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State. Nearly one hundred rusts were obtained and about 250 collections of fleshy fungi, a group of which scarcely more than a dozen species have been reported from New Mexico. Probably more than 300 species of fungi have been added to the known flora of the State as a result of the expedition.

BOTANICAL EXPLORATIONS IN THE HAWAIIAN ISLANDS

During the summer of 1916, from June to November, Mr. A. S. Hitchcock, systematic agrostologist in the Department of Agriculture and custodian of the section of grasses of the division of plants in the National Museum, traveled in the Hawaiian Islands studying and collecting the flora, especially the grasses. Mr. Hitchcock was assisted by his son, A. E. Hitchcock. The islands visited were Kauai, Oahu, Lanai, Molokai, Maui, and Hawaii, these comprising all the islands of the main group except the two small ones Kahoolawe and Niihau. The islands are all of volcanic origin and the rock is lava except a very little that is coral formation. Kauai, the geologically oldest island, shows the greatest effect of erosion, the deep canyons rivaling in beauty the Grand Canyon of the Colorado. The rainfall on the mountains of the windward side is excessive, that of Waialeale, the highest peak of Kauai, being as much as 600 inches per annum. The lee side of the islands is arid, the rainfall being often reduced to less than 15 inches per annum. The islands to the south are successively younger, Hawaii, the largest, being now in a state of volcanic activity. On this island are the two highest peaks of the group, Mauna Kea, 13,825 feet, and Mauna Loa, 13,675 feet in height. Above 10,000 feet there is scarcely any vegetation upon these peaks, especially upon Mauna Loa which is made up of comparatively recent lava. There is much snow upon the peaks in winter and extensive banks persist throughout the year. The magnitude of the mountain mass is greater than at first appears, because the cones arise from the floor of the ocean 18,000 feet below the surface, thus making the total height over 30,000 feet. The gradual slope from the sea to the summit deceives the eye and the great height is not at first fully realized. Upon Hawaii is the active volcano Kilauea (4,000 feet) with its pit of boiling lava. What is said to be the largest crater in the world (Haleakala) is upon Maui, the second largest island of the group.

The important agricultural industries of the islands are sugar, live stock, and pineapples. The native Hawaiian population is decreasing. It is only in the less accessible parts of the islands that



FIG. 61.—A deeply eroded canyon of the Waimea River, Kauai.



FIG. 62.—A view of Mauna Kea near timber line. The small trees in the middle distance are mamani (*Sophora chrysophylla*). The grass in the foreground is *Koeleria glomerata*. Mauna Loa is seen in the distance. A cloud bank lies between at the left.

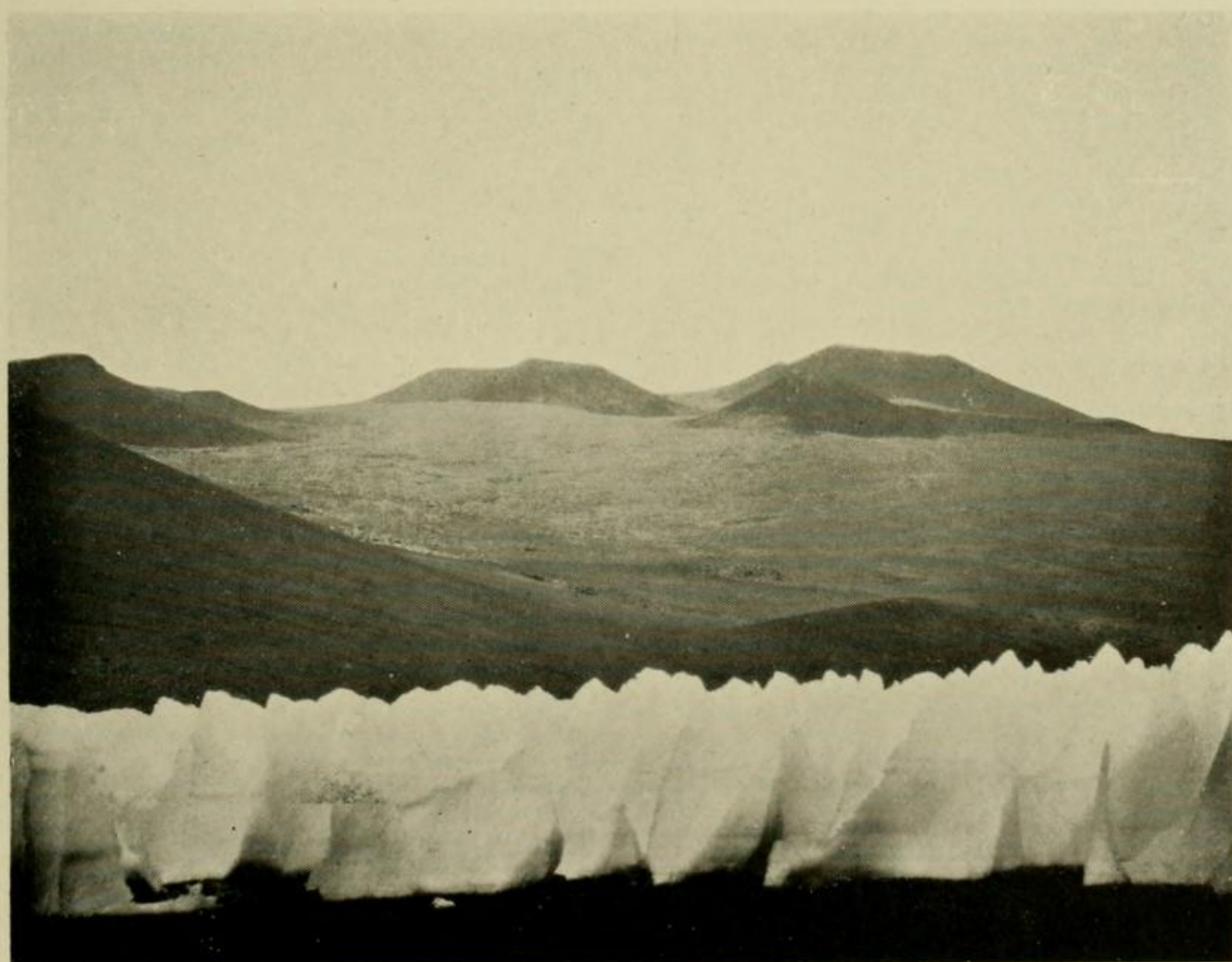


FIG. 63.—Near summit of Mauna Kea. Cinder cones in the distance. Snowbank in the foreground about 6 feet high (August).



