "759"	770. 72
Kukuihaele store, 200 yards west of, forks of road to plantation stables, south side of road, in rock; bronze tablet stamped "730," painted "U. S. B. M."	730. 059
Kukuihaele store, 1.5 miles west of, at edge of Waipiopali, 200 yards southwest of Jorgensen's residence, at end of wagon road and beginning of trail to Waipiō village, south side of road, in rock; bronze tablet stamped "894"	906. 111
Kukuihaele, 0.5 mile south of, at Waimea road crossing over Hamakua ditch, east side of south end; chisel point on foundation, "U. S. B. M.," painted on wooden girder	980. 57

Kukuihaele, 3 miles southeast of, at first forks of Waimea road, north side of road; third post from end of fence; copper nail in top, painted "U. S. B. M.," aluminum tag stamped "1494".....	Feet. 1,493.36
Kukuihaele store, 3.25 miles south of, top of small hill known as Puu Mauu, in rock centered over location of old pipe marking triangulation station Puu Mauu; bronze tablet stamped "1629".....	1,629.327
Kukuihaele, 4.5 miles south of, on west side of road, 300 feet north of south edge of cane lands, 150 yards south of ditch crossing, west side of road and inside of fence; copper nail in ohia stump, aluminum tag stamped "1947," painted "U. S. B. M." on tree.....	1,946.30
Kukuihaele, 5.5 miles south of, 6.5 miles northeast of Waimea, first gate to Parker ranch on "Mud Lane," 100 feet north of, on east side of road, in rock; bronze tablet stamped "2392," painted "U. S. B. M.".....	2,391.670

From point 6 miles east of Kawaihae east to point 5 miles east of Waimea.

Kawaihae, 7 miles east of, 5 miles west of Waimea, 50 feet west of milepost 5-7, 2 feet above roadbed on south side; chisel point on rock, painted with circle and "U. S. B. M.".....	1,797.73
Kawaihae, 8 miles east of, 4 miles west of Waimea, south side of road; copper nail in top of milepost 4-8, aluminum tag painted "U. S. B. M."... ..	2,022.24
Kawaihae, 9 miles east of, 3 miles west of Waimea, south side of road; copper nail in top of milepost 3-9, aluminum tag, painted "U. S. B. M."... ..	2,219.57
Kawaihae, 10 miles east of, 2 miles west of Waimea, at forks of road to Kohala, 30 feet northwest of black wooden bridge, in concrete covered wing wall of abutment; bronze tablet stamped "2413," painted "U. S. B. M.".....	2,413.380
Waimea, 1 mile west of; copper nail in top of milepost 1-17, aluminum tag, painted "U. S. B. M.".....	2,575.74
Waimea (Kamuela post office), 200 yards north of, 50 feet west of Akona's store, in northeast abutment of black wooden bridge; bronze tablet stamped "2669" "U. S. B. M." painted on bridge.....	2,669.308
Waimea (Kamuela post office), 1.2 miles east of, 150 feet east of small unpainted barn on south side of road, opposite banana grove, 300 feet southeast of brown house with red trimmings; copper nail in stump, 1 foot above ground, painted "U. S. B. M.".....	2,774.41
Waimea (Kamuela post office), 2 miles east of, north side of road; copper nail in top of milepost 2-16, aluminum tag, painted "U. S. B. M.".....	2,854.51
Waimea (Kamuela post office), 3 miles east of; copper nail in top of milepost 3-15, aluminum tag, painted "U. S. B. M.".....	2,894.13
Waimea (Kamuela post office), 3.4 miles east of, 50 feet southwest of fence corner on north side of road, 250 feet northwest of fence corner on south side of road, 20 feet west of telephone pole, in rock; bronze tablet, stamped "2889," telephone pole painted "U. S. B. M.," rock monument painted "U. S. B. M.".....	2,888.702
Waimea (Kamuela post office), 4 miles east of; copper nail in top of milepost 4-14, aluminum tag, painted "U. S. B. M.".....	2,868.59

From point 2 miles west of Waimea northwest 5 miles.

Waimea (Kamuela post office), 3 miles northwest of; copper nail in top of milepost 3-22, aluminum tag stamped "2688," painted "U. S. B. M."... ..	2,685.21
Waimea (Kamuela post office), 4 miles northwest of; copper nail in top of milepost 4-21, aluminum tag stamped "2949," painted "U. S. B. M."... ..	2,946.08

Waimea (Kamuela post office), 5 miles northwest of, 20 feet southeast of milepost 5-20, in rock; bronze tablet stamped "3164," painted "U. S. B. M.".....	Feet. 3, 160. 997
Waimea (Kamuela post office), 6 miles north of; copper nail in top of milepost 6-19, aluminum tag stamped "3290," painted "U. S. B. M.".....	3, 287. 15

From Waimea northwest to Hokuula triangulation station (single spur line).

Waimea (Kamuela post office), 1 mile north of, on Waimea slope of Hokuula, east side of old wood road or trail; chisel point on rock, painted "U. S. B. M.".....	3, 029. 68
Hokuula triangulation station, on west edge of crater and on highest point of crown where a post was found but no pin; kerosene oil can filled with concrete set in ground and tablet set in center over point where stake originally was.....	3, 376. 948

From Makapala southeast along road to Honokane Nui Gulch (leveled twice).

NOTE.—Two bench marks of Barringer's line at this point are destroyed.

Pololu Gulch, 1,000 feet west of, in front of old Kohala Ditch Co.'s office, on small rise, 25 feet north of road, in boulder; bronze tablet.....	486. 36
Pololu Gulch, bottom of, west side, 100 feet west of schoolhouse, on stone 18 inches square; chiseled point, painted "U. S. B. M.".....	5. 71
Low tide 10.00 a. m., Jan. 24, 1911, surface of water.....	-1. 969

NOTE.—Time of tide does not tally with Coast and Geodetic Survey tide tables. Low tide should be about -1 foot (?) (below sea level).

Honokane Nui Gulch, at foot of trail, on east side of stream, in rock ledge; bronze tablet, painted "U. S. B. M.," stamped "27".....	27. 359
Honokane Nui Gulch, 0.5 mile east of, on summit of ridge between Honokane Nui and Honokane Iki gulches, in flat rock with monument built around; bronze tablet, painted "U. S. B. M.," stamped "458".....	457. 646

From Kukuihaele northwest to Waimanu Valley (single spur line).

NOTE.—This line was run for topography only and is unchecked.

Waipio Valley, east side of, at foot of trail, on rock; chiseled square.....	8. 610
Waipio Valley, west side of, at third turn of trail, on rock; chiseled square	220. 32
Kukuihaele post office, 6.51 miles west of, south side of twelfth gulch west of Waipio Valley, seaward side of trail, on rock; circle painted "U. S. B. M.".....	1, 252. 494
Waimanu Valley, south side, at top of steep part in trail, seaward side of trail; in white paint on rock, "U. S. B. M.".....	1, 287. 504
Waimanu Valley, bottom of, 42 feet in front of old house on south side of stream near beach, 30 feet from stream bank; bronze tablet, not stamped	9. 480

WAIKI QUADRANGLE.

From Waimea south to Holoholoku triangulation station (single spur line).

Holoholoku triangulation station, in scoria on summit of hill; four redwood posts are set around it to support signals; kerosene can filled with concrete set in ground and around the iron pin; bronze tablet set in concrete exactly over head of pin, rock monument built around mark.....	3, 265. 246
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Hilo, Kilauea Crater, and Puna quadrangles.

HAWAII COUNTY.

The elevations in the following list are based upon a bench mark of the Corps of Engineers, United States Army, at Hilo breakwater, the accepted elevation of which above mean sea level was determined from one year's automatic gage record, June 1, 1911, to May 31, 1912, inclusive.

The leveling was done in Hilo quadrangle in 1910, by W. H. Barringer and in 1912, by J. M. Rawls and S. H. Birdseye; in Puna quadrangle in 1912. by Rawls, and in Kilauea Crater quadrangle in 1912 by Rawls and Birdseye.

HILO QUADRANGLE.

[Latitude 19° 30'-19° 45'; longitude 155°-155° 15'.]

From Hilo breakwater west and north to bench mark 2.9 miles north of Hilo.

Hilo, at land end of breakwater, 75 feet east of station O (U. S. C. E. b. m. 7.44 feet above zero of automatic gage as reset February, 1911, by Geo. F. Whittemore, U. S. Army Engineer).....	Feet. 6. 393
Hilo, land end of breakwater, 70 feet northeast of station O, lava rocks near shore line, 50 feet east of Hilo R. R. tracks, on top of breakwater, in rock and cement; bronze tablet stamped "6.89".....	7. 281
Hilo, 0.5 mile south of, at Waiakea, south end of east side of steel bridge over slough; head of bolt in bedplate, aluminum tag not stamped.....	13. 467
Hilo, 1 mile east of, land end of Hilo wharf, north side of, in center of top of masonry pier 3.5 feet in diameter and covered with cement; bronze tablet stamped "5.79 1910".....	6. 183
Hilo, 1 mile east of, 100 yards west of land end of Hilo wharf, in top of sea wall extending out from old Government wharf; bronze tablet stamped "5.83 1910".....	6. 228
Territorial Survey b. m. 3; bottom of square hole cut in concrete wall just north of Government wharf (elevation by Territorial Survey 5.39 feet)..	6. 073
Hilo, 100 yards east of United States lighthouse, at foot of Waianuenue Street, in concrete pedestal or foundation of tower; bronze tablet stamped "8.82 1910".....	9. 210

From Hilo south along automobile road to Keaau, thence southwest along public road to point near Glenwood (part of a double spur line).

