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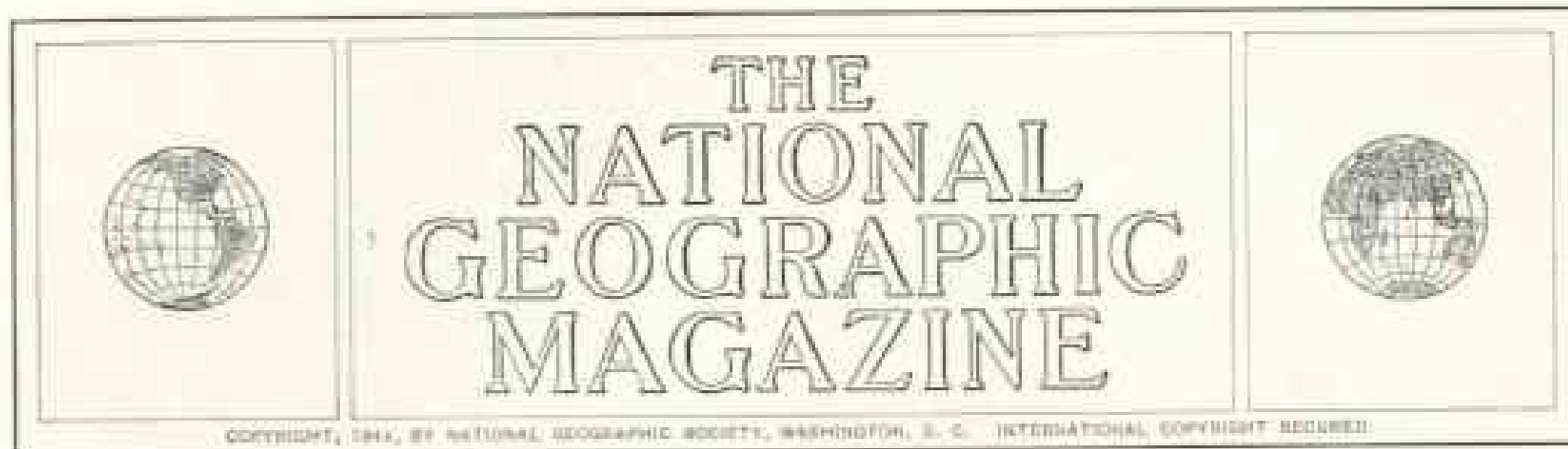
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I Lived on Formosa

BY JOSEPH W. BALLANTINE

BEFORE Pacific war broke we heard little of Formosa, that mysterious Jap-owned island that lies between Nippon and the Philippines and some 90 miles off the China coast. Now, as shooting gets closer to Japan, the name Formosa comes more and more into the news (maps, pages 6, 7).

It was here, we know now, that Japan trained her jungle fighters; from here she launched her first air attacks against the Philippines, and it was to Formosa that she brought Lt. Gen. Jonathan M. (Skinny) Wainwright and some 250 other American prisoners of war taken at Bataan. Here she also interned Sir Mark Young, the British Governor of Hong Kong; Sir Shenton Thomas, Governor of the Straits Settlements; and many other British officials from Hong Kong and Malaya, along with some Dutch captured in the Netherlands Indies.

Formosa made the headlines again when, in the Cairo Declaration of December 1, 1943, the island was named as one of the territories stolen from China by Japan, which should therefore be returned.

Our Navy Begins Formosa Attacks

This Pacific war first hit Formosa itself in November, 1943, when the American Fourteenth Air Force in China attacked a Jap airbase near Shinchiku. Several times thereafter General Chennault's bombers left their calling cards on the island. In October, 1944, naval air forces and China-based Superfortresses struck heavy blows at its shipping, its military installations, and at Jap air forces thereabouts.

After we invaded the Philippines, Formosa's position gave it even more military importance. It lies only a short air hop of 225 miles north of the big Philippine island of Luzon.

Forming a bastion of Japan's so-called "Greater East Asia Co-Prosperity Sphere," this island commands most of the South China coast and the sea lanes between Japan and her southern sources of tobacco, oil, rubber, tin, bauxite, hemp, copra, quinine, and iron ore.*

Any military power holding Formosa has a good base for assault against Japan and against Jap-held Chinese areas. Between Formosa and the citadel of Japan, the Nansei Islands (Ryukyu Retto) form convenient steppingstones.

Humped high above the stormy China Seas, this oval-shaped island is cut almost in half by the Tropic of Cancer. It has about the same area and population as Massachusetts and Connecticut combined. But population is the same only in numbers, for some of Formosa's oldest families collect human heads instead of antique furniture, and even after 50 years of rule the Japs still have trouble with many of these wild people.

The aboriginal tribesmen, numbering some 150,000, live mostly on the island's eastern half—a wild land of lofty and densely forested hills and mountains. About a third have become partly tamed and more or less sedentary.

Chinese began migrating to Formosa in large numbers in the 17th century. Today about 5½ million live here. Most of them, together with some 300,000 Japanese, occupy the fertile plain which runs the whole length of the island, from north to south, along its western seaboard.

Two facts about population strike any thoughtful man who looks at Formosa. First,

* See "Japan and the Pacific," by Joseph C. Grew, in the NATIONAL GEOGRAPHIC MAGAZINE, April, 1944; and "Springboards to Tokyo," by Willard Price, October, 1944.



As at Canton, Formosan Chinese Hold an Annual Dragon Feast

Long, narrow boats, gaily painted like dragons, are paddled furiously close to shore. To drive away evil spirits and cheer the Chinese crews to greater efforts, rooters on shore yell and beat on gongs. Popular now in Takao and Ampin, such festivals seem akin to South China's annual Dragon Feast, wherein similarly decorated craft are used.

though near-by Japan has held it for half a century, relatively few Japanese have settled here permanently, despite their homeland's overpopulation. Second, very few Western visitors have come here, and practically no whites comparable to those "old China hands" who formerly lived in near-by Amoy, Foochow (Minhow), etc., settled here.

This island is, in fact, a Chinese country, but ruled and dominated by Japanese.