FIG. 64.—A view in Haleakala crater showing the numerous cinder cones within the main crater.



FIG. 65.—A view in the eastern part of Haleakala crater, looking west, two cinder cones in the center.

the primitive customs still prevail. Here may be found the grass huts of the natives. These huts are made of a frame work of wood filled in with a thatch of grass. The grass used for this purpose is usually pili (*Heteropogon contortus*), an indigenous grass abundant upon the rocky soil of the lowlands.

The cultivated trees and shrubs are of great variety and beauty, and are drawn from all tropical and subtropical lands. The introduced flora is very pronounced in the region of the towns, ranches, and plantations. One must go several miles from Honolulu to find indigenous plants. Of 60 species of grasses found on Oahu about 50 were introduced. One of the introduced trees of great economic

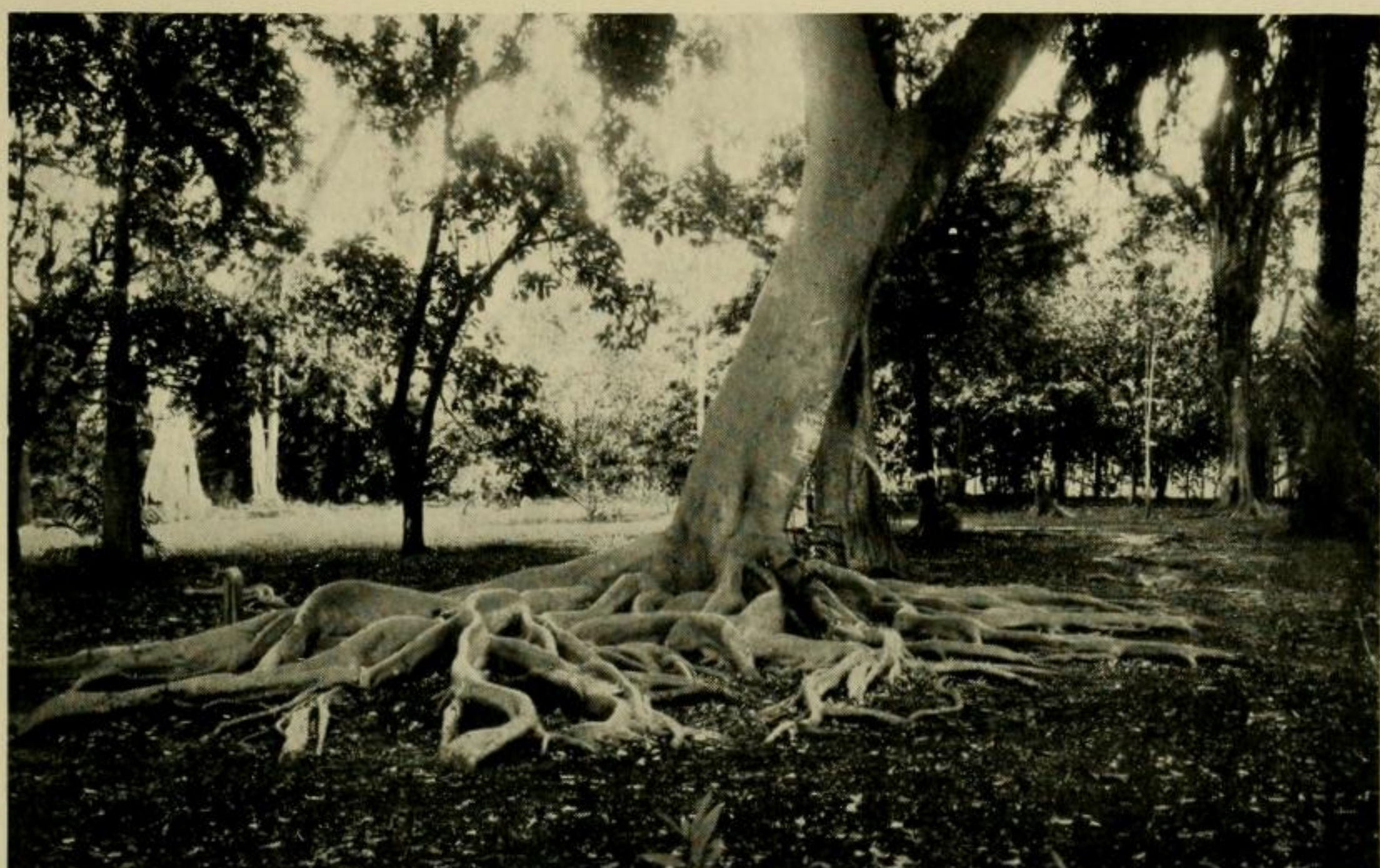


FIG. 66.—View in the garden in Honolulu, formerly owned by Dr. William Hillebrand, author of "Flora of the Hawaiian Islands," showing a tropical tree with brace roots.