Hilo, 1 mile southeast of, at junction of Volcano road and Lepalepa Street, on concrete base of flag pole; center of circle of white paint, aluminum tag on flag pole, stamped "14.3".....	14. 72
Hilo, 2.2 miles south of, about 2,000 feet south of Waiakea Mill, on east side of road, near bunch of breadfruit trees, at base of telephone pole; chisel point on rock, aluminum tag stamped "49.5," telephone pole painted "U. S. B. M.".....	49. 89
Hilo, 2.5 miles south of, beside gatepost at road leading west, on top of 1-inch pipe flush with ground, aluminum tag on gatepost stamped "71.0".....	71. 44
Hilo, 3.2 miles south of, 200 feet north of Waiakea Uka schoolhouse, 60 feet west of gate, 15 feet south of stone fence, in top of rock mound in school yard; bronze tablet stamped "143".....	143. 381

Hilo, 4 miles south of, on small wooden culvert, in seaward end of bridge floor; copper nail, aluminum tag stamped "174.6, U. S. B. M." painted on bridge floor.....	Feet. 175. 05
Hilo, 4.9 miles south of, at lone mango tree blazed with triangle on mountainward side of road; spike in base of tree.....	233. 09
Hilo, 6 miles south of, 0.6 mile south of Youngs road, in rock outcrop on mountainward side of road; bronze tablet stamped "271".....	271. 17
Hilo, 6.9 miles south of, 750 feet north of Hilo-Puna boundary signboard, on seaward side of road; copper nail in top of kukui stump, "U. S. B. M." painted on stump.....	289. 62
Hilo, 7.9 miles south of, 0.8 mile south of Puna-Hilo boundary, on mountainward side of road at sharp bend, at base of rock ledge 15 feet high; chisel point on rock 2 feet above road, rock painted "U. S. B. M.".....	280. 00
Hilo, 8.9 miles south of, 0.3 mile north of Hilo R. R. crossing, at forks of road to Olaa Mill, in northeast corner of road forks; copper nail in root of Pride of India tree, aluminum tag stamped "334.3".....	334. 74
Keaau, 770 feet north of station, in yard of Japanese Christian Church, in rock outcrop 50 feet west of road; bronze tablet stamped "359.3".....	359. 643
Keaau, at railroad crossing west of station; top of north rail.....	390. 9
Keaau, 1.2 miles south of, 2,300 feet south of road to Japanese Camp, spike in base of telephone pole, painted "U. S. B. M.," aluminum tag stamped "571.6".....	571. 97
Keaau, 2 miles southwest of, 150 feet south of Catholic Church, in fence corner on seaward side of road; copper nail in root of Pride of India tree, painted "U. S. B. M." on fence, aluminum tag stamped "641.6".....	641. 93
Keaau, 3.2 miles southwest of, in bottom step of 12-mile schoolhouse; bronze tablet stamped "764".....	764. 701
Keaau, 4 miles southwest of, 50 feet south of forks of road leading west, on mountainward side of road; chisel point on rock, painted "902.5".....	902. 80
Keaau, 5 miles southwest of, 50 feet south of 14-mile blacksmith shop, on seaward side of road; copper nail in top of large ohia stump, painted "U. S. B. M.," aluminum tag stamped "1061.2".....	1, 061. 54
Keaau, 5.5 miles southwest of, at forks of road leading to Kukui R. R. station, on seaward side of road; spike in telephone pole 14 inches above base, painted "U. S. B. M.," aluminum tag stamped "1137.9".....	1, 138. 22
Keaau, 6 miles southwest of, 1,150 feet southwest of Japanese joss house, in yard of native's house; copper nail in root of aligator pear tree.....	1, 233. 16
Keaau, 6.2 miles southwest of, 0.4 mile southwest of Japanese joss house, in rock ledge, on mountainward side of road, 2 feet above road; bronze tablet stamped "1266".....	1, 266. 435
Keaau, 6.7 miles southwest of, at crossroads leading to railroad station, beside flagpole; copper nail in top of stump, painted "U. S. B. M.," aluminum tag stamped "1360.1".....	1, 360. 45
Mountain View R. R. station, in south end of station platform, east end of third plank; copper nail, aluminum tag stamped "1534.2".....	1, 534. 52
Mountain View, 0.7 mile southwest of, at forks of road leading west to Japanese camp, on seaward side of road; chisel point on rock painted "U. S. B. M. 1671.2".....	1, 671. 61
Mountain View, 1.3 miles southwest of, in mountainward side of small wooden culvert at flume crossing; copper nail painted "U. S. B. M.," aluminum tag stamped "1799.124".....	1, 799. 52
Mountain View, 2 miles southwest of, at Norman Lyman's house, in rock base of front steps to house; bronze tablet stamped "2002".....	2, 002. 342

From Hilo west and north to Wainaku Mauka camp.

Hilo, 1.2 miles west of, at forks of road to north, under flume, on concrete pier on seaward side of crossroad; bronze tablet stamped "379".....	Feet. 379. 767
Wainaku Mauka camp, at foot of telephone pole, south side of road, 20 feet seaward from gate, in cement pier; bronze tablet stamped "473".....	473. 557

KILAUEA CRATER QUADRANGLE.

[Latitude 19° 15'-19° 30'; longitude 155° 15'-155° 30'.]

From point near Crater Hotel west along main automobile road into Kilauea crater, thence northeast along trail to Volcano House, thence southeast along government road to Crater Hotel.

Crater Hotel, 2 miles southwest of, on north side of road at sharp bend; chisel point on rock 2 feet above ground.....	3, 734. 44
Crater Hotel, 3.25 miles southwest of, at old prisoners' camp, on south side of road at beginning of Crockett's trail, in top of ohia stump; copper nail..	3, 756. 41
Crater Hotel, 3.3 miles southwest of, at old prisoners' camp, 200 feet north of road, 650 feet northwest of beginning of Crockett's trail, in large boulder; bronze tablet stamped "3764".....	3, 764. 339
Keanakakoi Crater, 500 feet northwest of, 120 feet south of road; chisel point on top of boulder.....	3, 647. 89
Halemaumau Crater, on southeast edge of, 4 feet northeast of stone rest-house; in top of stone pier; bronze tablet stamped "3697".....	3, 696. 994
Halemaumau Crater, on north edge of, inside house of Massachusetts Institute of Technology, in top of concrete pier; bronze tablet stamped "3700".....	3, 700. 595
Halemaumau Crater, 0.4 mile east of, 10 feet east of stone corral, north side of trail; circle with white paint.....	3, 633. 84
Halemaumau Crater, 0.9 mile east of, north side of trail; circle with white paint, painted "U. S. B. M.".....	3, 544. 99
Halemaumau Crater, 1.9 miles east of, in northeast end of bottom stringer of bridge over large crack in lava; copper nail.....	3, 490. 24
Volcano House, on secondary triangulation station known as Volcano House Flag, 15 feet west of road, in front of hotel, in top of concrete pier; bronze tablet stamped "3973".....	3, 973. 090
Volcano House, 0.7 mile southeast of, crossing of old railroad grade, in top of wooden post on south side of road; copper nail.....	3, 882. 40

From Volcano House west and southwest along or near Kau Road 5.5 miles, thence east to Halemaumau Crater.

Volcano House, 0.9 mile west of, forks of road leading to Ollie Shipman's ranch house, on north side of road forks, in small ohia tree, about 18 inches above ground; copper nail.....	3, 997. 29
Volcano House, 2.2 miles west of, Uwekahuna primary triangulation station, in old drill hole in rock marking station and under large tripod; bronze tablet stamped "4088".....	4, 088. 261
Volcano House, 2.5 miles west of, 800 feet southeast of government prisoners' camp, on south side of old Kau road; copper nail in root of 6-inch ohia tree, painted "U. S. B. M.".....	3, 937. 18
Prisoners' camp, 0.9 mile southwest of, on north side of old Kau road, copper nail in root of 10-inch ohia tree, painted "U. S. B. M.", aluminum tag stamped "3802".....	3, 802. 48
Prisoners' camp, 2 miles southwest of, east edge of Keamoku lava flow, in rock 10 feet north of 18-inch culvert at small drain crossing; bronze tablet stamped "3632".....	3, 631. 971

Prisoners' camp, 3 miles southwest of, in southeast corner of crossing of old Peter Lee road and Kau road; chisel point on rock, painted "U. S. B. M.".....	Feet. 3,564.34
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From Kau road across country to Cone Flag.

Cone Flag, 1 mile northwest of; flag in small ohia tree on center of three lava bubbles; copper nail driven in lava 7 feet north of tree.....	3,580.22
Cone Flag, secondary triangulation station, 4 miles southwest of Volcano House, on highest point of rock ridge (tablet replaces galvanized iron spike driven in lava rock which originally marked station); bronze tablet stamped "3653" covered by mound of rock.....	3,653.642
Cone Flag, 1 mile east of, on west edge of smooth flat plateau, at base of flag; chisel point on rock.....	3,704.51
Cone Flag, 1.5 miles east of, on low rim of west edge of Kilauea Crater; ground at base of flag.....	3,659.09

From point near Volcano House northwest along Puu Oo trail 3 miles (double spur line).