Saw Formosa as a Yankee Consul

I was born in India, of American parents. Later, as a young member of the American Foreign Service, I served as student interpreter in the American Embassy at Tokyo. Living for a year with a Japanese family, I came to know their language, habits, and rigid forms of social etiquette. Still later I held consular and diplomatic posts in both China and Japan. For 25 years in all I worked with and among the Japanese and Chinese people; but none of my posts was more interesting than that in Formosa.

To any foreign service officer nothing is more fascinating than to study at first hand the workings of colonial policy. In Formosa I

was to see, intimately, how Japan handles a subject people.

Vividly I recall my first sight of Formosa, with the fantastic sandstone rock and bald, conical islands which stand like sentinels before Keelung (Kirun) Harbor. As I gazed on the green, richly wooded hills and saw rising behind them range on range of turquoise mountains shrouded in mist and mystery, I understood why that early Portuguese, first European navigator to behold this wonderland, had exclaimed "Ilha formosa!" (Beautiful island).*

Walking down the gangplank into this strange new land, I had a singular feeling of self-reliance and satisfaction. I knew what all the Japs about me were saying.

More than ever, now, I appreciated that year with the native family in Tokyo. Also, having spent my childhood in India, I felt at home in the Far East.

An American tea merchant and a consular clerk had come to meet me. Soon we were on the narrow-gauge train and off on the hour's

* See "Formosa the Beautiful," by Alice Ballantine Kirjansoff, NATIONAL GEOGRAPHIC MAGAZINE, March, 1920.



U. S. Army Air Forces, Official

China-based B-29's Find Formosa's Okayama Airfield Pitted with Navy Calling Cards

On October 16, 1944, the strip was out of action; around it lay 50 wrecked Japanese planes. For this damage Gen. H. H. Arnold's communique gave credit to the Navy's carrier planes, which beat his B-29's to this target. In a different area his men counted 37 buildings wrecked by B-29's two days earlier. "Sausage links" (right) are plane revetments; some are bull's-eyes for American bombs. Called "most important target south of Japan," Okayama is 10 miles from Takao (pages 4 and 5).



Bombs from Superfortresses Smother Japanese Shipping in Takao's Inner Harbor

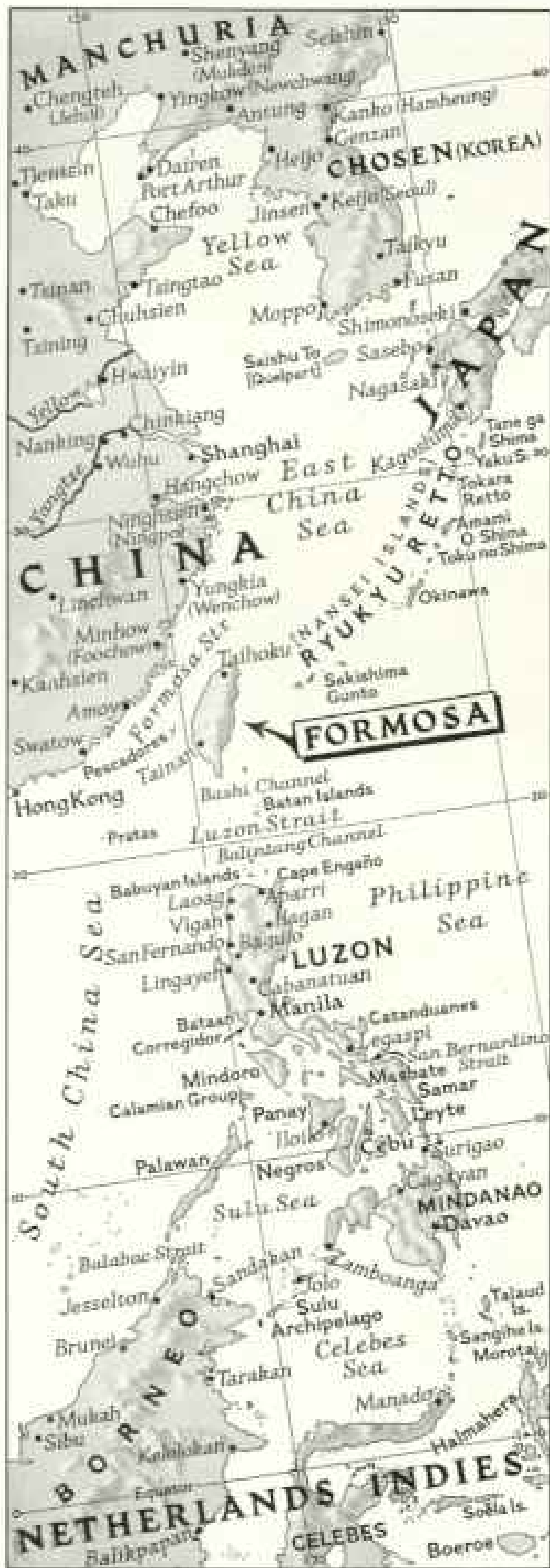
This Formosan port is a major stop for enemy convoys. Two half-mile-long breakwaters protect the outer harbor. The narrow entrance leads to a spacious lagoon lined with docks, warehouses, oil-tank farms, airfields, and other military installations. On the long sandspit (left) the enemy maintains a navy yard (just out of sight).



U. S. Army Air Force, Official

Ships Are Picked Off Accurately at Piers, Land Targets Saved for a Later Day

Takao's heart lies in the center. To its wharves, tracks of the island's main railroad spread out. Rails cross the nearest bridge over a river lined with barges. From Formosa, Japan launched her attack on the Philippines. Before our return to Leyte, the Navy and the Army's 20th Bomber Command bombed Formosa heavily.



Raids on Japan or China Would Be Easy from Formosa

Strategically located some 90 miles from the China coast, between Japan and Luzon, this strongly fortified, Japanese-controlled island suggests a big anchored airplane carrier.

run to Taihoku, the capital. Driving rain drenched Keelung as we pulled out. This port, weathermen say, is among the world's wettest. But after we passed through a long tunnel and emerged into the valley that lies about Taihoku, we ran into bright sunshine.

Our consulate, I found, was simply some rented rooms, used for both office and living quarters, on the second floor of an American tea firm's establishment. But that didn't bother me—for this was Formosa!