importance is the algaroba tree, or kiawe, as the Hawaiians call it (*Prosopis juliflora*). It is found in a belt on the lowlands along the shores of all the islands and occupies the soil almost to the exclusion of other plants. The pods are very nutritious and are eagerly eaten by all kinds of stock. The flowers furnish an excellent quality of honey. The Molokai ranch produces 150 to 200 tons of strained honey per year. The prickly pear cactus (a species going under the name of *Opuntia tuna*) has become extensively naturalized in the dryer portions of all the islands. The ranchmen utilize this for feed when other kinds become scarce, the cattle eating the

succulent joints in spite of the thorns. Two introduced shrubs now occupy extensive areas and have become great pests. These are guava (*Psidium guajava*), whose fruit furnishes the delicious guava jelly, and lantana (*Lantana camara*), with clusters of handsome parti-colored flowers. In the moister portions of the islands large areas have been occupied by Hilo grass (*Paspalum conjugatum*) which has little value as a forage plant. The kukui or candlenut tree (*Aleurites moluccana*) with its light, almost silvery, green foliage is now a common and rather striking element in the valleys and gorges.

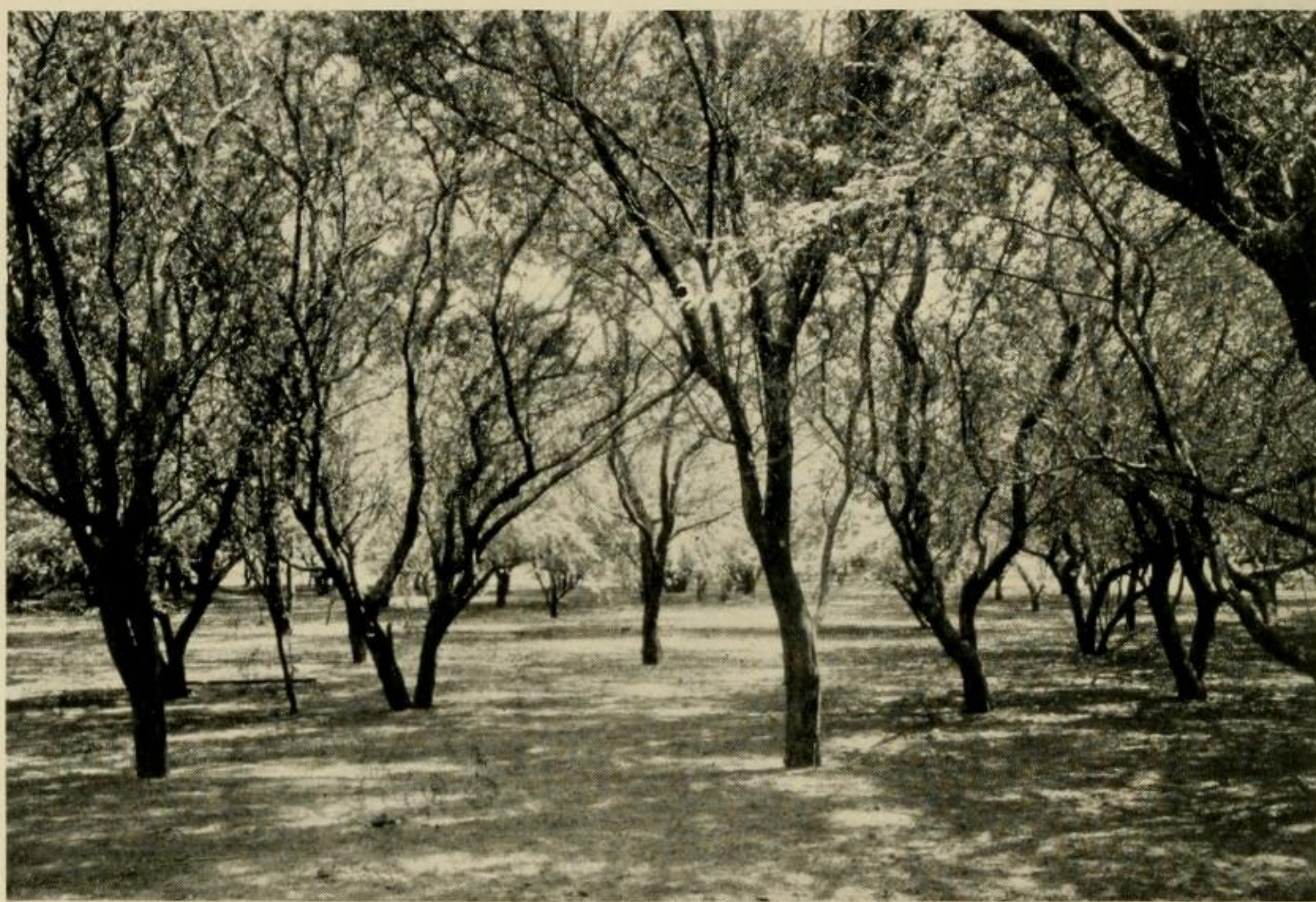


FIG. 67.—A forest of algaroba trees (*Prosopis juliflora*). The pods are much relished by stock and are an important cattle food. From the flowers are produced an excellent quality of honey which is an important article of export.

The indigenous flora is highly interesting though not abundant in species. Two of the commonest trees are the ohia (*Metrosideros polymorpha*) and the koa (*Acacia koa*). The former, also called ohia lehua and lehua, resembles, in the appearance of the trunk, our white oak, but bears beautiful clusters of scarlet flowers with long-protruding stamens. The koa produces a valuable wood much used in cabinet making, now becoming familiar through its use for making ukuleles. Characteristic of the upper forest belt on the high mountains of Hawaii is the mamani (*Sophora chrysophylla*), a leguminous tree with drooping racemes of yellow flowers and long 4-winged



FIG. 68.—Trees on the windward side of Lanai, showing the effect of the strong trade wind.