Volcano House, 1.3 miles northwest of, Ollie Shipman's ranch house, 150 feet southwest of house; copper nail in root of large koa tree.....	4,014.39
Ollie Shipman's ranch house, 1.3 miles northwest of, north edge of level pasture lands, 6 feet east of wire fence; copper nail in root of large koa tree.....	4,018.38
Ollie Shipman's ranch house, 2.4 miles northwest of, at first rock ledge at north end of second flat, 15 feet south of large koa tree blazed with triangle, 25 feet west of trail, in rock; bronze tablet stamped "4321".....	4,321.415

From point 1.6 miles northwest of Devils Throat northwest along Cockett's trail to old prison camp.

Devils Throat, 1.6 miles northwest of, large crater with active steam crack, on northwest side of crater, between crater and trail; chisel point on top of large boulder.....	3,628.05
Devils Throat, 2.2 miles northwest of, at third crater, on east side of crater and east edge of trail; chisel point on rock, point encircled with white paint.....	3,646.72

From Devils Throat southwest to Puu Ohale triangulation station (single spur line to check vertical angles, checked by back-face rod readings).

Puu Ohale triangulation station, 10 feet south of, in rock surface; bronze tablet stamped "V. A".....	3,314.137
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PUNA QUADRANGLE.

[Latitude 19° 15'–19° 30'; longitude 155°–155° 15'.]

From point near Glenwood southwest along automobile road to Crater Hotel (Kilauea volcano) (part of double spur line).

Mountain View, 3.2 miles southwest of, at crossing of small gulch about 300 feet west of old Japanese camp; copper nail in mountainward side of bridge floor, painted "U. S. B. M.," aluminum tag stamped "2126.2".....	2,126.47
Mountain View, 4.25 miles southwest of, 0.65 mile northeast of Glenwood station, at 21-mile post, on seaward side of road; spike in base of telephone post, painted "U. S. B. M.," aluminum tag stamped "2204".....	2,204.22
Glenwood station; on southeast corner of Volcano stables, chisel point in stone foundation, painted "U. S. B. M 2295.2".....	2,295.50

Glenwood station, 0.5 mile southwest of, 1,000 feet southwest of 22-mile post, in ledge 30 inches above road and on mountainward side of road; bronze tablet stamped "2326".....	Feet. 2, 326. 752
Glenwood station, 1.3 miles southwest of, at 23-mile post, on seaward side of road; chiseled point on stone in rock ledge (bench mark is 2 feet above road), painted "U. S. B. M. 2477.9".....	2, 478. 22
Glenwood station, 2.3 miles southwest of, at 24-mile post, on mountainward side of road; chisel point on rock encircled by white paint.....	2, 669. 63
Glenwood station, 3.3 miles southwest of, 200 feet northeast of 25-mile post, in shelf of rock ledge 5 feet above ground; bronze tablet stamped "2824".....	2, 824. 275
Glenwood station, 4.3 miles southwest of, at sixth telephone pole west of beginning of long tangent in road, 8 feet northeast of telephone pole; chisel point on rock.....	3, 023. 82
Glenwood station, 5.4 miles southwest of, 75 feet east of 27-mile post, on seaward side of road; chisel point encircled with white paint on rock....	3, 321. 41
Glenwood station, 6.5 miles southwest of, 200 feet west of 28-mile post, on mountainward side of road, in rock outcrop; bronze tablet stamped "3565".....	3, 565. 399
Crater Hotel, 0.6 mile east of, 30 feet north of road, in top of corner fence post at southwest corner of Peter Lees's yard; copper nail.....	3, 743. 64
Crater Hotel, in concrete base to front steps; bronze tablet stamped "3821".....	3, 821. 036

From Crater Hotel south along short-cut road to main automobile road.

Crater Hotel, 0.3 mile southwest of, on north side of junction of short-cut road with automobile road from Volcano House; copper nail in top of small ohia stump.....	3, 870. 78
Crater Hotel, 1 mile south of, at short cut to Keauhou road by Twin Craters, on west side of automobile road; copper nail in top of small ohia stump..	3, 928. 76

From Twin Craters south along Keahou road 3.2 miles, thence west and north to old prison camp (double run circuit).

Crater Hotel, 1.5 miles south of, at first flag on west side of road; copper nail in top of small ohia stump, aluminum tag stamped "3833.4".....	3, 833. 66
Crater Hotel, 2.5 miles southeast of, 2,300 feet south of bottom of steep rise in road, on south edge of rock outcrop; copper nail in rock in circle of red paint, aluminum tag stamped "3589".....	3, 589. 08
Crater Hotel, 3.3 miles southeast of, on east side of road; chisel point in circle of white paint on rock, aluminum tag stamped "3340".....	3, 439. 89
Junction of Keahou road and Hulu Hulu trail; copper nail in root of ohia tree.....	3, 269. 30
Crater Hotel, 4 miles southeast of, at junction of Keahou road and Puu Hulu Hulu trail, about 15 feet north of road is small ohia tree blazed, 6 feet west of this tree is cement cylinder set in ground and protruding above surface 6 inches, in top of cylinder; bronze tablet stamped "3269".....	3, 269. 690
Crater Hotel, 3.7 miles southeast of, at junction of new cut trail with Keahou road, on south edge of road; copper nail in ohia stump, aluminum tag stamped "3351".....	3, 351. 60
Devils Throat, 0.5 mile east of, 100 feet north of large crater on Cockett's trail, 10 feet south of trail; chisel point in circle of white paint, marked "3356.4".....	3, 356. 88
Devils Throat, 270 feet east of, on north side of Cockett's trail; chisel point in circle of white paint on top of large boulder.....	3, 391. 30

Devils Throat, 270 feet east of, on north side of Cockett's trail, in top of large boulder 4 feet east of above temporary bench mark; bronze tablet stamped "3390".....	Feet. 3, 390. 610
Devils Throat, 0.9 mile northwest of, at first crater west, just west of crater is rocky hill, on south edge of trail at nearest point to crater; copper nail in root of ohia tree.....	3, 521. 25

From forks of Keauhou road and Kalapaua trail south to Puu Huluhulu triangulation station (single spur line checked by back-rod readings).

Forks of Kalapaua trail and trail to Puu Huluhulu triangulation station, about 900 feet southwest of triangulation station; copper nail in root of 6-inch ohia tree, painted "U. S. B. M.".....	3, 242. 38
Puu Huluhulu triangulation station, 0.25 mile south of, at forks of trail to Opeluhaalili crater; copper nail in root of ohia tree, painted "U. S. B. M.".....	3, 188. 47
Puu Huluhulu triangulation station, 0.4 mile south of, at old trail crossing; copper nail in root of ohia tree painted "U. S. B. M.".....	3, 135. 57

From forks of Keauhou road and Kalapaua trail along trail southeast 0.6 mile (single spur line checked by vertical angles and back-rod readings).

Forks of Keauhou road and Kalapaua trail, 0.6 mile south of, on west side of road; copper nail in root of tree, painted "U. S. B. M.".....	3, 239. 90
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KAUAI ISLAND.

Kapaa, Lihue, Na Pali, and Waimea, 15' quadrangles, including area shown on Hanalei, Hanapepe, Kilauea, Kapaa, Lihue, Mana, and Na Pali atlas sheets.

KAUAI COUNTY.

The following elevations are based upon mean sea level through Coast and Geodetic Survey bench mark No. 1 at Eleele Landing. This bench mark is the highest point of the head of an eyebolt set in rocky ledge just north of Eleele Landing, into which is hooked a stay rod. The elevation is 13.90 feet above zero of gage, and 12.24 feet above mean sea level. The tidal observations were made between February 16 and March 11, 1904, the mean range being 1.02 feet.

The leveling was done in 1910 by L. F. Biggs.

KAPAA QUADRANGLE (including area shown on Kapaa and Kilauea atlas sheets).

[Latitude 22°-22° 15'; longitude 159° 15'-159° 30'.]

From 1.2 miles northeast of Hanamaulu northeast along county road to Kealla, thence north to Anahola, thence northwest to Hanalei.

Hanamaulu, 1.2 miles northeast of, south edge of road, at end of stone fence, opposite end of flume, 150 feet west of end of macadam road, in concrete culvert over irrigation ditch; copper bolt marked "66".....	Feet. 65. 873
Hanamaulu, 2 miles northeast of, northeast corner of concrete culvert over irrigation ditch; chiseled point painted "11".....	10. 46
Hanamaulu, 3.1 miles northeast of, south edge of road, where flume crosses road, in base of flume support; copper bolt, aluminum tag stamped "51".	51. 08
Wailua River, northeast corner of steel bridge, on top of concrete pier; bronze tablet stamped "12".....	11. 882

