





FAMED HULIHEE PALACE IN KAILUA, KONA, HAWAII

(Hawaii Visitors Bureau photo.)

'Transit of Venus' Pier at Kailua, Hawaii

By JAMES B. MANN

IN THE YARD of the Hulihee palace at Kailua, Kona, Hawaii, is a concrete monument with a brass plate inscribed, "Transit of Venus—H.T.S. 1929." This marks the location of one of the three observation stations used by the Tupman "Transit of Venus" expedition of 1874. This expedition was sent to Hawaii by the British government to observe the transit of Venus across the face of the sun, so that the longitude of places in the Hawaiian Islands could be known more accurately. One station was located at Waimea, Kauai; one at Honolulu and this one in the palace grounds at Kailua to insure permanency because the grounds were tabu.

The longitude of Honolulu and other places in the Hawaiian Islands had not been known with very great accuracy. Cook, Vancouver, Wilkes and other navigators previously had determined the longitude of various points in the islands, and the longitude of Honolulu had been determined roughly through the transporting of chronometers between San Francisco and Honolulu. The observations made by Tupman's expedition, however, were the most accurate, and the longitude of Honolulu then determined was used up to the time the Pacific cable was laid in 1903. Then longitude was determined exactly by time signals received over telegraphic and cable

lines from Washington, D. C.

Capt. Tupman divided his expedition into three parties, one on Kauai, one on Hawaii, and he himself established the "Transit of Venus" pier in Honolulu. The Honolulu pier was located on Punchbowl St. near the waterfront, in what became the Lewers & Cooke lumber yard.

The orbit of Venus lies between that of the earth and the sun. Venus passes through the plane of the earth's orbit three times each year, first "upward," through the ascending node, and then "downward," through the descending node. One year there will be two ascending nodes, separated by one descending node; the next year there will be two descending nodes, separated by one ascending node. On very rare occasions the earth, Venus and the sun are exactly in line, and looking through a dark glass one could see Venus as a tiny black spot on the sun's bright face. Astronomers speak of this as being an inferior conjunction of Venus at the time of its ascending or descending node, or a transit of Venus.

There is an interesting relationship between the periods of revolution of Venus and the earth (that is, the length of time it takes each to make one circuit of its orbit around the sun) and the interval between "nodes." If, on a given date a conjunction occurs

at the ascending node, and there is a transit of Venus across the sun, another may occur at the same node almost exactly eight years later, and still another at the same node almost exactly 243 years after that. Also, a transit at the descending node can be expected 129½ years after the first mentioned transit, and still another at the same node just eight years after that.

For example, a transit occurred at the ascending node Dec. 7, 1631, and another Dec. 4, 1639. The next pair at that node occurred Dec. 9, 1874, and Dec. 6, 1882, almost exactly 243 years after the corresponding transits of the previous pair. A transit occurred at the descending node June 5, 1761, 129½ years after the 1631 transit, and another at that node June 3, 1769. The next pair will occur at that same node June 8, 2004, and June 6, 2012, after an interval of 243 years.

A pair of transits is sure to occur when the first crossing takes place near one edge of the sun; the second crossing will take place near the opposite edge. If the line of a transit should pass across the center of the sun's disk (which would require almost exactly eight hours) no second transit would occur eight years later. Transits of Venus would not occur again in pairs for more than a thousand years.

Before it was possible to transmit

time signals by means of cable or radio, transits of Venus were very carefully observed and used as checks on other calculations in figuring distances between points on the earth's surface and the distance from the earth to the sun. Better methods have been devised for computing such distances, but transit observations give a valuable check on the motion of Venus in her orbit, and probably will be continued. This is done by simultaneous observations of the transit from various points on the earth's surface. Such transit observations are also used for calculating the longitude from Greenwich to the point of observation.

The "Transit of Venus" piers at Kailua, Honolulu and Waimea later were tied into the triangulation system of the islands, so that a further check on the geographic positions of triangulation stations was made possible.

Soon after the "Transit of Venus" pier at Kailua was established and tied into the triangulation system, a small house was built over it, and it was not until 1929 that the station was recovered by a private surveyor who was then engaged in precise surveying in Kailua village.

The data by which it was recovered was reported to Robert D. King, territorial surveyor, who ordered the concrete work which now marks the station.