FIG. 69.—Grass hut of the Hawaiians. The wooden framework is thatched with pili grass (*Heteropogon contortus*).

pods constricted between the seeds. In the arid regions is found the wiliwili (*Erythrina monosperma*), a deciduous tree with gnarly growth, a very soft light wood, and bright scarlet seeds. Among the peculiar plants of the islands is the silversword (*Argyroxiphium sandwicense*), a strikingly beautiful composite with glistening silvery leaves, which grows only on the slopes of cinder cones in the crater

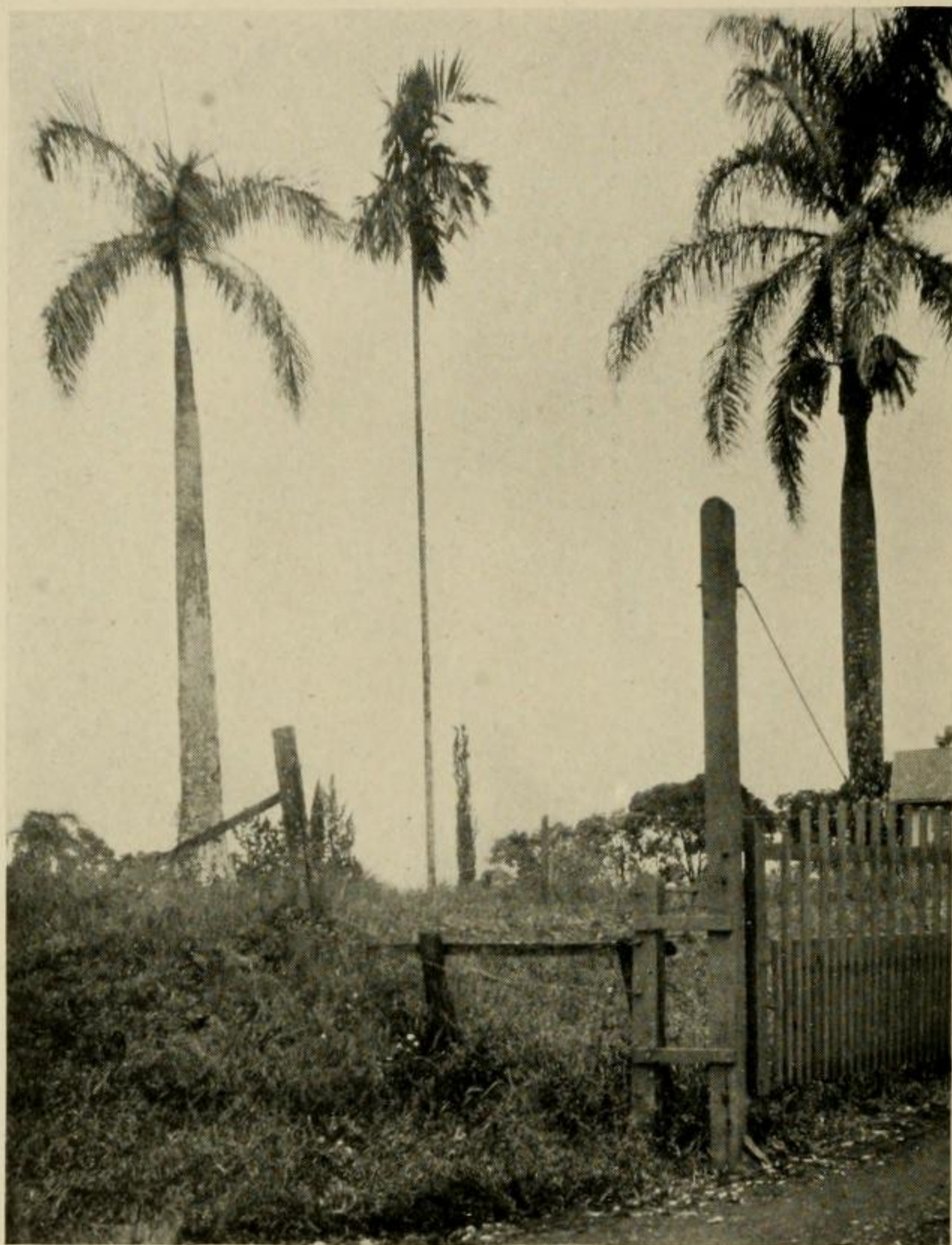


FIG. 70.—Palms at Hilo. Two royal palms with a slender betel palm between.

of Haleakala and in a few very limited localities on Hawaii. The family Lobeliaceae is represented by about 100 species belonging to 6 genera. The numerous arborescent species are very peculiar and characteristic. Many of them form slender trunks like small palms, crowned with a large cluster of long narrow leaves. The trunks of some species are as much as 30 or 40 feet high and the large bright colored flowers are sometimes remarkably beautiful.