	Feet.
Wailua River, 1.3 miles northeast of, north end of race track, north edge of road, 150 feet west of frame house; spike in base of telephone pole, aluminum tag stamped "7"	6.57
Wailua River, 1.8 miles northeast of, northeast corner of concrete bridge over creek, on top of guardrail; copper bolt marked "12"	11.00
Kapaa, northeast corner of concrete bridge over drain; chiseled point painted "12"	11.55
Kapaa, east end of town, 50 feet east of old chimney, northeast corner of concrete culvert; chiseled point painted "11"	10.87
Kealia, west end of town, northeast corner of bridge over Kapaa River; iron bolt on top of concrete pier, painted "11"	10.56
Kealia, 150 feet north of post office, southeast corner of concrete culvert; chiseled point painted "12"	11.68
Kealia, northwest corner of Kealia store, 3 feet above ground, in concrete foundation; bronze tablet stamped "14"	13.790
Kealia, 300 feet west of breakwater, in fence corner, in boulder; bronze tablet stamped "18"	18.128
Kealia, 0.4 mile northeast of, south edge of road, on summit of steep grade; chisel point in milepost 11, painted "121"	120.48
Kealia, 1.4 miles northeast of, opposite junction of road to east; spike in base of telephone pole, aluminum tag stamped "242"	241.62
Kealia, 2.7 miles north of, at crossroads, northeast corner of cane field; chisel point on boulder, painted "425"	424.81
Kealia, 3 miles north of, at road junction; chisel point on stone culvert, painted "378"	377.75
Kealia, 3 miles north of, at road junction, east side of road, north side of ditch, in 6-inch tube of cement; bronze tablet stamped "377"	377.131
Kealia, 3.5 miles north of, opposite second-class road, on east bank of gulch; chisel point in milepost 14, painted "312"	311.46
Anahola, 500 feet east of church, opposite junction of road to landing, north edge of road; chisel point on boulder, painted "70"	70.09
Anahola, northeast corner of bridge over Anahola River; chisel point on top of concrete pier; aluminum tag stamped "18"	17.43
Anahola, 1 mile north of, west edge of road, 100 feet south of row of ironwood trees, at east end of stone fence; chisel point on boulder, painted "137"	136.66
Anahola, 1.4 miles north of, west end of concrete culvert over small creek, 250 feet north of small cabin; chisel point on culvert, painted "78," aluminum tag stamped "78"	78.27
Anahola, 2 miles north of, east edge of road; chisel point on top of milepost 17, painted "205"	204.52
Anahola, 3.1 miles north of, west edge of road, 200 feet north of second-class road west, 250 feet south of milepost 18; spike in base of telephone pole, aluminum tag stamped "256"	255.42
Milepost 18; chisel point in, painted "266"	265.67
Anahola, 4.1 miles north of, east side of road, 75 feet west of cabin, at new road; spike in base of ironwood tree, aluminum tag stamped "134"	133.99
Koolau schoolhouse, southwest corner of schoolyard, on top of iron pipe; aluminum tag stamped "321"	321.24
Koolau schoolhouse, southwest corner of schoolyard, in 6-inch tube of cement; bronze tablet stamped "320"	319.824
Koolau schoolhouse, 1 mile northwest of, 250 feet north of plantation stable, north side of road; spike in root of tree, aluminum tag stamped "295"	295.24

Koolau schoolhouse, 2 miles northwest of; copper bolt in top of milepost 22, aluminum tag stamped "299"	Feet. 298. 75
Koolau schoolhouse, 2.9 miles northwest of; copper bolt in top of milepost 23, aluminum tag stamped "310"	310. 19
Kilauea River, southeast corner of bridge, 50 feet east of junction of road to mill, 200 feet south of church; top of bolt on brace, painted "294"	294. 01
Kilauea River, 300 feet east of, southeast corner of church yard, north edge of road, in 10-inch tube of cement; bronze tablet stamped "296"	295. 475
Kilauea River, 0.8 mile west of, 300 feet east of schoolhouse, in fence corner; chisel point on cement monument, aluminum tag stamped "279"	278. 48
Kalihiwai River, 25 feet northeast of, on east margin of road, set in bed rock; bronze tablet stamped "15"	15. 027
Hanalei, 4 miles east of, north edge of road, at fence corner; spike in fence post, aluminum tag stamped "294"	294. 18
Hanalei, 3.4 miles east of, at gate to corral, on top of lower hinge; aluminum tag stamped "348"	347. 90
Hanalei, 2.2 miles east of, at road junction, large gate to field; spike in post, aluminum tag stamped "328"	327. 75
Hanalei, northwest corner of bridge over Hanalei River, on top of stone abutment; bronze tablet stamped "17"	17. 035
Hanalei; northwest corner of stone step of Hanalei Hotel, marked "11" ..	10. 70
Hanalei, 200 feet northwest of hotel and post office, south side of road, on fence line, set in top of concrete pier; bronze tablet stamped "12"	11. 574

From Kealia along plantation railroad north to Anahola.

Kealia landing, northwest corner of pier; spike in floor	3. 73
Kealia, 0.8 mile northeast of, southeast corner of railroad trestle; bolt head, painted "36"	36. 13
Kealia, 1.7 miles northeast of, south end of railroad trestle, 600 feet south of tunnel; bolt head, painted "54"	53. 62
Kealia, 2.6 miles northeast of, northeast corner of cement wall around cattle guard; chisel point, painted "54"	54. 15
Anahola landing, 1 mile south of, at lighthouse; top of eyebolt set in concrete, stamped "25"	24. 82
Anahola lighthouse, 30 feet north of, in concrete foundation of brace; bronze tablet, stamped "24"	24. 425

From Kealia west and south to east slope of Kilohana Crater.

Kealia, 0.7 mile west of, 1,000 feet north of school, 3 feet from telephone pole; aluminum tag, stamped "129"	129. 40
Kealia schoolhouse, 1.2 miles west of, 5 feet west of road, 30 feet north of railroad cut; chisel point on bowlder, painted "239"	239. 22
Kealia schoolhouse, 2.2 miles west of, at plantation house; spike in base of flag pole, aluminum tag stamped "307"	307. 04
Kealia schoolhouse, 2.2 miles west of, 0.7 mile southwest of where irrigation ditch crosses road, 15 feet south of large gate; chisel point on corner of stone ditch, painted "333"	332. 88
Kealia schoolhouse, 2.2 miles northwest of (2.5 miles west of?), at reservoir, north end of platform to water gate; spike in post, aluminum tag stamped "369"	369. 14
Kealia schoolhouse, 2.2 miles northwest of (2.5 miles west of?), at reservoir, north end of platform to water gate, in 6-inch tube of cement; bronze tablet stamped "369"	369. 378

Kealia schoolhouse, 2.2 miles west of, 0.6 mile southwest of reservoir, 50 feet east of road; top of iron pipe, stamped "468".....	Feet. 468. 244
Kealia schoolhouse, 2.2 miles west and 4.2 miles south of, 0.5 mile north of Nonou Mountain; spike in base of hau tree, aluminum tag stamped "355".....	357. 62
Wailua River, on north bank of, in direct line between Nonou and Puu Pilo mountains, where trail goes down to river; chisel point on boulder, painted "318".....	320. 83
Aahoaka Mountain, west slope of, 1.5 miles north of Wailua Falls, 500 feet northeast of house, at gate in stone fence; spike in base of post, aluminum tag stamped "357".....	360. 35
Wailua River, 200 feet north of falls, northeast corner of bridge; chisel point on concrete pier, painted "287".....	289. 60
Wailua River, 200 feet north of falls, northeast corner of stone abutment of bridge; bronze tablet, stamped "290".....	289. 652
Wailua River, 0.7 mile west of, 0.5 mile west of steel railroad bridge, north edge of road; chisel point on concrete culvert, painted "347".....	359. 82
Wailua River, 1.3 miles south of, at junction of Wailua Falls and Kilohana Crater roads; chisel point on large lava boulder, painted "374".....	374. 20
Junction of Wailua Falls and Kilohana Crater roads, 0.8 mile west of, on south edge of road; chisel point on concrete culvert, painted "456"....	459. 45
Junction of Wailua Falls and Kilohana Crater roads, 1.4 miles southwest of, south edge of road, on south bank of canyon, at junction of road to south; chisel point on boulder, painted "491".....	493. 70
East slope of Kilohana Crater, east edge of road, north bank of canyon, at fence corner; spike in base of fence post, aluminum tag stamped "773".....	774. 26
Kilohana Crater, 1.4 miles east of, at large gate; spike in base of gatepost, aluminum tag stamped "933".....	934. 45

From Hanamaulu to Kalepa triangulation station (part of line).

Kalepa triangulation station, 15 feet south of monument; chisel point on boulder, painted "706".....	705. 65
Kalepa triangulation station, in 6-inch tube set 2 inches above ground; bronze tablet stamped "710".....	709. 418

From point 2.2 miles east of Hanalei south along road and trail to junction of Wailua Falls and Kilohana Crater roads.

Hanalei, 3 miles southeast of, 1.5 miles south of road junction, at fence corner; spike in fence post, aluminum tag stamped "387".....	387. 15
Hanalei, 4.5 miles southeast of, southwest corner of small white house; spike in base of large tree, aluminum tag stamped "635".....	634. 70
Hanalei, 5 miles southeast of, where power line crosses road, at junction of road and trail; spike in base of power pole, aluminum tag stamped "827".....	826. 98
Hanalei, 5.9 miles south of, on trail along power line, 6 feet south of fence, in large boulder; bronze tablet stamped "1012".....	1, 011. 858
Hanalei, 7.2 miles south of; spike in base of first power pole south of line tender's cabin, aluminum tag stamped "1310".....	1, 303. 50
Hanalei, 8.2 miles south of, 0.9 mile south of line tender's cabin; spike in base of power pole, aluminum tag stamped "1525".....	1, 524. 32
Hanalei, 9.6 miles south of, at summit of pass at point called Kualapa; spike in base of power pole, aluminum tag stamped "2127".....	2, 127. 15
Hanalei, 9.6 miles south of, at summit of pass at point called Kualapa, 2 feet north of power pole, east edge of trail, in 6-inch tube of cement set flush with ground; bronze tablet stamped "2127".....	2, 127. 351

Summit of pass, 1.4 miles south of; spike in base of power pole, aluminum tag stamped "1399"	Feet. 1,399.05
Summit of pass, 2.4 miles south of, where power line crosses trail; spike in base of stump, aluminum tag stamped "1266"	1,265.28
Wailua Falls, 5.5 miles northwest of; spike in base of power pole, aluminum tag stamped "855"	865.71
Wailua Falls, 3.9 miles northwest of, 50 feet east of power line at corral; spike in base of tree, aluminum tag stamped "603"	612.91
Wailua Falls, 3.9 miles northwest of, 50 feet east of power line, 0.3 mile northeast of Hanahanapuni, at fence line, west end of gate, in 6-inch tube of cement; bronze tablet stamped "612"	612.409
Wailua Falls, 2 miles northwest of, 20 feet south of large gate at end of cane field; chisel point on large boulder, painted "451"	461.02
Wailua Falls, 0.9 mile northwest of, at end of railroad track, at large gate; spike in base of gate post, aluminum tag stamped "375"	384.55

From Kapaia northwest to Wailua Falls and Kilohana Crater road (part of line).