Chinese Dislike Jap Overlords

Taihoku, near the north coast, has some aspects of a modern city but is far from cosmopolitan. Japs have a superficial way of imitating European cities. They erect fine public buildings and go in for wide avenues and shady parks, but they don't put European culture or atmosphere into this citified shell.

Taihoku offers little to lovers of music, art, or literature. The social and political atmosphere is dull and spiritually stifling. You don't even see bored housemaids giving the family dog his morning constitutional.

Though there are only about twice as many Chinese as Japanese, the two races live in separate sections of the city, enjoy no social intercourse, and find no common ground in their respective ways of life.

But for the semitropical atmosphere, the Jap section of Taihoku looks like any Jap homeland town, and the Chinese quarter is typical of any South China town.

Because I understood perfectly all the Japanese gossip and street chatter I heard about me, and because I read the daily Japanese papers and the government reports, I soon saw with what harshness and contemptuous arrogance the Japanese regarded and treated the subject Chinese. They didn't act much better to the few whites in their midst.

Japs themselves disdain learning to speak Chinese. They try to force their own tongue and culture on the Chinese; they put pressure on the latter to make them lose their identity as a race group, to wear Jap clothes, and even to adopt Jap surnames!

Though there are eighteen times as many Chinese as Japanese in Formosa, should a school child wish to study Chinese he may do so only after regular Japanese school hours, and then only by taking private lessons.

Newspapers in Chinese are forbidden; so, if any of the 5½ million local Chinese want to read a newspaper, they must buy one of the five Jap dailies published here.

About a third of all Japs on Formosa live in Taihoku, and the rest in other cities. You see almost no Jap farmers or country people;

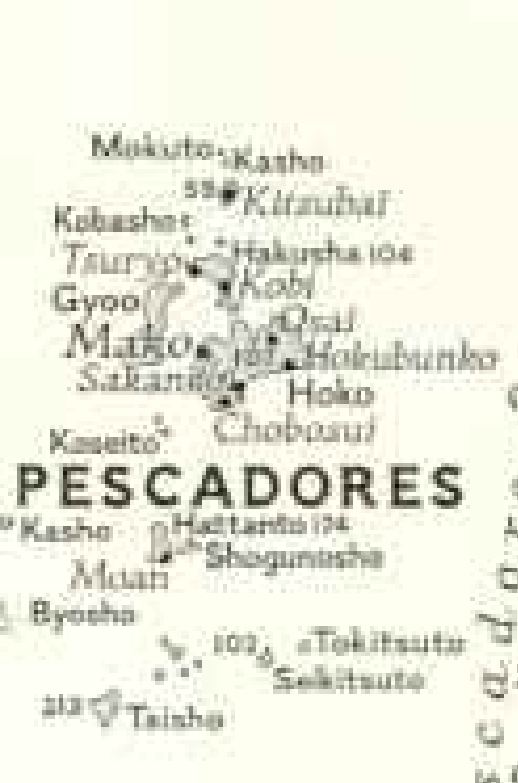


Hokusho 4,400
[Agincourt]

Menkasho 4,170
Kahesho 192

CHINA COAST

FORMOSA STRAIT



PESCADORES



Highways ——— Railroads ———

Drawn by H. E. Eastwood and Irwin E. Alderman



Nobajima from Pix.

Wild Boys Put Flowers in Their Hair and Play a Flute to Win a Girl

Here a suitor's best girl listens closely. Courtship starts when a girl reaches 17 and may last 7 or 8 years. Should a bride bear no children after three years of marriage, she must leave her husband's home. Note the carvings over the girl's head, a common decoration on hill tribes' huts.

instead, they're white-collar folk who hold all key government jobs, almost all the school positions, and all the good jobs in business and manufacturing concerns.

No Jap Looks on Formosa as His Home

Should the special privilege which Japanese enjoy under Nipponese dominion come to an end, few except those with professional, technical, or scientific skills could survive competition with Chinese.

No Jap expects to stay here indefinitely. They all try to maintain ties with the homeland and look forward to getting back there. To overcome their reluctance to serve in Formosa, the Government and Japanese firms accord them large bonuses over the salary scale in Japan. Japanese workers get on the average more than twice as much as Formosan Chinese doing the same work.

Chinese distrust and hate the Japanese, but obey their laws. This is not due to lack of

spirit; it's only because they know they are helpless against Jap force and ruthlessness. But Chinese have great endurance and are used to a comparatively low standard of life. The Chinese birth rate here is among the world's highest and is much greater than that of the Japanese.

Formosa's chief ruler is a Japanese Governor General, usually a retired army or navy man. Higher government officials are all Japanese, and their activity includes wide participation in business.

Jap policemen have long arms, regiment the populace, pry into everybody's private affairs, interfere with religious services, teach school, and even try to control the thoughts of the people. Prevention and detection of crime with them are merely incidental functions.

Part of a consul's work is to make trade reports to his government. I was amazed to find here a wealth of statistics on almost every line of economic activity. (This was



Frederick L. Hamilton from *Three Lions*

An Arrogant Daughter of the Sons of Heaven Out for an Airing

Cap badges worn by the two Formosan Chinese carrying the chair show they're in Japanese Government service. The chair, "For Official Use Only," is no doubt used here by the daughter of some public official.

before the Japanese had become acutely spy conscious.) But my faith in Jap figures was shattered by an incident which occurred soon after my arrival.

When writing a report on the fisheries, I went to interview the official concerned. He gave me neat, elaborate tables, showing to the last integer the pounds of each kind of fish caught in each administrative area.

"Mr. Suzuki," I remarked, "I'm impressed with the exhaustive character of your material. How did you get it all?"

"It is very simple," he replied. "We know if we asked fishermen to report their catches they wouldn't give us the right figures. They'd fear we only meant to raise the taxes. So, our officials in each district make a guess at it! We then adjust these figures."

