used. Lumbermen who have tested it for freighting purposes estimate that the cost is about one-third of the sum expended when teams are employed. In these estimates the fuel and water and repairs are all carefully estimated and deducted.

FIJI AND THE FIJIANS.

A TRAVELER'S OBSERVATIONS IN THE PARADISE OF THE PACIFIC.

BY SIDNEY DICKINSON, M.A., F.R.G.S., BOSTON.

Few travelers, comparatively, have penetrated the mysterious regions of the Southern Seas. Many have, indeed, wandered as far as the Hawaiian Islands, and returned enraptured with the mingled beauty and grandeur of these, our new possessions—but even there the traveler stands merely upon the threshold of the Sub-Tropical Wonderland.

Far below his horizon roll immeasurable leagues of iridescent seas; his ear cannot hear the roar of distant surf upon the coral reefs; the melting skies, the amethystine mountains, the vales "with verdure clad," lie far beyond his ken. There is perpetual summer; beauty that never fades; a year whose cycle knows no blight of frost or shroud of snow; flowers that bloom in never-fading generations; days of unbroken sunshine; nights in whose violet depths strange constellations glisten, and from whose bosom subtle perfumes emanate and intoxicate the air. Here nature wears her native and immaculate garb—virgin as she appeared on creation's morning, when the Spirit moved upon the waters, and from the womb of primeval Night brought forth these Islands of Eternal Day. Audacious the tongue that attempts to utter, the pen to record, the brush to paint the wonders of these happy archipelagoes—yet will I try to lift a corner of the veil that hides their beauties, confident of indulgence if I fail in my endeavor to describe the indescribable.

Example of Fiji Architecture—A Thatched Hut.

Most interesting, perhaps, of all these lands of the Southern Seas in natural charm, strange and somber history, and present importance as illustrating the work of civilization in that part of the globe, are the Fiji Islands. Upon the chart of the world they appear as mere pin-pricks amid the vast expanses of ocean that surround them—a small galaxy among the thousand systems that form that Milky Way of the Pacific known to geographers as "Oceanica." A vast continent, ages ago, may have existed here, and, subsiding slowly, have left its loftiest peaks and table-lands to stand above the waves as monuments to mark its place of burial. Cyclopean remains upon certain of the groups, whose builder no man knows, and present languages and customs seem to refer to some mighty and long-buried past. The glamor of mystery that broods about those seas is fascinating—all the more so that their secrets seem likely to be preserved inviolate until eternity solves the riddles of time.

The Fiji group, lying south of the equator at about the distance that the Hawaiian Islands lie north of it, covers five degrees of latitude and three of longitude. Forty of the islands are of considerable size, while some two hundred more are of decreasing importance, the tale dwindling to barren and uninhabited rocks hardly large enough to be christened. These islands lie in an irregular oval—300 miles in longest, and 120 miles in shortest diameter, around the Koro Sea, and, like our own West Indies, are composed of two groups, known as the "Greater" and "Lesser Fijis."

"Fiji" is a corruption of the native "Viti," which appears in the name of the largest land of the group—"Viti Levu," or "Big Fiji"—which contains an area of 4112 square miles; "Vanua Levu," or "Big Land," coming next with 2432 square miles. Roughly speaking, the total land area of the Fiji Islands about equals that of the State of Connecticut, and the population is estimated at a quarter of a million.

Travel to this land of the whilom cannibals is to-day a commonplace matter. Steamers from San Francisco make regular calls, and at least two lines from Australia convey the voyager in luxurious comfort. My own approach to Fiji from Melbourne was by the "Taviuni" of the New Zealand Union Line—a boat which was then making her first trip after steaming from her birthplace in Scotland to Melbourne around the Cape of Good Hope—a trifle of 12,000 miles—without once stopping her engines. As to one's treatment by the sea—that is a matter of luck and temperament. The Pacific has its whims, and, despite its name, I have never encountered worse weather or heavier seas than around Australia and New Zealand. When the discoverer of this sea, looking from the hills at Panama, saw its languid swell and the lazy break of its surf on the shore, he might well have thought he was looking upon the waters in their constant mood, and have had reason for calling the ocean the "Pacific." If, however, he had set sail upon it, and made test of its capricious temper, we can fancy him looking over the side of his caravel with a face of anguish, and declaring between his qualms that he was the biggest failure that ever lived in the matter of christening large bodies of water.