Kapaia, 1.4 miles northwest of, where railroad crosses road; spike in base of telephone pole, aluminum tag stamped "293"	292.68
Kapaia, 2 miles northwest of junction of second-class road; spike in base of gate post, aluminum tag stamped "329"	329.80

LIHUE QUADRANGLE (including area shown on Lihue atlas sheet).

[Latitude 21° 45'-22°; longitude 159° 15'-159° 30'.]

From a point 3.5 miles northeast of Homestead post office east to a point 0.6 mile northeast of Hanamaulu.

Homestead post office, 3.5 miles northeast of, on short-cut road to Lihue, 0.3 mile west of, southwest corner of pineapple plantation, southwest corner of concrete bridge over drain; chisel point painted "451"	451.43
Homestead post office, 3.8 miles northeast of, east end of gate to field road, opposite northeast corner of pineapple plantation; spike in post, aluminum tag stamped "487"	516.46
Homestead post office, 5.3 miles northeast of, 250 feet southeast of power line, 200 feet south of jog in fence line; spike in base of fence post, aluminum tag stamped "687"	687.28
Homestead post office, 6 miles northeast of, at junction of main road and northeast end of short-cut road to Lihue, in concrete culvert; bronze tablet stamped "623"	622.760
Homestead post office, 6.9 miles northeast of, 0.9 mile north of junction of short-cut road, where telephone line crosses road; spike in base of telephone pole, aluminum tag stamped "564"	563.36
Lihue, 5.5 miles northwest of, northwest corner of steel bridge over Huleia River; bolt in top of cover plate, painted "336"	336.091
Lihue, 4.1 miles northwest of, south edge of road, at head of small canyon; spike in base of fence post, aluminum tag stamped "481"	481.58
Lihue, 4.1 miles northwest of, south edge of road, at head of small canyon, in 6-inch tube of cement; bronze tablet stamped "481"	481.192
Lihue, 3.4 miles northwest of, south edge of road at T road south; spike in base of telephone pole, aluminum tag stamped "389"	389.04
Lihue, 2.2 miles northwest of, 0.5 mile west of A. S. Wilcox's residence, south side of road on brow of hill; spike in base of fence post, aluminum tag stamped "334"	333.51

Lihue, 1.7 miles northwest of, opposite lane to residence of A. S. Wilcox; spike in base of telephone pole, aluminum tag stamped "319".....	Feet. 319.03
Lihue, 0.6 mile northwest of, at crossroad, 0.5 mile west of sugar mill; spike in base of telephone pole, aluminum tag stamped "225".....	224.48
Lihue, 25 feet north of post office, concrete wall around flower beds, at base of telephone pole; copper bolt set in concrete wall, stamped "205".....	206.140
Lihue, 370 feet southeast of post office, 25 feet south of band stand, southwest corner of Lihue Park grounds, in concrete pier; bronze tablet stamped "207".....	206.470
Lihue, 0.8 mile northeast of, at road junction, 500 feet west of church, at corner of stone fence; chisel point on rock, painted "222".....	222.41
Lihue, 1.3 miles northeast of, on northwest corner of steel bridge over Hanamaulu River; bolt head on top of bearing plate, painted "89".....	88.961
Hanamaulu, at junction of road, where railroad crosses road, 200 feet south of store; spike in base of telephone pole, aluminum tag stamped "175".....	175.06
Hanamaulu, 0.6 mile northeast of, north edge of road at junction of second-class road through cane field, where telephone line crosses to south side of road; chisel point on bowlder, painted "74".....	73.80
From point 0.6 mile northwest of Lihue post office along roads to Nawiliwili, thence north to Lihue post office.	
Lihue post office, 1.2 miles southwest of, back road to landing, north end of ironwood tree, at entrance of lane; spike in base of fence post, aluminum tag stamped "207".....	206.57
Lihue post office, 0.5 mile south of, at entrance to Fairview Hotel; chisel point on curb of sidewalk, painted "172".....	171.66
Lihue post office, 25 feet north of; copper bolt in concrete wall around flower bed, painted "205".....	206.140
Lihue, 100 feet northeast of courthouse; copper bolt in concrete foundation of flagpole, stamped "139".....	139.13
Nawiliwili landing, southwest corner of bridge over Nawiliwili River; bolt head at top of bearing plate, aluminum tag stamped "10".....	8.89
Nawiliwili landing, southwest corner of churchyard, in concrete step on culvert; bronze tablet stamped "13".....	12.865
Nawiliwili landing, 0.6 mile north of, east edge of road; chisel point on concrete culvert of irrigation ditch, painted "150".....	149.44
From point 1.4 miles east of Kilohana Crater south to a point 4.1 miles northwest of Lihue post office.	
Kilohana Crater triangulation station, set in top of 10-inch pipe filled with cement; bronze tablet stamped "1133".....	1,133.564
Kilohana Crater, 0.5 mile southeast of, 0.4 mile south of mountain house; spike in fence post, aluminum tag stamped "964".....	966.86
Kilohana Crater, 1.3 miles south of; spike in fence post, aluminum tag stamped "728".....	731.24
From point 1.1 miles east of Lawai River northeast to point 6 miles northeast of Homestead post office.	
Lawai River, 1.1 miles east of, 50 feet north of store, 25 feet south of track; spike in base of telephone pole, aluminum tag stamped "85".....	84.84
Lawai, East Section, 0.8 mile east of road crossing, 200 feet east of switch; spike in base of telephone pole, aluminum tag stamped "47".....	47.00

Koloa, southeast corner of school yard, set in top of concrete pier; bronze tablet stamped "182"	Feet. 182. 623
Koloa, opposite sugar mill, northwest corner of bridge, in top of concrete pier; copper bolt stamped "211"	209. 704
Koloa, 0.7 mile north of, east edge of road, on summit of grade; spike in base of telephone pole, aluminum tag stamped "310"	310. 47
Koloa, 1.9 miles north of, southwest corner of bridge, 400 feet north of second-class road; spike in floor, aluminum tag stamped "425"	425. 17
Koloa, 2.3 miles north of, at forks of road; spike in base of telephone pole, aluminum tag stamped "553"	553: 58

From Hanamaulu toward Kalepa triangulation station (see Kapaa quadrangle for Kalepa triangulation station).

Hanamaulu, 0.4 mile north of, south end of stone fence; chisel point on rock, painted "270"	269. 55
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From Kapaia north to junction of Kiloohana Crater and Wallua Falls roads (part of line).

Kapaia, 0.7 mile northwest of, at plantation houses; spike in gatepost, aluminum tag stamped "257"	256. 55
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NA PALI QUADRANGLE (including area shown on Na Pali, Hanalei, and part of Mana atlas sheets).

[Latitude, 22°-22° 15'; longitude, 159° 30'-159° 45']

From point 2 miles southwest of Hanalei west to Wainiha.

Waiali River, northwest corner of bridge over; copper bolt in rail brace, aluminum tag stamped "8"	7. 59
Hanalei, 2 miles southwest of, northwest corner of bridge over slough; top of bolthead, painted "12"	11. 66
Hanalei, 2.9 miles west of, north edge of road, at sharp bend; spike in fence post, aluminum tag stamped "150"	149. 72
Lumahai River, northwest corner of bridge; top of bolt, aluminum tag stamped "17"	16. 89
Wainiha, northwest corner of bridge over Wainiha River; top of bolthead, aluminum tag stamped "14"	14. 09
Wainiha, northeast corner of Kauai Electric Co.'s powerhouse, 4 feet above ground, set in wall; bronze tablet stamped "101"	100. 292
Wainiha, 25 feet west of powerhouse, west edge of road, in boulder; bronze tablet stamped "110"	109. 261

From point 3 miles northwest of Kekaha, northwest to point 3 miles north of Mana.

E. A. Knudsen's residence, 1 mile north of, junction of road to pumping station; spike in base of gatepost, aluminum tag stamped "32"	31. 99
E. A. Knudsen's residence, 2.5 miles north of, at junction of second-class road; spike in base of gatepost, aluminum tag stamped "14"	13. 76
E. A. Knudsen's residence, 3.3 miles north of, at road to pumping station, on top of lower hinge of small gate; aluminum tag stamped "17"	16. 53
E. A. Knudsen's residence, 4.6 miles north of, 300 feet south of Mana schoolhouse, opposite store; spike in root of tree, aluminum tag stamped "10"	10. 32
Mana schoolhouse, northeast corner of school yard, in 6-inch tube of cement; bronze tablet stamped "10"	9. 840

Mana schoolhouse, 1.4 miles north of, large frame house; spike in base of gatepost, aluminum tag stamped "9".....	Feet. 8.50
Mana schoolhouse, 2.5 miles north of, at large gate across road; spike in gatepost, aluminum tag stamped "8".....	7.49
Mana schoolhouse, 2.9 miles north of, 500 feet north of railroad crossing, 150 feet west of road, 10 feet east of iron pipe; chisel point on rock, painted "35".....	35.43
Mana schoolhouse, 2.9 miles north of, 500 feet north of railroad crossing, 150 feet west of road, at secondary triangulation station, in 6-inch tube of cement; bronze tablet stamped "36".....	35.623

From Camp Nine northeast to intake of Olokele ditch (single spur line).