Among places of interest in Taihoku are the museum, with its island natural-history and industrial exhibits, and the botanical garden, with many plants for which Formosa is noted. There is Maruyama Park, distin-

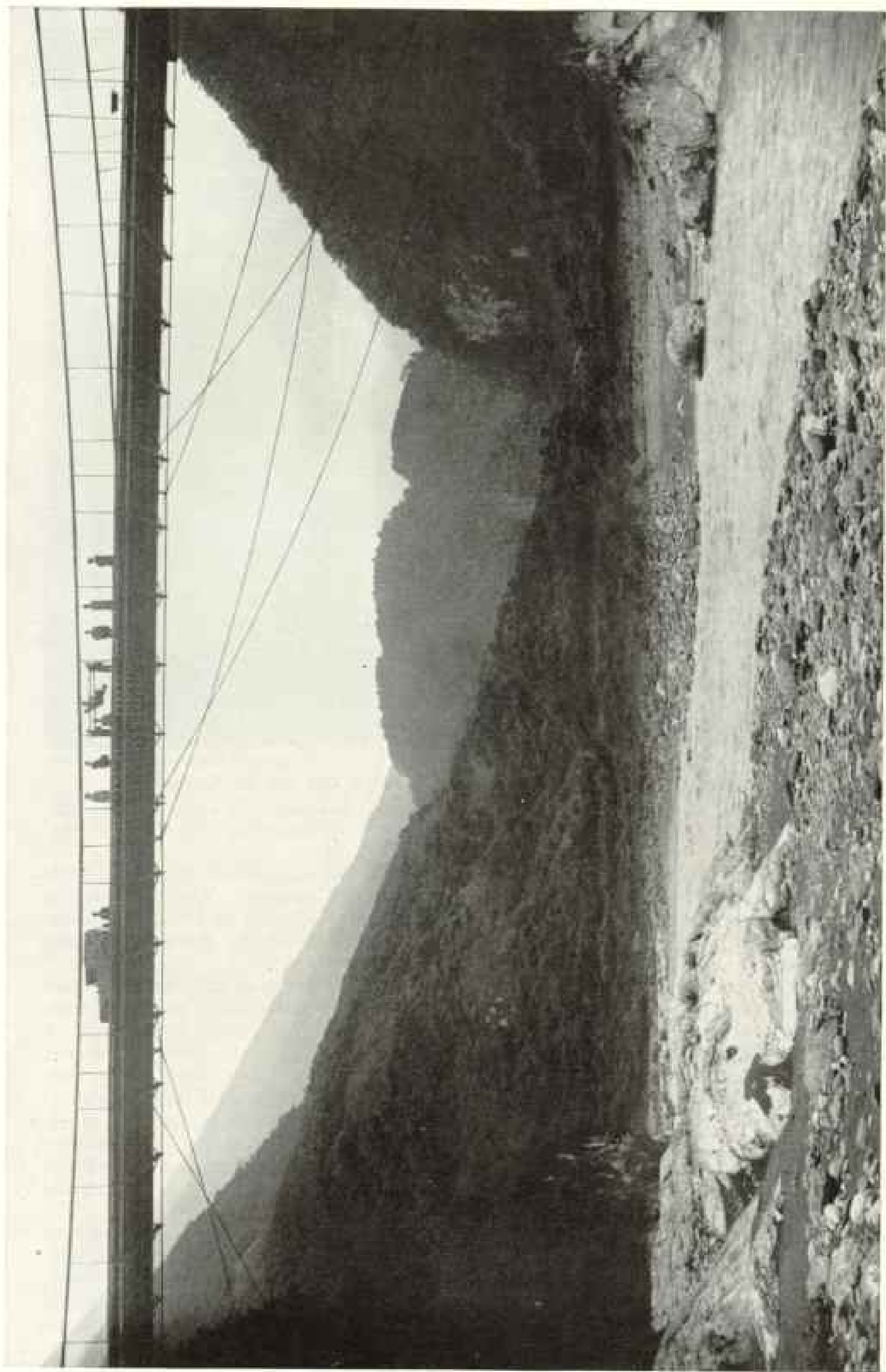
guished for the magnificent views it affords of surrounding country. Also, here is the Shinto temple dedicated to Prince Kitashirakawa, commander of the Japanese invading forces in 1895.

Then there's the monopoly bureau, where the bulk of the world's supply of natural camphor is distilled and opium is prepared for those who like to "hit the pipe" and dream.

Before this war only about fifty non-Asiatics lived here; most of these resided in Twatutia (Daidotei), one of the two Chinese quarters of Taihoku. Since 1942, this number has been augmented by many American prisoners of war, as well as some British and Dutch war prisoners.

In my time there were on the island an American and a British consulate; about eight American and British business firms, chiefly tea exporters; a Canadian Presbyterian and a Spanish Dominican mission. That was the whole "foreign community"!