Early on the morning of the seventh day from Melbourne, a patch of misty blue appears upon the horizon, and by degrees the verdant shores of Fiji rise into view. Passing through the opening in the coral reef, we enter the placid harbor of Levuka—lying, like Honolulu, under precipitous hills, sprinkled with the white bungalows of the European residents. There is a strange sense of unreality in coming, in our present fashion, to the Land of the Cannibals, and the air of peace and serenity which broods over the beautiful harbor and town afford a striking contrast to the conditions that one has imagined after reading Fijian history. The former things, however, have passed away, and the stranger may now wander pretty freely over the islands, without fortifying himself with the hope that Sydney Smith urged upon his departing missionary friend—"that he would disagree with the man who ate him."

As we approach the shore, a flotilla of boats puts out to meet us—catamarans made of cocoanut logs hollowed out, pointed at each end, and rendered stable by wide outriggers. Natives, clad only in loin cloths, or *sulus*, of calico or snowy *tappa* cloth, paddle these craft rapidly toward us, and swarm aboard to sell their cargoes of fruit and curios—somewhat to the consternation of our lady passengers who precipitately flee to the cabin at sight of these brawny savages; but soon return, for it is not in feminine breasts to resist the fascinations of the bargain counter.

These Fijians are a stalwart race; very tall and muscular, for the most part, their skins soft as velvet from anointings of cocoanut oil, their countenances strong and in most cases pleasing, rather than forbidding. A thing that at once impresses the visitor is the varied and striking manner in which both men and women—the former especially—arrange their hair. Here a man is seen whose pate seems covered with a thick coating of whitewash; there another, whose locks, radiating in every direction from his skull as if they were electrified, could hardly be inserted in a bushel basket. The former state is but a preliminary to the second. The natives plaster their hair with a kind of paste made of powdered coral mixed with water, which, after hardening and then being broken up, stiffens the hair and bleaches it from its natural black to odd shades of red and dull yellow—thus producing strange effects in combination with the dark-brown skins of the people. Each form of head dressing has its meaning—the chiefs wear one, famous warriors another, men of counsel a third, yet all with variations at the caprice of individuals, which give great picturesqueness to a native gathering. Married men are distinguished from bachelors by the cut of their hair; the latter are of little account in Fiji, and by the way, are barbered, to announce to a scornful population their independent and degraded condition.

Both sexes are attired in the airy and simple manner which residence in a climate where the sun is hot, and the rainfall from eight to twelve feet a year, would naturally suggest. An elaborate female costume is shown in the picture of a chief's daughter, who is arrayed as to her trunk with a necklace of "trade" beads, and from her waist downward with a mantle of beautifully decorated "*tappa*" cloth, of creamy white ground relieved by designs of dull reds and browns. This "*tappa*" cloth is a characteristic product of Fiji, and is made from the inner bark of the paper-mulberry tree, which is macerated in water and the pulp beaten out upon hard ground with heavy wooden mallets, making a sort of vegetable felt of varying thickness—some as heavy as a blanket, others as light and thin as gossamer. The average female dress, however, is less elaborate—consisting simply of a fringe of cocoanut husk or hibiscus fiber dyed black and hanging from the waist to the knees. This adapts itself to every movement of the wearer, and is at once a sensible and decent dress.

Chiefs Drinking Kava.

FIJI AND THE FIJIANS.

The interior of a native house illustrates another use of the omnipresent "*tappa*" in wall

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hangings and decorative coverings of beams. Piles of the cloth spread upon the floor, make delightfully cool and elastic beds, and upon the rafters are placed huge rolls of the finer textures, which by their number and total of yards represent the family wealth. When a woman of means marries she displays her social position by winding about herself all the "*tappa*" cloth her family can muster—so that a bride from the Fiji "Four Hundred" resembles a cotton bale with her head sticking out of the middle, and has to be carried to the altar by half a dozen muscular male relatives.