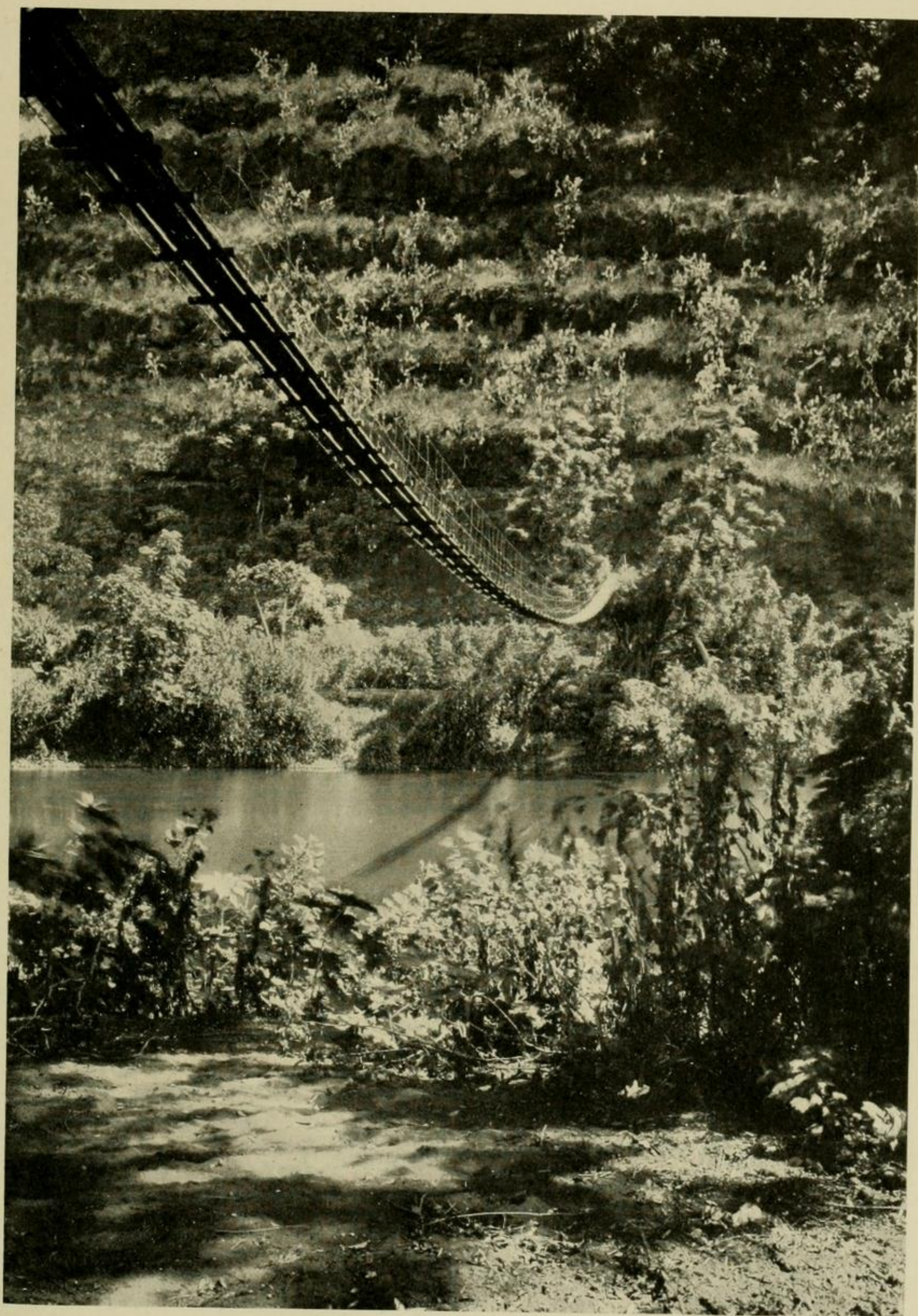


FIG. 71.—A foot bridge across the Waimea River, above Waimea, Kauai. On the opposite cliff are seen numerous plants of prickly pear cactus (the so-called *Opuntia tuna*).