We maintained, as a center of social life, a



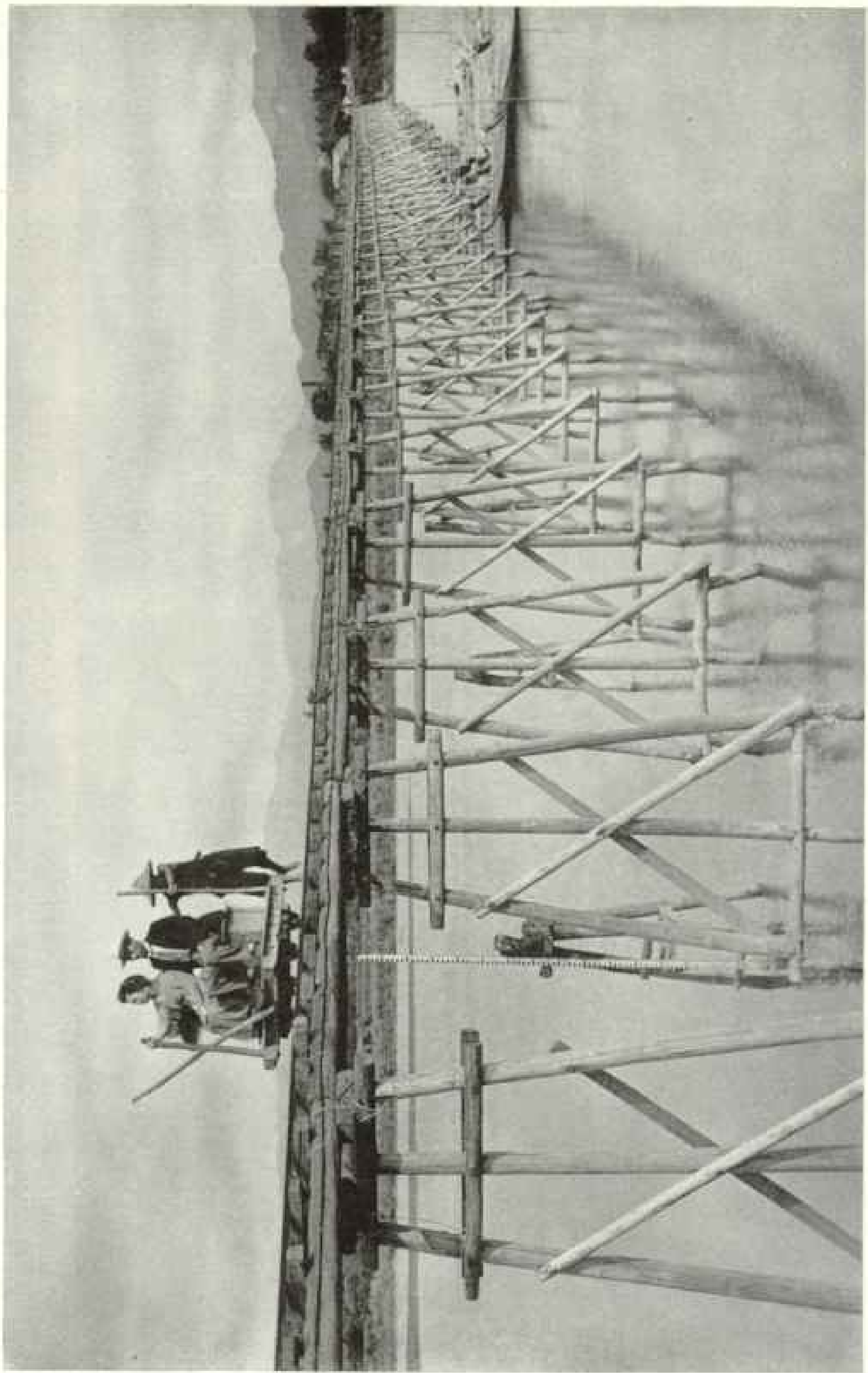
Motorcar and Sedan-chair Parties Halt to Watch a Cameraman Make This Picture of Takikiri River Bridge

Rising near Mount Gokan, this 30-mile-long stream reaches the Pacific Ocean at Kenkai, on the east coast. Its sands are rich in gold. From the lofty bridge travelers gain fine views of Taroko Kyo (Gorge) in the background.



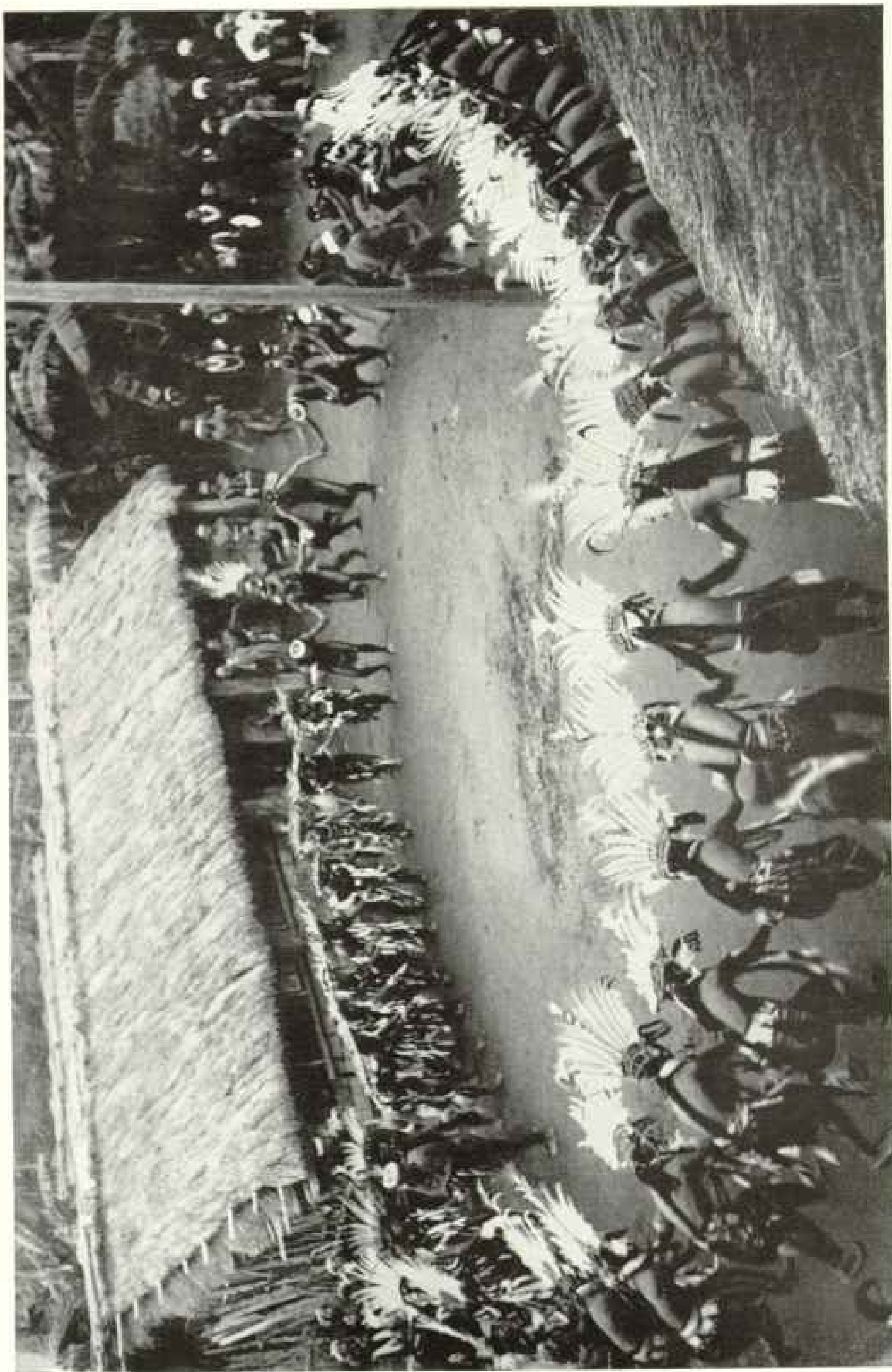
Ceremonial Processions with Decorated Floats Are to Chinese Crowds What the Old-time Circus Parade Was to Americans

Look at that band, leading a parade in Taihoku. Between trumpet men march the drummer boys, just as in a life-and-drum corps. Though it's daylight, men carry big paper lanterns covered with dragons and characters. Costumed girls, under parasols, ride on the floats (page 6).