Camp Nine, 0.6 mile north of, 50 feet south of large gate, at end of cane field; spike in bridge over drain, aluminum tag stamped "1170".....	1, 169.74
Camp Nine, 3.5 miles northeast of, 50 feet south of road, at opening in tunnel, 200 feet south of forks of trail, on concrete sill of ditch; chisel point, painted "1412".....	1, 412.18
Camp Nine, 3.6 miles northeast of, 400 feet south of opening in tunnel where trail goes over hill; chisel point on bowlder, painted "1417".....	1, 417.44
Camp Nine, 4.3 miles northeast of; chisel point on bowlder, painted "1538".....	1, 538.06
Camp Nine, 4.5 miles northeast of, on short sharp ridge above house in bottom of canyon; chisel point on bowlder, painted "1467".....	1, 467.18
Olokele ditch, 3.8 miles west of intake, opposite ditch tender's cabin, set in retaining wall of ditch; bronze tablet stamped "1427".....	1, 426.549
Olokele ditch, 2.7 miles west of intake; spike in base of tree, aluminum tag stamped "1437".....	1, 434.60
Olokele ditch, 1 mile west of intake; spike in base of tree, aluminum tag stamped "1411".....	1, 409.08
Olokele ditch, 30 feet south of intake, on top of concrete retaining wall of flood gates; bronze tablet stamped "1477".....	1, 477.165

From point 1.5 miles northwest of Kekaha, northeast along road and trail via Puu Ka Pele to Wainiha Bluff (single spur line).

E. A. Knudsen's residence, 2 miles north of, 25 feet east of second-class road; chisel point on bowlder, painted "1137".....	1, 136.60
E. A. Knudsen's residence, 2.9 miles northeast of, north edge of road, 500 feet west of fence; chisel point on bowlder, painted "1538".....	1, 537.21
E. A. Knudsen's residence, 4.5 miles north of, at cluster of koa trees; copper bolt in root of tree, aluminum tag stamped "2129".....	2, 129.09
E. A. Knudsen's residence, 5 miles northeast of, west edge of road, in large lava bowlder; bronze tablet stamped "2320".....	2, 319.321
E. A. Knudsen's residence, 6 miles northeast of, 25 feet northwest of road; spike in base of tree, aluminum tag stamped "2620".....	2, 620.10
E. A. Knudsen's residence, 6.7 miles northeast of, west edge of road; on point of ridge; copper bolt in root of koa tree, aluminum tag stamped "2977".....	2, 977.095
Puu Ka Pele, 0.8 mile south of, west of road, at sharp bend; chisel point on bowlder, painted "3296".....	3, 296.30
Puu Ka Pele, west slope of, west edge of road; chisel point on large bowlder, painted "3448".....	3, 448.14
Puu Ka Pele triangulation station, on top of iron pipe 8 inches above ground, painted "3661".....	3, 660.790

Puu Ka Pele triangulation station, 40 feet east of, in large lava boulder; bronze tablet stamped "3657".....	Feet. 3, 656. 981
Puu Ka Pele, 0.9 mile north of, west edge of road; chisel point on boulder, painted "3491".....	3, 491. 36
Puu Ka Pele, 2 miles north of, 10 feet south of large gate; chisel point on large boulder, painted "3434".....	3, 434. 55
Puu Ka Pele, 2.8 miles north of, at junction of road to Fryer's summer cottage; copper bolt in root of kau tree, aluminum tag stamped "3645"....	3, 645. 52
Knudsen summer cottage, 0.5 mile east of, at junction of trails; spike in base of kau tree, aluminum tag stamped "3695".....	3, 694. 70
Puu Ka Pele, 4.7 miles north of, 0.2 mile west of Hansens camp, at gate to pasture, in large boulder; bronze tablet stamped "3545".....	3, 544. 029
Hansens camp, 1 mile north of, east edge of trail, on summit of ridge; spike in base of lehue tree, aluminum tag stamped "3757".....	3, 755. 60
Hansens camp, 1.3 miles northeast of, east edge of trail; spike in root of stump, aluminum tag stamped "3614".....	3, 613. 70
Kauaikinana River, on west bank of canyon, 150 feet above river, where trail makes sharp bend to north; spike in base of tree, aluminum tag stamped "3375".....	3, 375. 42
Kauaikinana River, 0.5 mile northeast of, at junction of trail to Dodge camp; spike in base of tree, aluminum tag stamped "3723".....	3, 722. 66
Kawaikoi River, 0.3 mile west of, west edge of meadow, west edge of trail; spike in base of tree, aluminum tag stamped "3932".....	3, 931. 67
Kawaikoi River, north bank of, where trail goes up ridge; spike in root of tree, aluminum tag stamped "3694".....	3, 694. 74
Kawaikoi River, south bank of, in large boulder, on north edge of trail; bronze tablet stamped "3692".....	3, 692. 807
Kawaikoi River, 0.4 mile north of, west edge of first swamp, west edge of trail; spike in base of tree, aluminum tag stamped "4019".....	4, 011. 95
West edge of Alakai swamp, east edge of trail; spike in base of small lihua tree, aluminum tag stamped "4040".....	4, 024. 06
Northeast edge of swamp, on bluff above Wainiha, north edge of trail; spike in base of tree, aluminum tag stamped "4022".....	4, 021. 92
Northeast edge of swamp, 30 feet west of edge of bluff above Wainiha, set in boulder; bronze tablet stamped "4023".....	4, 022. 725

WAIMEA QUADRANGLE (including area shown on Hanapepe and part of Mana atlas sheets).

[Latitude 21° 45'-22"; longitude 159° 30'-159° 45'.]

From Eleele landing along county road northeast to point 2.4 miles northeast of Homestead post office.

Eleele, McBride Co.'s warehouse, northwest corner, on cement foundation; chiseled cross (U. S. C. E. b. m.).....	28. 863
Copper bolt set 4 inches from above bench mark, stamped "U. S. B. M. 29".....	28. 870
Eleele landing, 150 feet south of McBride warehouse, 100 feet north of flagpole, 30 feet east of breakwater, in top of concrete pier; bronze tablet ..	34. 667
Eleele landing, base of flagpole (U. S. C. E. b. m.).....	31. 520
Eleele, 0.5 mile northeast of, 250 feet southwest of McBride warehouse, J. I. Silvias store at road junction; spike in base of telephone pole, marked "86".....	86. 30
Eleele, 0.7 mile northeast of, 150 feet southwest of McBride plantation store, opposite junction of road to McBride sugar mill; at corner of stone fence; chisel point on large boulder, painted "159".....	158. 49

Eleele, 1.5 miles northeast of, at junction of main road between Waimea and Lihue, east margin of road; chisel point on boulder, painted "291".	Feet. 291. 10
Eleele, 2.5 miles northeast of, on main road between Waimea and Lihue, at junction of second-class road, on brow of short sharp pitch in road, where irrigation ditch crosses road; spike in base of telephone pole, aluminum tag stamped "479".	478. 61
Eleele, 3.4 miles northeast of, 1,000 feet north of concrete bridge, west end of rock fence, south bank of canyon; chisel point on rock, painted "498".	497. 52
Eleele, 3.9 miles northeast of south edge of road, 50 feet west of crossroads; copper bolt in lava boulder, stamped "631".	631. 434
Eleele, 4.7 miles northeast of, 1,000 feet north of Homestead Catholic Church, at crossroads; chisel point on property line corner stone, aluminum tag stamped "701".	700. 46
Homestead, 300 feet west of post office, at T road south, south side of road, in 6-inch tube of concrete; bronze tablet stamped "700".	700. 046
Homestead post office, 0.7 mile northeast of, northeast corner of concrete bridge over small creek; chisel point, painted "517".	517. 14
Homestead post office, 1.2 miles northeast of, southwest of concrete culvert; chisel point, painted "400".	439. 82
Homestead post office, 2 miles northeast of, 300 feet west of Kauai Fruit & Land Co.'s cannery, southwest corner of concrete bridge; bronze tablet stamped "436".	436. 224
Homestead post office, 2.4 miles northeast of, at junction of main road and short cut to Lihue, where flume crosses road; chisel point on boulder, painted "544".	544. 40

From Eleele landing east along railroad to point 0.5 mile east of Lawai River.

Eleele landing, northwest corner of foundation of McBride warehouse; copper bolt set in concrete, stamped "29".	28. 877
Eleele landing, 1.7 miles east of, at McBride plantation stables, 50 feet north of barn; spike in base of power pole, aluminum tag stamped "173".	173. 00
Wahiawa sugar mill, opposite north end of round house; spike in base of power pole, aluminum tag stamped "207".	207. 13
Wahiawa sugar mill, 1 mile east of, at east end of cane field, where railroad makes sharp bend; spike in base of telephone pole, aluminum tag stamped "235".	234. 53
Wahiawa sugar mill, 1.6 miles east of, north end of railroad bridge; copper bolt in floor, aluminum tag stamped "234".	233. 69
Wahiawa sugar mill, 2.4 miles east of, where railroad crosses inverted siphon; chisel point on concrete culvert, painted "234".	233. 73
Lawai, West Section, at point of switch, 200 feet north of stables; spike in base of telephone pole, aluminum tag stamped "203".	202. 97
Lawai River, on north bank of canyon, at road crossing, 25 feet east of track; chisel point on boulder, painted "123".	123. 11
Lawai River, west end of railroad bridge, 1,000 feet north of pumping station; spike in base of power pole, aluminum tag stamped "47".	46. 78
Lawai River, 0.5 mile east of, 10 feet north of track, at road crossing, at corner of stone fence; chisel point on boulder, painted "128".	128. 32

From Eleele landing northwest along roads through Waimea and Kekaha to point near E. A. Knudsen's residence (double line).