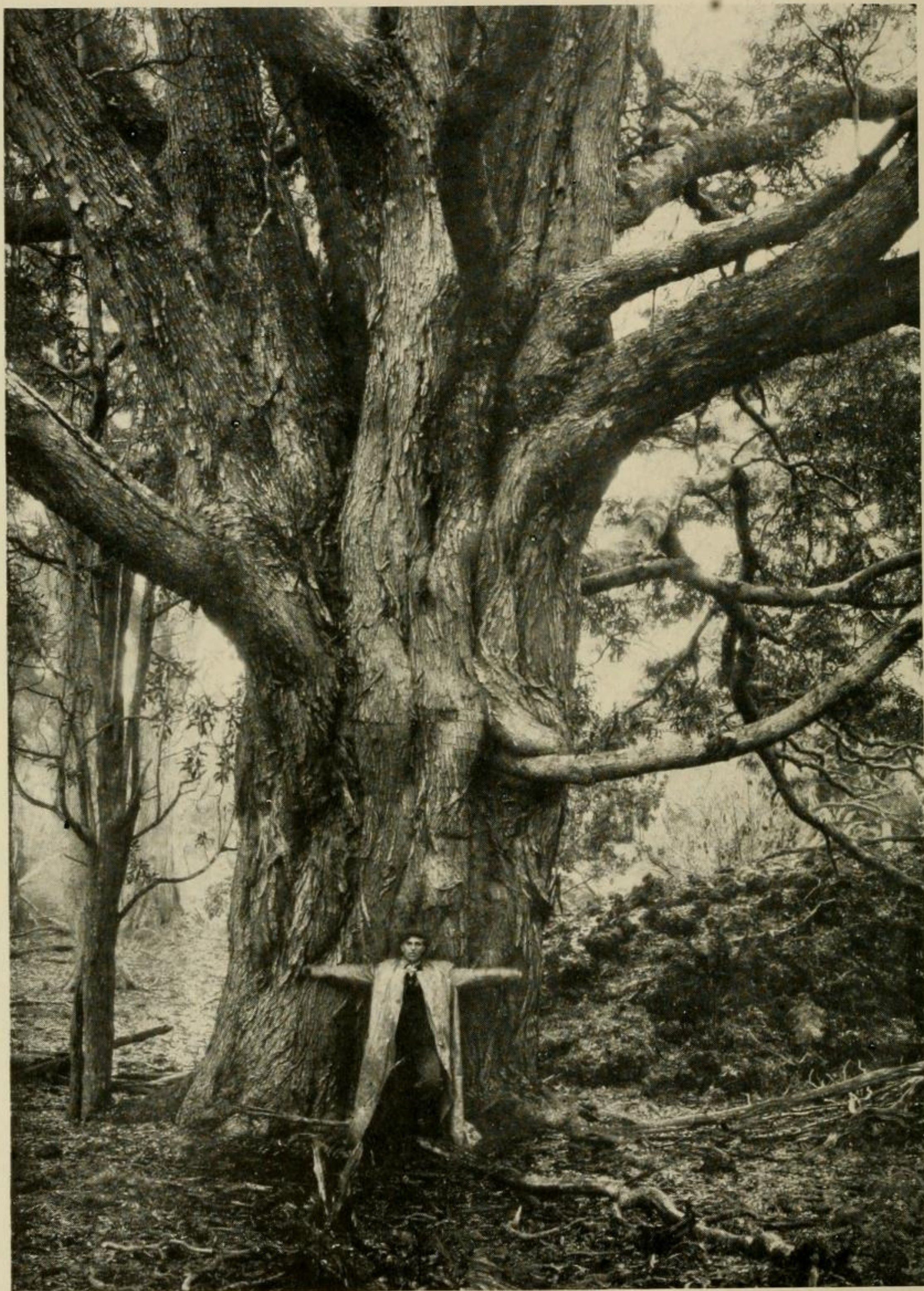


FIG. 72.—Trunk of a large koa tree (*Acacia koa*), on the eastern slope of Mauna Loa, Hawaii. A valuable wood much used in cabinet making, especially for ukuleles.

The indigenous grasses of the Hawaiian Islands are not numerous. The most interesting belong to the genera *Panicum* and *Eragrostis*. A tall species of the latter (*E. atropioides*) is the dominant grass upon the plain between Mauna Loa and Mauna Kea. Three peculiar

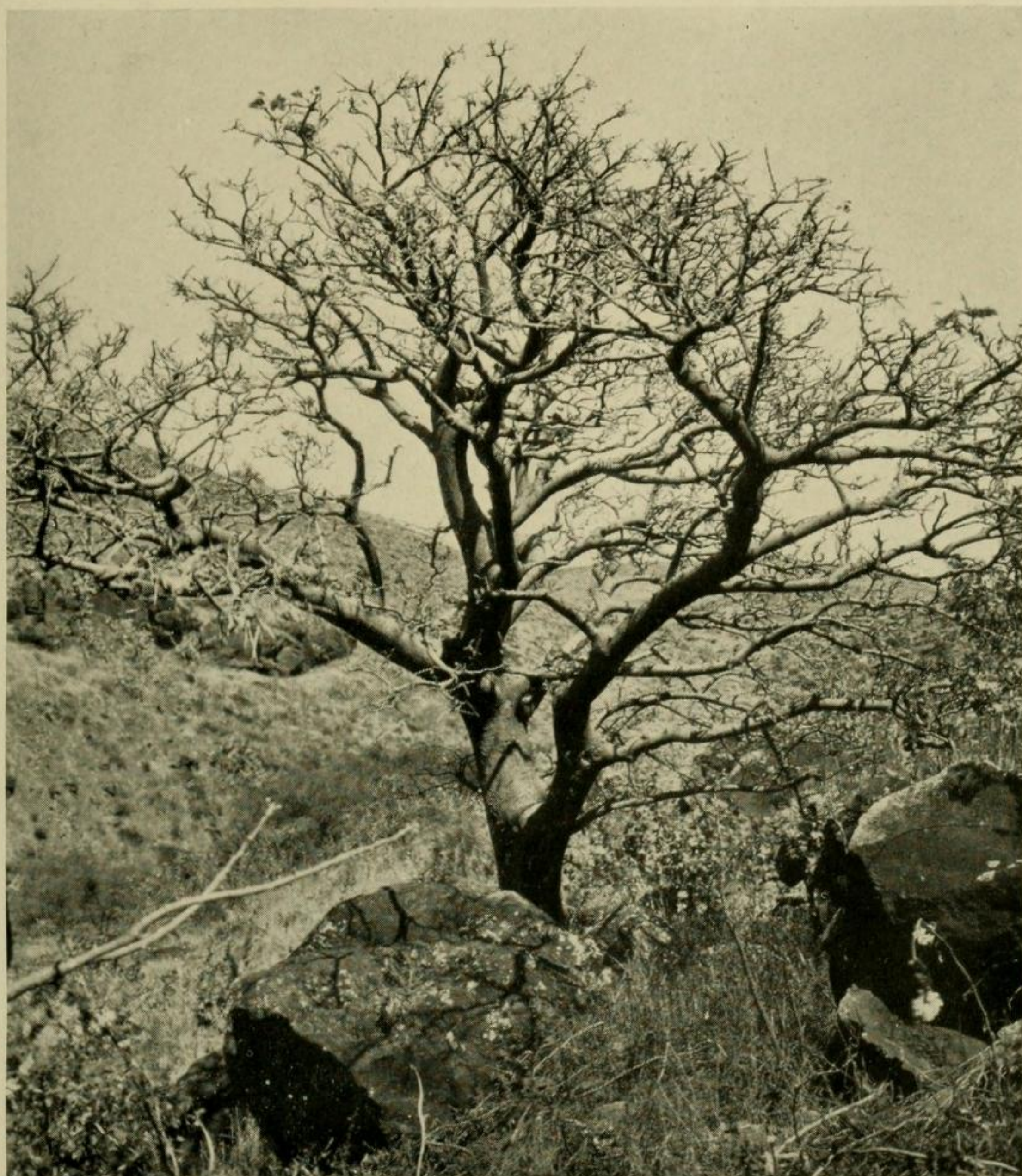


FIG. 73.—Wiliwili (*Erythrina monosperma*), in an arid gulch on the western part of Molokai. At this season (October) the tree is devoid of leaves. Flowers and pods may be seen at the extremities of the branchlets.