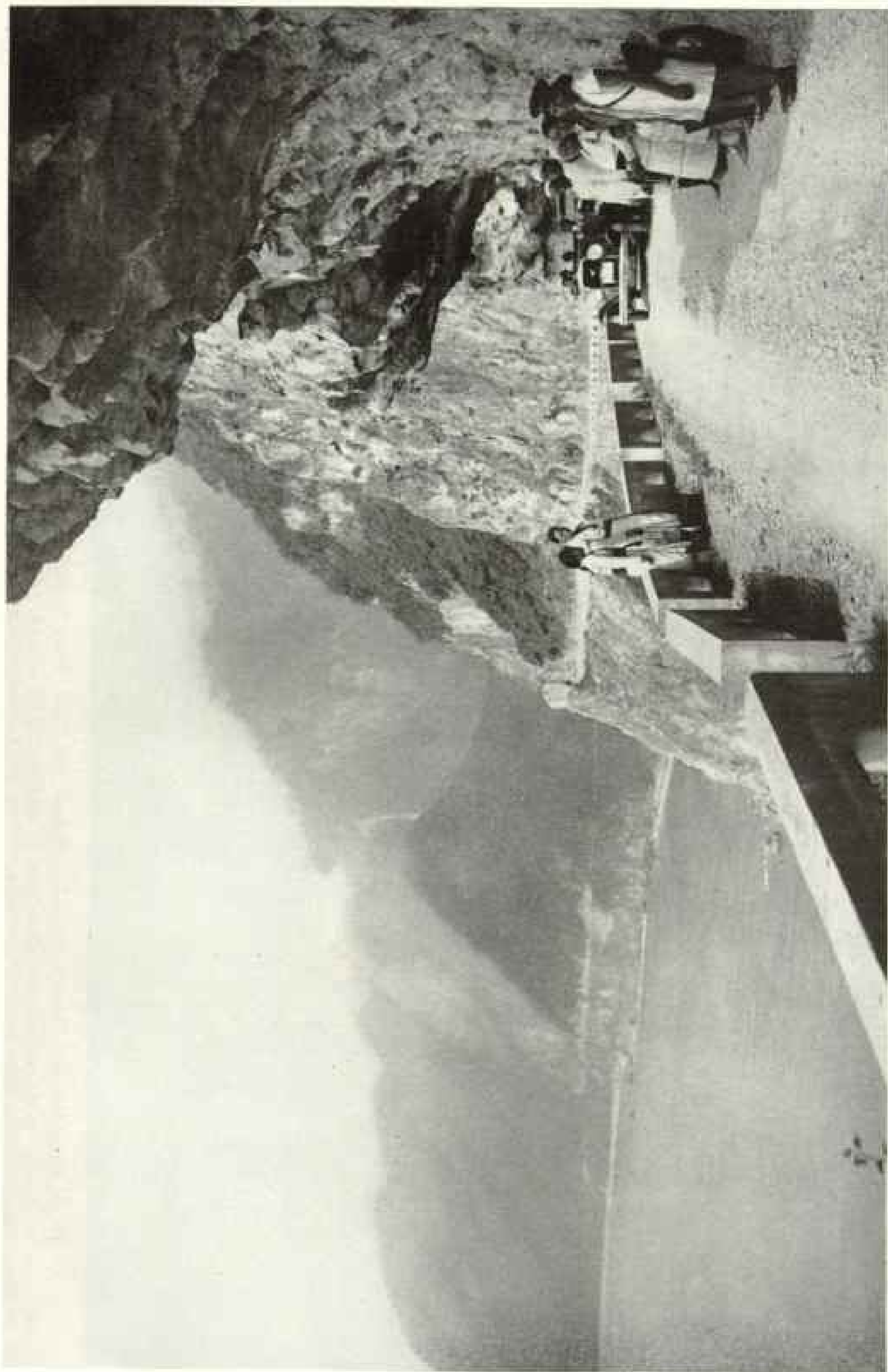
In a Roller-coasterlike Car, Pushed by a Chinese, a Japanese Couple Crosses a Spidery Wooden Bridge

Cheap labor permits wide Formosan use of such push cars, which serve as feeders to railroads. They make about 6 miles an hour on level ground, much less uphill, and about 10 miles downhill. Some are poled along, like a boat; some have sails. "First-class" push cars have bamboo seats and carry only two passengers. Second-class cars take four people. This spindly bridge, built high to keep the track above flood tide, is built above a tidal gauge. Under the car hangs a tidal gauge.



Taiyal Head-hunters' Dances Now Are Halted, but This "Paul Jones" Illustrates How They Were Once Performed

It was Taiyal custom to set up the captured head, dance about it, and offer it food and drink, as if to dispel the victim's sorrow. Many skulls in a village were thought to bring prosperity. Some villagers now compromise on a monkey's head! Formerly, dancers wore all their weapons. Now disarmed, they go in for fancy dress.



Cut from Cliffs by Jap Engineers, This Good Highway Winds Many Miles Along Formosa's Craggy East Coast

Aborigines standing by the road inhabit adjacent hills and hunt with dogs. Steep cliffs hereabouts tower to great heights, and adjacent ocean waters are among the world's deepest. Japanese have climbed and renamed many of Formosa's higher peaks and made careful studies of flora, fauna, forests, and minerals.

small club equipped with a library of American and British periodicals and books, a billiard room, and a combined bar and buffet. From the club veranda you look out on the bustling water front, where junks enter from and clear for Amoy and other ports on the China coast, as well as island ports.