At short intervals along the shore, and in the cleared spaces of the tropical jungle, are the homes of the natives—some isolated, others collected into considerable villages, but all swarming with the brown children of the sun. These houses are always wide open, and one can enter at will, the people and the visitor seeming to take an equal enjoyment in the curious appearance that each presents to the other. A Fijian house is perfectly adapted to the climate, and affords protection alike against the torrid rays of the sun and the frequent tropical deluges of rain. It is made by driving stout posts into the ground, across which are laid beams fastened to the supports by ropes of cocoanut fiber, and from this framework rafters are run up to a central ridge-pole. Roof and sides are covered with a thatch of grass and reeds, sometimes two or three feet thick, the whole structure being elevated on rough blocks of coral, thus affording freedom from the dampness of the ground. In ancient times the four corner supports of chiefs' houses were set in holes wherein captured enemies had been buried alive, while a chaste and agreeable decoration of the front would be a row of stones indicating the number of captives the chief had eaten during his career. Thus, the tales of stones of a famous chief, counted by a missionary in 1849, was 872—for which the chief apologized, saying there should have been more, but he had been indolent of late, and had neglected to post up his ledger.

A country like Fiji, with its copious rainfall, is naturally full of watercourses, and the mountainous character of the land gives opportunity for numerous waterfalls, which are among the most charming features of the islands. Nothing can be more beautiful than these silvery cascades, set, as they are, in a dense jungle of flowering trees, variegated shrubs and mottled crotons, or in ravines where enormous orange-colored spiders swing in webs that glitter like diamonds from the spray of the falls, and where the flight of the "orange" and "rainbow" doves, and crimson and green parakeets, gives movement and shifting color to the scene. The natives are a cleanly folk, and spend much time in the water of the inland streams or in the sea within the coral reefs, where the sand is of dazzling whiteness and the water shows every shade of the opal, turquoise and sapphire.

Along the edge of the sea, extending for miles on both sides of Levuka, runs a smooth and level path, which, built up on the wall of coral rock that rises a few feet above the water, leads by gentle curves around projecting promontories into avenues of palm-trees, and picturesque glades where sleepy villages drowse under the rustle and shade of the cocoanuts, and in hearing of the perpetual symphony of the waves. From this path the eye extends to the encircling coral reef, against which the ponderous waves of the Pacific burst in clouds of foam. The heavenly blue of the water inside the reef forms a beautiful contrast with the purplish-indigo expanse without, and the drowsy air is made drowsier still by the incessant reverberant roar of the distant breakers. This sound is heard nowhere else in the voice of the sea. It has no intervals, but resembles the continuous passage of a heavily loaded railroad train, the hollow, semi-elastic structure of the coral giving it a metallic, ringing quality that is as noticeable as it is difficult to describe.

If you will launch a boat at noon, when the vertical sun lights up every detail in the bottom of the shallow lagoon, you may introduce yourself to a strange and lovely spectacle. You float over fairy grottoes, looking into which, through translucent fathoms, you see coral in every tint of blue, green, pink and creamy brown—the recollection of which will give you ever after a distaste for its bleached and ghastly skeletons in cabinet or on bric-a-brac table. Through its finest of branches float armies of fish the color of topazes and rubies, and of quaint or monstrous forms; enormous purple and crimson starfish sprawl upon snowy sands, while around them the hideous (but edibly delicious) sea-slug—the famous bêche-de-mer—glides in writhing progression, and sea-urchins expand and contract their iridescent spines. Now and then you drift over spaces dusky with depth, through which enormous conger-eels pass with wavering fins, and green turtles flap like strange, unwieldy birds—while rainbow-hued shells incrust everything in wanton profusion, and add to the beauties of fish, coral and swaying weed to produce a scene of exquisite loveliness, which lingers in the recollection like an enchanted dream.