species of *Panicum* inhabit the open bogs formed on the tops of many of the high mountains in the wet zone such as Mt. Eeka and Mt. Kukui in West Maui, some of the peaks of Molokai and Oahu, and Waialeale in Kauai, that upon the latter covering in all several

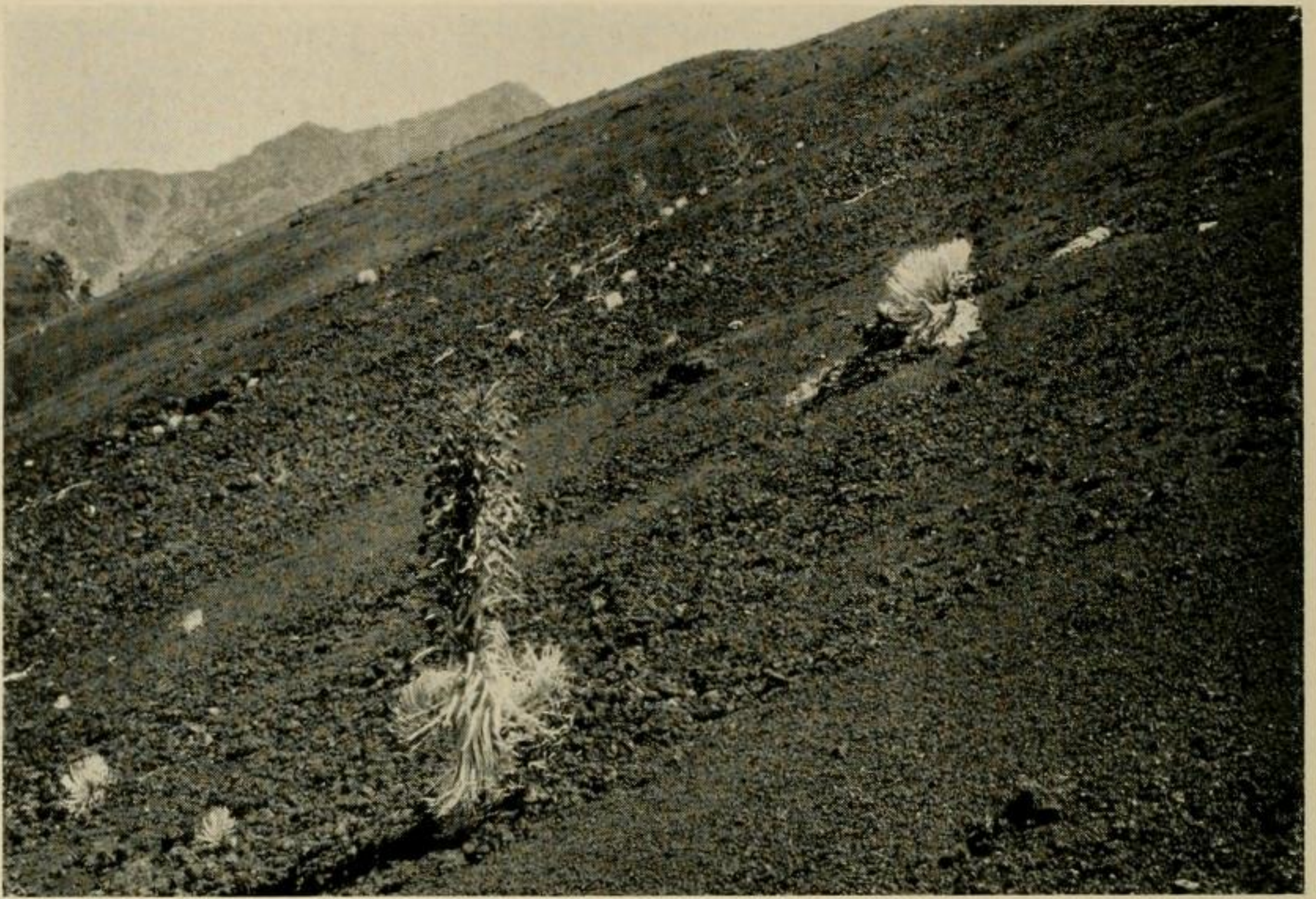


FIG. 74.—The silver sword (*Argyroxiphium sandwicense*), growing on cinder slopes in the crater of Haleakala, East Maui, at an altitude of about 9,500 feet.



FIG. 75.—A tree fern (*Cibotium menziesii*) near Puu Waawaa, Hawaii. The undergrowth is a common fern (*Dryopteris fuscoatra*) found in much of the wet forest at an altitude of 3,000 feet.

square miles. These bogs are found near the summits of ridges in the regions of heavy rainfall, are devoid of trees and shrubs, and harbor a peculiar vegetation. Many species form more or less globose tussocks which rise above the general level of the bog. The most interesting of these tussock plants are a sedge