Hanapepe River, on beach at mouth of, top of iron bolt set in concrete.	2. 06
Hanapepe River, southeast corner of bridge over; bolt head on brace, aluminum tag stamped "11".	10. 93

	Feet.
Eleele landing, 2.1 miles west of, 50 feet west of railroad crossing, north edge of road; spike in base of telephone pole, aluminum tag stamped "136".....	136. 06
Eleele landing, 2.5 miles west of, summit of hill, at gate 12 to cornfield; spike in gate post, aluminum tag stamped "194".....	194. 24
Eleele landing, 2.9 miles west of, west end of plantation house, at junction of road to east; chisel point on bowlder, painted "195".....	194. 44
Makaweli, 0.5 mile east of Makaweli sugar mill, at crossroad where power line crosses road; spike in base of power pole, aluminum tag stamped "185".....	185. 27
Makaweli, 0.5 mile north of sugar mill, at crossroad, south side of road, in top of 6-inch tube of cement; bronze tablet stamped "185".....	184. 772
Waimea, 3.2 miles south of, bend of road, on south bank of canyon, 50 feet east of large gate where telephone line crosses canyon; spike in base of telephone pole, aluminum tag stamped "100".....	99. 78
Waimea, 1.5 miles south of, junction of roads; chisel point on east end of concrete culvert, painted "21".....	21. 03
Waimea, 1.1 miles south of, at entrance of lane to Mr. Robinson's residence; chisel point on base of stone gate post, painted "48".....	48. 19
Waimea, southwest corner of steel bridge over Waimea River, on top of concrete pier; bronze tablet stamped "14".....	13. 593
Waimea, 500 feet north of courthouse, 75 feet south of road junction, at east entrance road; chisel point on bowlder, painted "15".....	14. 84
Waimea, 50 feet east of courthouse, in top of concrete pier set 2.5 feet in ground, and 1 foot above ground; bronze tablet stamped "9".....	9. 091
Waimea, 0.9 mile west of, 200 feet west of dairy, north edge of road; spike in root of tree, aluminum tag stamped "8".....	7. 70
Waimea, 2.1 miles northwest of, southwest corner of bridge; copper bolt in floor, aluminum tag stamped "7".....	6. 60
Kekaha, 1,300 feet northwest of sugar mill, west edge of road, 100 feet east of post office; copper bolt in root of tree, aluminum tag stamped "8"....	8. 70
Kekaha, 300 feet east of post office, north side of road, in fence corner, set in 6-inch tube of cement; bronze tablet stamped "9".....	9. 171
Kekaha, 1 mile northwest of, 0.5 mile southeast of E. A. Knudsen's residence, north edge of road where power line crosses road; spike in base of stump, aluminum tag stamped "33".....	32. 91
E. A. Knudsen's residence, 200 feet south of, northeast corner of bridge at Hoca Creek; top of bolt head, aluminum tag stamped "35".....	35. 34
E. A. Knudsen's residence, 300 feet south of east abutment of bridge; bronze tablet stamped "34".....	33. 430
From Hanapepe north along road and trail to Puu Lani triangulation station (single spur line).	
Hanapepe, 0.7 mile north of, at railroad crossing; spike in base of fence post, aluminum tag stamped "166".....	165. 60
Hanapepe, 1.2 miles north of, at road junction; spike in base of fence post, aluminum tag stamped "237".....	236. 81
Hanapepe, 2.1 miles north of, where main ditch crosses road, northeast corner of bridge; copper bolt in floor, stamped "435".....	435. 136
Hanapepe, 2.5 miles north of, at large gate across road; spike in post, aluminum tag stamped "566".....	566. 56
Puu Lani, on east slope of, 300 feet west of road junction, at field gate; spike in base of fence post, aluminum tag stamped "761".....	761. 31
Puu Lani triangulation station, on top of iron pipe, stamped "1023".....	1, 023. 554
Puu Lani triangulation station, in 10-inch tube of cement set 2 inches above ground; bronze tablet stamped "1023".....	1, 023. 389

From point 1.5 miles southeast of Waimea north to Camp Nine (single spur line).

	Feet.
Francis Gay's residence, 1 mile northeast of, on second-class road at reservoir; spike in base of post at gate A, aluminum tag stamped "384".....	385. 42
Francis Gay's residence, 1.8 miles northeast of, at Camp Eight; spike in base of telephone pole, aluminum tag stamped "556".....	557. 30
Camp Eight, 0.6 mile north of; spike in base of telephone pole, aluminum tag stamped "757".....	757. 73
Camp Eight, 1 mile north of where irrigation ditch crosses road; spike in floor of bridge, aluminum tag stamped "898".....	899. 23
Camp Eight, 2.2 miles north of, where main ditch crosses road; spike in base of telephone pole, aluminum tag stamped "1031".....	1, 032. 20
Camp Nine, 0.3 mile south of, where main ditch crosses road, 5 feet north of ditch, 500 feet south of cabins, in 6-inch tube of cement; bronze tablet stamped "1032".....	1, 032. 771

From point 1 mile northwest of Kekaha to point 0.9 mile north of E. A. Knudsen's residence (single spur line).

E. A. Knudsen's residence, 0.5 mile north of, where power line crosses road; spike in base of power pole, aluminum tag stamped "253".....	252. 94
E. A. Knudsen's residence, 0.9 mile north of, 100 feet south of reservoir; spike in base of power pole, aluminum tag stamped "561".....	560. 57

APPENDIX.

SECONDARY ELEVATIONS.

Secondary elevations from records and topographic maps of the United States Geological Survey are given below. The figures are approximate only and should not be used for accurate work.

Locality.	Quadrangle.	Island or county.	Elevation.
Aahoaka.....	Kapaa.....	Kauai.....	<i>Fect.</i> 805
Ahualiku.....	Waimea.....	do.....	1,224
Alae Crater, bottom of.....	Kilauea Crater.....	Hawaii.....	2,589
Alealau triangulation station.....	Na Pali.....	Kauai.....	3,883
Anahola.....	Kapaa.....	do.....	1,516
Anguene, 4 miles west of Honokaa village and 1 mile south of Government road; bronze tablet in rock marking original station, stamped "1608 V. A." (vertical angle b. m.).	Waipio.....	Hawaii.....	1,608
Cone Peak.....	Kilauea Crater.....	do.....	3,653
Eke, high point in upper end of land of Kawaihar 2, about 5 miles northwest of Waimea village.	Waipio.....	do.....	5,311
Haiku, on small hill about 3,500 feet south of Ninole railroad station; bronze tablet in top of concrete cylinder marking station, stamped "683 V. A." (vertical angle b. m.).	Honomu.....	do.....	683
Halaula.....	Na Pali.....	Kauai.....	1,055
Haleone.....	Kapaa.....	do.....	2,006
Haloa, high point about 2 miles northeast of Waimea Village.	Waipio.....	Hawaii.....	4,070
Hanahanapuni triangulation station.....	Kapaa.....	Kauai.....	911
Hanalei.....	do.....	do.....	2,260
Haupu.....	Lihue.....	do.....	2,280
Hihimanu triangulation station.....	Kapaa.....	do.....	2,262
Hokunui.....	Lihue.....	do.....	1,605
Hono o Na Pali.....	Na Pali.....	do.....	3,312
Humuula, on north slope of ridge about 1.2 miles southeast of Ookala, in top of concrete post; bronze tablet stamped "1085 V. A." (vertical angle b. m.).	Hamakua.....	Hawaii.....	1,085
Iole.....	Kapaa.....	Kauai.....	2,620
Kaaha.....	Na Pali.....	do.....	2,923
Kaala triangulation station, on summit of high hill known as Puu Kaala, 3 miles northeast of Waimea village, in concrete cylinder marking station; bronze tablet stamped "3983 V. A." (vertical angle b. m.).	Waipio.....	Hawaii.....	3,983
Kehena triangulation station, about 8 miles northwest of Kawaihae, bronze tablet stamped 268 (vertical angle b. m.).	Kohala.....	do.....	268
Kanakeakua.....	Na Pali.....	Kauai.....	3,423
Kahili.....	Kapaa.....	do.....	2,569
Do.....	Lihue.....	do.....	3,076
Kaholo triangulation station, 2 miles west of Ookala and 350 feet south of government road, in top of large concrete post; bronze tablet stamped "952 V. A." (vertical angle b. m.).	Hamakua.....	Hawaii.....	952
Kainamanu triangulation station.....	Na Pali.....	Kauai.....	4,086
Kaiwilahilahi triangulation station, about 0.3 mile east of Papaaloa post office, in top of large concrete cylinder marking station; bronze tablet stamped "284 V. A." (vertical angle b. m.).	Honomu.....	Hawaii.....	284
Kaiwiki triangulation station, bronze tablet stamped 1210.	do.....	do.....	1,210
Kalalea.....	Kapaa.....	Kauai.....	3,555
Kalanipuu.....	Lihue.....	do.....	786