Two Groups of Chinese

Here is abundant material for the study of Chinese life. I learned to distinguish between the Hok-lo and the Hakka, the two principal groups of Chinese in Formosa.

From Fukien Province came the Hok-lo. Unaffected by the Chinese republican revolution of 1911-12, the men for years wore pig-tails and women bound their feet. Japanese now forbid foot binding; so you see women with bound feet only among the older Chinese.

The Hakkas are China's frontiersmen, coming largely from the backwoods of northeastern Kwangtung. In the Chinese republican revolution they furnished some good leaders, especially military, to the Chinese revolutionary cause. Being rugged individualists, their women did not bind their feet even in pre-republican days. Of the Chinese in Formosa, 100,000 are Cantonese, mostly city-dwelling merchants. A million are Hakkas, most of whom live in the areas bordering the savage territory. The Hok-lo number over 4,000,000 and are among the most conservative people in the world.

Much produce brought to Twatutia is sold right there on the bund (river front). Hag-gling over prices is long drawn out and lively. A buyer would "lose face" to pay anywhere near the first asking price for anything.

Voices have to be raised high to be heard over the cackling of poultry and the squealing of pigs. Sometimes there is a quarrel between rival venders, but it never ends in blows, as would be the case in any other country if names were called even less abusive than those to which the genius of the Amoy dialect of China so richly lends itself.

I never tired of looking on life's pageant from the club veranda. The view upriver will always remain fresh in my memory. Junks, with eyes painted on either side of the prow to enable the boat to keep clear of devils and other dangers invisible to the human eye, glide serenely up- and downstream, the steersman with his long scull silhouetted against the brown lateen mainsail.

On the farther side of the stream is a wide sandy stretch of river bed and beyond that are deep-green orange orchards. In the background are cloud-capped mountains, home of fierce head-hunters.

Most whites are here to sell oil or buy tea. Occidental staffs of these foreign firms, or "hongs," consist of the "taipan," the Chinese equivalent for "boss," the "number two," who is usually the executive officer and office manager, and sometimes a junior assistant.

Each hong has a large Chinese staff, all employed on the recommendation of the "comprador," an alert Chinese through whom the whites in the firm conduct all their local business. The comprador is much more than an interpreter; he is a responsible and respected merchant and often might buy out his taipan many times over.

In the case of tea firms the taipan stays in Formosa only during the tea season, which is from early spring to late autumn; the rest of the year he spends in the United States offices of his firm, making contacts with customers.

How a Tea Taster Works

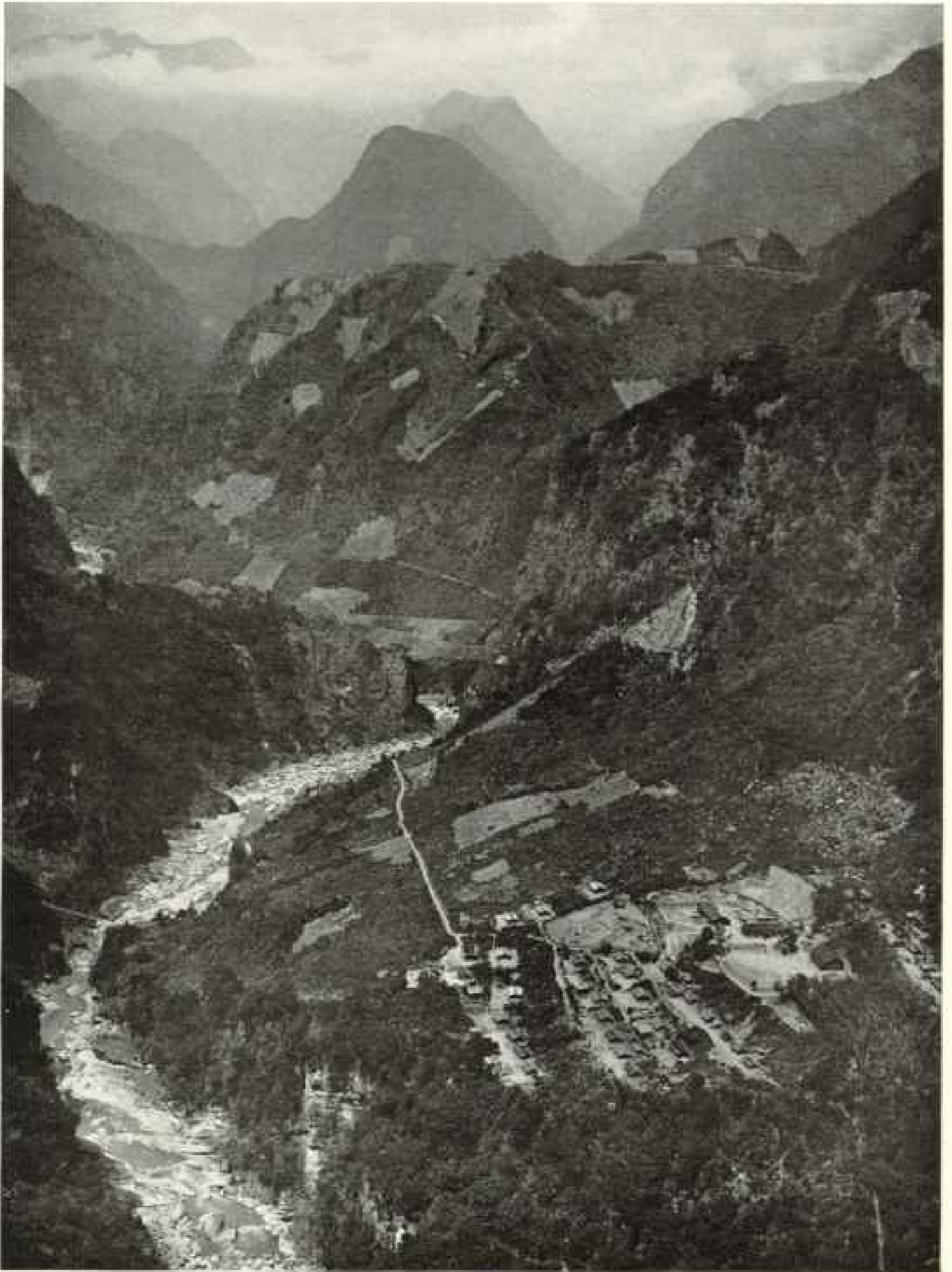
Foreign tea firms do not grow tea; they buy the plucked leaf from Chinese growers. Samples are taken from each lot and from them brews are made.