A view of Fiji would be incomplete without some illustration of the old cannibal practices which, until less than fifty years ago, made the country a section of hell transplanted to earth. Instances of this era are found most numerously at Mbau, the old heathen capital, and headquarters of the late King Thakombau (to give the English pronunciation of his name), who, as the last ruler of Fiji, ceded his country to Great Britain for a pension of £1500 a year and other considerations, and whose war-club, sent to the Queen as mark of fealty, holds worthy place at Windsor beside the umbrella of King Koffee of Dahomey—reminders to the world of two as thorough scoundrels as ever cumbered it. Before his conversion to Christianity the city of Mbau was covered with trees forming sanctuaries like the groves of Baal, and as one of his first acts on reformation was to cut these down, Mbau now lacks many interesting arboreal growths. Chief of these was the famous "Mbau Larder"—an enormous tree upon whose spreading branches tough victims were hung to acquire that "gamey" flavor which Fijians like in "long pig" (as they facetiously term the human bake-meat) and Englishmen in pheasants and grouse. The Wesleyan Mission House to-day fronts the ground where banquets were served and victims prepared for the oven. A huge stone stood at one end, upon which the subject's brains were knocked out as a preliminary; to-day it is in the church at Mbau, and is used as a baptismal font for native converts, its top having been hollowed out.

I met an aged man at Mbau who gave me much interesting information on cannibalism. His father, he said, had been a famous trencherman in the good old days, and although he denied that he himself had ever eaten the flesh of his kind, yet in the course of his description he fingered my arms and pinched my legs and poked me in the ribs in a manner which seemed to me not altogether platonic. Fijian flesh, he stated, was superior to that of white men, who tasted of the salt they ate with almost everything—while a tough old sailor was practically a waste of raw material from the tobacco and grog with which a life before the mast has a tendency to flavor the human system. Interrogated as to choice cuts, he gave the palm to the head—the brains and eyes being particularly desirable, and the cheeks, especially in young subjects, submitting to baking very kindly indeed. The upper part of the arm, too, and the calf and upper portion of the leg, were not to be despised—but, said this epicure, as for the rest of the body, "throw him away." In the afternoon this interesting savage came around for me to get my gun and go into the bush with him, where he would "show me plenty parrots." After the enthusiasm of his morning description, however, I thought it prudent to decline.

A quaint feature of Fijian life is "*kava*" drinking—the beverage being made from the root of the *angona* shrub, which, being macerated and mixed with water, ferments and forms a mild intoxicant. It tastes like soap-suds and ginger-ale mixed, and the relish for it has to be acquired. It is drunk with solemnities at meetings of chiefs and at conferences generally, and its absorption is governed by strict rules of etiquette. It must not be sipped, but swallowed at a gulp, as a Western cowboy assimilates his whisky, and it is a fine touch, and an instance of *savoir faire* after drinking to "skitter" the cocoanut-shell cup in which the beverage is served along the ground to the presiding genius at the supplying bowl. In native circles the root is chewed by women and expectorated in the bowl to be mixed with the water. This is said to give a peculiar and agreeable flavor, but the less robust white residents reduce the root by a grater.

The "*Meke-Mekes*," or descriptive songs and dances of the Fijians, are wonderfully impressive. The illustration shows a party of girls giving the "Wave" *Meke*, describing the movement of the sea on the reefs. The hands sweep the ground slowly, with waving motions of the fingers, to show the ripples crisping in the wind. Then the bodies sway in unison to show the roll of the ocean—other movements of rising and falling figures show the leap and fall of the breakers. Action grows more violent and confused, the performers rise to their knees, then to their feet; at last, with a spring and a clapping of hands, the wave is described overleaping the barrier of the reef, and as it falls into the still lagoon the dancers drop to the ground in unison with a long cry in diminishing cadence, and the "*Meke*" is over.

Delicious is the life in the tropic seas, dreamy as the lotus that typifies it—not to be understood by residents in our colder and ruder North, but delicious even in the aftertaste to him who has experienced it. Even I, who have sparingly partaken of this divine food, cannot forget its flavor; forevermore will rise before me, in smoky London, perchance, or in bustling New York, visions of the slumbering palms in the moonlight at Levuka, and my ears hear the murmur of the surf and the plaintive *Mekes* of Fiji.