Locality.	Quadrangle.	Island or county.	Elevation. <i>Feet.</i>
Ka Lehua Hakihaki	Na Pali	Kauai	3,548
Kaliko	Kapaa	do	4,189
Ka Loko reservoir, water surface	do	do	727
Kalualea	Lihue	do	1,816
Kamakeanu	Na Pali	do	3,870
Kamanu	Kapaa	do	3,363
Kamaulele	Lihue	do	1,497
Kamoku triangulation station	Kapaa	do	763
Kapailu	Na Pali	do	2,051
Kapalaea	Waimea	do	3,275
Kapalikeya	Na Pali	do	1,015
Kapehuala	Kapaa	do	3,130
Kapohakau	Waimea	do	1,429
Kapuaa	Na Pali	do	2,854
Kaukaopua	Kapaa	do	1,292
Kaumanalehua	do	do	2,301
Kauku triangulation station, on north side of high hill about 4 miles west of Honoumu, in 9 by 9 by 20 inch rock marking station; bronze tablet stamped "1956 V. A." (vertical angle b. m.).	Honomu	Hawaii	1,956
Kaunu-o-kaleihoohe, highest point in Kohala Mountains (marked on Government maps as "Summit"), about 5.5 miles northwest of Waimea village.	Waipio	do	5,505
Kawakini	Kapaa	Kauai	5,170
Kawailewa	do	do	3,315
Kawaiumakua	do	do	1,670
Kawela triangulation station; in concrete pier marking original station; bronze tablet stamped "940 V. A." (vertical angle b. m.).	Waipio	Hawaii	942
Kaweliko	Lihue	Kauai	687
Keanakakoi Crater, bottom of	Kilauea Crater	Hawaii	3,455
Keanapuka	Na Pali	Kauai	4,064
Keapua	do	do	4,350
Keawanui triangulation station, about 6 miles northwest of Kawaihae, bronze tablet stamped "101 V. A." (vertical angle b. m.).	Kohala	Hawaii	101
Kekoiki	Kapaa	Kauai	2,805
Keopaweo	Lihue	do	1,163
Kikoo triangulation station	Kapaa	do	1,484
Kilauea Iki Crater, bottom of	Kilauea Crater	Hawaii	3,130
Kilauea triangulation station	Kapaa	Kauai	570
Kiloa	do	do	2,383
Kipole	Na Pali	do	2,978
Koali	do	do	4,160
Koholalele primary triangulation station, on east end of flat-topped hill, about 1.2 miles southwest of Kukaiaiu, in top of concrete cylinder marking station; bronze tablet stamped "1506 V. A." (vertical angle b. m.).	Hamakua	Hawaii	1,506
Kokii	Lihue	Kauai	1,204
Koia reservoir, water surface	do	do	232
Koloakapohu	do	do	948
Kolopua	Na Pali	do	1,255
Kowaimanu	Lihue	do	1,353
Kuaha	Na Pali	do	3,975
Kuilie triangulation station, about 2 miles west of Honokaa village and about 1,700 feet south of Government road, in rock marking station; bronze tablet stamped "1431 V. A." (vertical angle b. m.).	Waipio	Hawaii	1,433
Laauihaihai	Lihue	Kauai	2,116
Laaukahi triangulation station	do	do	1,384
Laimi triangulation station, in cane field about 0.8 mile south of Honoumu and 200 feet west of Government road, in top of 12 by 12 by 24 inch rock marking station; bronze tablet stamped "365 V. A." (vertical angle b. m.).	Honomu	Hawaii	365
Maheo	Kapaa	Kauai	2,155
Makana, bronze tablet stamped 1200	Na Pali	do	1,200
Makaopuhi Crater, bottom of	Kilauea Crater	Hawaii	2,050
Makeopihi	Na Pali	Kauai	4,038
Mamalahoa	do	do	3,735
Maunahou	do	do	1,729
Maunapulu	do	do	1,729
Moaalele	do	do	4,054
Naluakeima	Lihue	do	1,310
Napau Crater, bottom of (elevation doubtful)	Kilauea Crater	Hawaii	2,550
Nonou, bronze tablet stamped 1238	Kapaa	Kauai	1,238
Oha	do	do	1,235

Locality.	Quadrangle.	Island or county.	Elevation. <i>Feet.</i>
Omoo.....	Lihue.....	Kauai.....	1,234
Ooluaili.....	Kapaa.....	do.....	471
Paauhau triangulation station, 1.8 miles south of Paauhau mill and 2,000 feet south of Government road, in top of granite post marking station; bronze tablet stamped "1348 V. A." (vertical angle b. m.).	Hamakua.....	Hawaii.....	1,350
Palehua.....	Na Pali.....	Kauai.....	4,252
Pali Eleele.....	do.....	do.....	3,160
Palikea.....	Kapaa.....	do.....	2,111
Do.....	Na Pali.....	do.....	1,332
Papaaloa triangulation station, at forks of road and trail, about 0.8 mile southwest of Papaaloa post office, in top of large concrete cylinder marking station; bronze tablet stamped "917 V. A." (vertical angle b. m.).	Honomu.....	Hawaii.....	917
Pau Ka Ele reservoir, water surface.....	Kapaa.....	Kauai.....	405
Phea.....	Na Pali.....	do.....	4,260
Pohakea.....	do.....	do.....	3,355
Pohakea triangulation station.....	Waimea.....	do.....	1,428
Pohakupele.....	Kapaa.....	do.....	4,352
Pohakupili, bronze tablet.....	do.....	do.....	2,589
Pooku, bronze tablet.....	do.....	do.....	460
Punohu triangulation station, on west summit of hill about 3 miles southeast of Mana, in concrete cylinder marking station; bronze tablet stamped "4321 V. A." (vertical angle b. m.).	Waiki.....	Hawaii.....	4,321
Puohenui.....	Kapaa.....	Kauai.....	560
Puu Aukai.....	Waimea.....	do.....	1,760
Puu Huluhulu triangulation station, on high hill known as Puu Huluhulu, about 6 miles southeast of Volcano House, in rock ledge about 5 feet south of south base of very large rock mound, center of which is station mark; bronze tablet stamped "3440 V. A." (vertical angle b. m.).	Kilauea Crater.....	Hawaii.....	3,443
Puu Huluhulu Crater, bottom of.....	do.....	do.....	3,290
Puu Iliahi.....	Na Pali.....	Kauai.....	3,337
Puu Io triangulation station, on north end of high hill known as Puu Io, about 8 miles southeast of Waimea village, in concrete cylinder marking station; bronze tablet stamped "4058 V. A." (vertical angle b. m.).	Waiki.....	Hawaii.....	4,059
Puuki.....	Kapaa.....	Kauai.....	1,323
Puu Kamaha.....	Na Pali.....	do.....	3,970
Puu Keakea.....	Kapaa.....	do.....	1,343
Puu Ki.....	Na Pali.....	do.....	1,687
Do.....	do.....	do.....	4,451
Puu Kona'ae.....	Kapaa.....	do.....	1,428
Puu Laau.....	Na Pali.....	Hawaii.....	3,451
Puu Loa triangulation station, about 7 miles northwest of Waimea village; bronze tablet stamped 4112 (vertical angle b. m.).	Kohala.....	Hawaii.....	4,112
Puu Maheu.....	Kapaa.....	do.....	858
Puu Manu.....	Na Pali.....	do.....	3,205
Puu Nopili.....	do.....	do.....	1,086
Puu Ohale triangulation station, about 4 miles south of Halemaumau Crater, in rock ledge about 10 feet southwest of flagpole in center of very large rock mound; bronze tablet stamped "3314 V. A." (vertical angle b. m.).	Kilauea Crater.....	Hawaii.....	3,317
Puu o Miki.....	Kapaa.....	Kauai.....	561
Puu Opae triangulation station.....	Na Pali.....	do.....	2,147
Puu o Papai triangulation station.....	Waimea.....	do.....	480
Puu Pa triangulation station, on west side of small crater about 2 miles southwest of Waimea village, in top of granite post marking station; bronze tablet stamped "2677 V. A." (vertical angle b. m.).	Waiki.....	Hawaii.....	2,677
Puu Pihakapu.....	Lihue.....	Kauai.....	723
Puu Pili triangulation station, about 10 miles northwest of Waimea village; bronze tablet stamped 4676 (vertical angle b. m.).	Kohala.....	Hawaii.....	4,676
Uluawaa.....	Kapas.....	Kauai.....	3,168
Uluhi.....	Lihue.....	do.....	838
U. S. stream gaging station; in upper end of Land of Kaiwika; bronze tablet stamped 2733.	Honomu.....	Hawaii.....	2,753
Wahiawa.....	Waimea.....	Kauai.....	831
Waiahuakua.....	Na Pali.....	do.....	3,950

Locality.	Quadrangle.	Island or county.	Elevation.
Waialeale; bronze tablet on highest point of island.	Kapaa.....	Kauai.....	<i>Fect.</i> 5,080
Waikoekeoe triangulation station, on pali about 1,200 feet west of Pacific Sugar Co.'s mill, in concrete pier marking station; bronze tablet stamped "400 V. A." (vertical angle b. m.).	Waipio.....	Hawaii.....	400
Waihunaahuna.	Kapaa.....	Kauai.....	412
Waipio triangulation station, on high bluff on west side of Waipio Canyon, 2,500 feet above trail, in rock marking station; bronze tablet stamped "1389 V. A." (vertical angle b. m.).	Waipio.....	Hawaii.....	1,389
Waipuni.....	Kapaa.....	Kauai.....	427
Wekiu.....	do.....	do.....	3,255

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