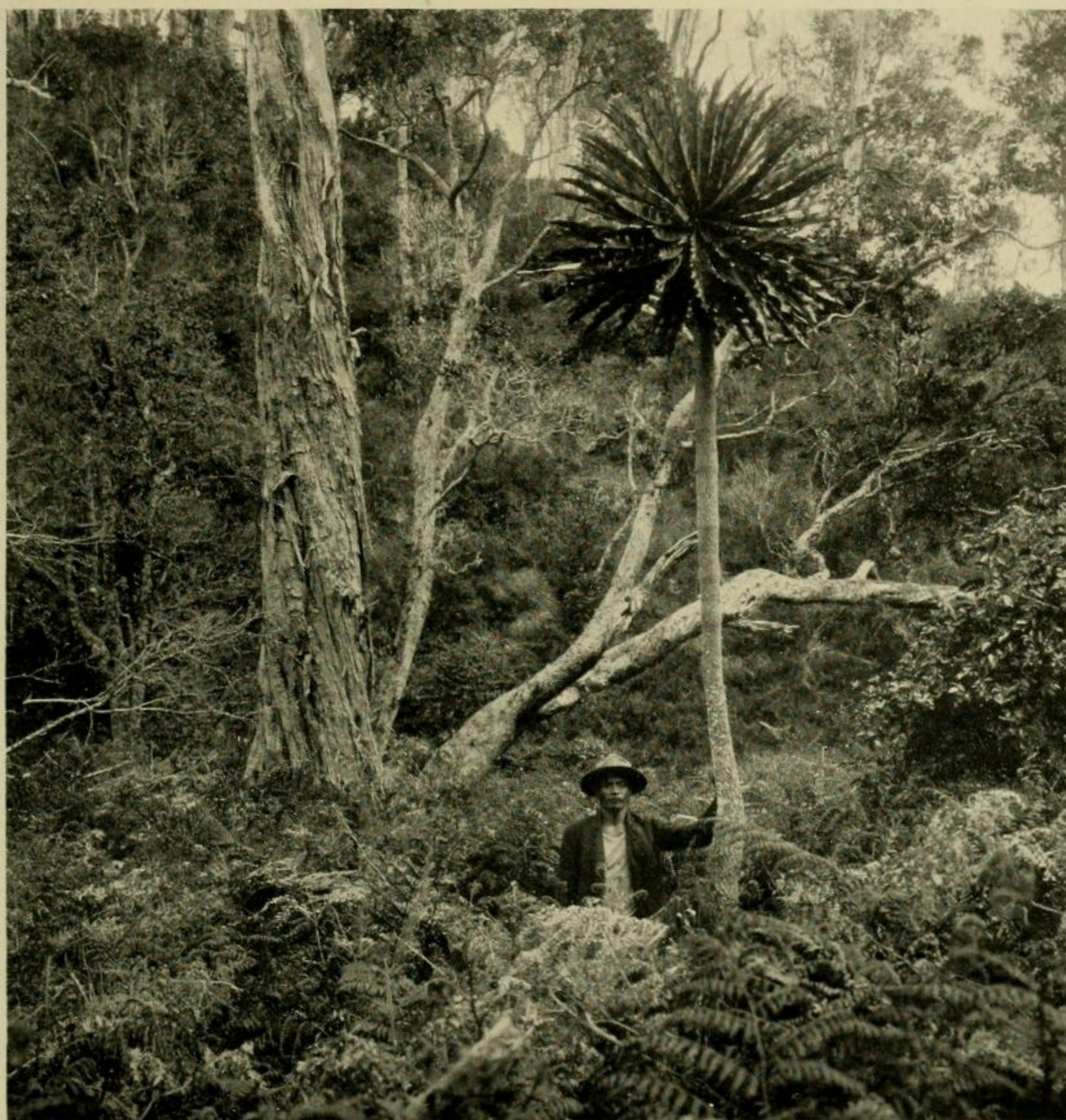


FIG. 76.—A representative of the peculiar arborescent lobelias (*Cyanca* sp.).
Forest near Kaholuamano, Kauai.

(*Oreobolus furcatus*) and the three species of *Panicum* mentioned. The panicums form close masses, the interior consisting of many generations of dead leaves and stems, scarcely decayed, the exterior consisting of short living shoots an inch or two long, with a few contiguous ovate blades and reduced panicles of one to a few spikelets. A showy lobelia (*L. gaudichaudii*) with numerous large



FIG. 77.—Bracket fern (*Elaphoglossum aemulum*) growing on ohia (*Metrosideros polymorpha*). The branching trunk of the latter is common and is probably due to the fact that the early growth was upon some other tree and these roots were thrown down to the ground for support.

cream-colored flowers as much as $3\frac{1}{2}$ inches long, peculiar violets, and a sundew (*Drosera longifolia*) are found in these bogs.

The ferns of the Hawaiian Islands are numerous in species and individuals. They are the dominant feature of all the wet forests. Three species of tree ferns of the genus *Cibotium* are found and in some places form extensive forests. These produce at the base of the stipe a great ball of brownish-yellow wool called pulu by the natives and used by them for stuffing pillows and mattresses. One species (*C. menziesii*) is shown in figure 75. Contrasted with the tree ferns are numerous small epiphytic forms, some species with fronds only an inch or two long. The ferns and fern allies number about 170 species.

ARCHEOLOGICAL EXPLORATIONS IN GUATEMALA AND HONDURAS

In February, 1916, W. H. Holmes, head curator of anthropology, United States National Museum, had the good fortune to become a member of the Carnegie Institution's archeological expedition to Central America under the direction of Sylvanus G. Morley. Among the ancient cities visited was Antigua, the ancient capital of the Spanish kingdom of Guatemala during the period of its greatest prosperity and power. The splendor of its religious establishments is amply testified by the ruins of upwards of forty great churches now scattered through the modern Indian town which occupies the ancient site. The city was visited by a series of earthquakes during which the splendid structures were shattered or thrown down and it was found impossible to restore them and keep them in repair, and in desperation the capital of the kingdom was removed to a neighboring valley, to the site of the present Guatemala City.

The history of the Spanish capital city and its great buildings proves most instructive to the student who would discover the causes that led to the downfall and destruction of the numerous cities built by the Mayan people in prehistoric times, the ruins of which are now found scattered over Central America.

The present Guatemalan capital is built on the site of one of these ancient cities represented to-day by numerous pyramids, terraces, and quadrangular enclosures as well as by works of sculpture which are scattered over a large area just outside of the limits of the capital city.

An extended visit was made to the ruined city of Quirigua in eastern Guatemala. This city has been the subject of much scientific interest during recent years and its remarkable sculptural and