Professor J. H. Sears, Curator of Mineralogy and Geology at the Peabody Academy of Science, in Salem, Mass., has unearthed in newly opened claybanks in Danvers fossils of the mollusk Portlandia lucina.

Correspondence.

Coal or Oil—An Early Suggestion from the Founder of the Guion Steamship Line.

To the Editor of the SCIENTIFIC AMERICAN:

In the summer of '79 or '80 I was crossing the ocean on the steamship "Arizona." The managing director, Mr. William H. Guion, was on board. Among the many interesting conversations with him was one upon the possible use, at some future date, of oil in the place of coal. The discussion came up on account of the vast amount of black smoke that almost constantly poured from the funnels of the steamship. The enormous amount of waste which he told me occurred from this unconsumed carbon was almost incredible. He then declared that the time would come when oil would be used in the place of coal, and gave as an interesting fact, or opinion, that the saving in freight room by the use of oil, in one trip between England and Australia, would be worth £6,000 ($30,000). Mr. Guion was a very practical, energetic, progressive man, and his line furnished the first of the ocean greyhounds. His remark was truly prophetic.

GEORGE G. ROCKWOOD.

New York, June 17, 1902.

Prizes for Photographs.

The Bausch & Lomb Optical Company, Rochester, N. Y., announce a photographic competition open to amateur and professional photographers, residents of foreign countries, as well as the United States, the object being to bring together as large and representative a collection of photographs as possible, in order that the present development of the photographic art and the progress in lens and shutter construction which has been made during the past quarter century may be made evident. It is during the last quarter century that the greatest progress in photography has been made. In order to enhance the interest of photographic work, the awards have been divided into a number of classes, such as landscape, portrait, genre, instantaneous, architectural, interior, etc. Several special awards for telephoto and other work have been provided, also a special award for users of the Bausch & Lomb rectilinear lenses on various makes of hand cameras, kodaks, etc.

The Current Supplement.

A fully illustrated article on the American cut-glass industry opens the current SUPPLEMENT. Next comes a dissertation by Dr. E. Fischer on temperature experiments with butterflies. Dr. Fischer has proved the remarkable fact that by breeding certain European butterflies at low temperatures species are obtained which probably existed in the glacial period, and that by breeding these same European butterflies at high temperatures species which never existed before are produced. The Peterson boat-launching apparatus is made the subject of an illustrated description. The compressed air cars used in France are fully described. The results of the Interstate Commerce Commission's report on safety appliances for trainmen are also published. Mr. Guglielmo Marconi in an entertaining way tells something of the practicability of wireless telegraphy. Prof. Pedersen, Valdemar Poulsen's assistant, has made an important improvement in multiplexing the telegraphone. The improvement is fully described. The wonderful Mexican istle plant and the many uses to which it can be put are fully set forth in an account illustrated by a series of very handsome pictures. The usual minor articles are also published.

An Odd Method of Heating Cars.

The Northwestern Railway Company of England has equipped some of its trains with a system of heating to which the much-abused term "unique" may well be applied. Two concentric cylinders are employed, the annular space between which communicates with a steam-pipe extending from the locomotive-boiler. The inner cylinder contains acetate of soda—a compound remarkable for its property of liquefying when heated, and of cooling very slowly. The radiators thus constituted are incased in asbestos-lined boxes having hinged doors. By opening or closing the door of a box the heat is turned on or off.

The United States Shipbuilding Company has absorbed the Bethlehem Steel Company, with the result that one of the most completely equipped and self-contained shipbuilding plants in the world has been formed. The new company is thus able to make every part of a ship, including armor plate and guns. The plant of the Bethlehem Steel Company, which is at South Bethlehem, Pa., covers an area of one and one-quarter miles long by one-quarter of a mile wide, of which about thirty acres are under cover. The works are particularly well equipped for the manufacture of armor plate and gun forgings.

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