Soon after daybreak the taipan starts work on an array of perhaps sixty cups of tea, beside each of which there is a small sample of the leaves. He examines the leaves and looks at the color of the infusion, and then he "tastes" the brew by gargling or by inhaling some through his nostrils. He swallows none, but spits each "sample" into a handy cuspidor. As he proceeds from cup to cup, he fixes the price which he will offer and the grading of the tea.

American and British hongs deal mostly in oolong tea, which is made from the choicest and most delicate leaves. Pouchong tea, made from coarser leaves of the same plant (to which jasmine and other flowers are added), is marketed locally or in Java and Hawaii and is handled by Chinese merchants.

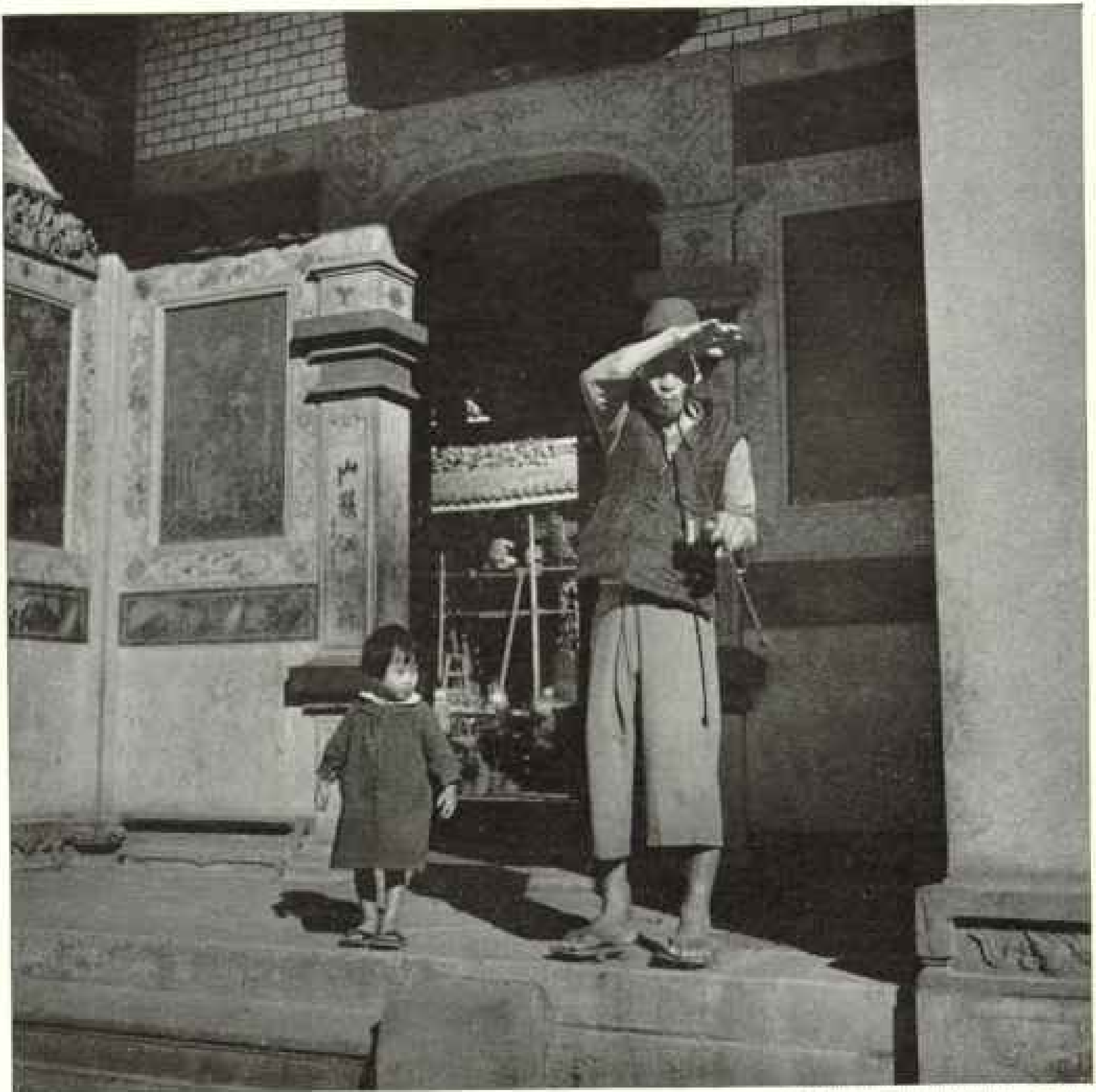
The Japanese sought by discriminatory treatment to push all oolong tea trade into the hands of Jap firms. The only reason they gave up the attempt was that they finally realized they couldn't beat American and British teamen in knowledge of market requirements and practices.

Life for these tea buyers and for me, too, was rather secluded; we formed a small clique to ourselves. The Japanese resented us, and the Chinese avoided us for fear intimacy with us would get them into trouble with the Japs. For outdoor amusements we Westerners had tennis, hiking, and snipe shooting; in the evenings we often dined together. Servants were cheap and food plentiful. In winter, with



Wild, Rough Eastern Formosa, No Place for a Modern Army's Tanks and Big Guns!

Like windshield stickers, a few garden patches cling to hillsides; some gray spots are scars of landslides. In the lower right is a hill-tribe village with market, police station, and school. White lines look like vehicular roads but are mere paths, hacked from brush and rocks.



Frederick L. Hamilton from *Three Lions*

Formosa's 5½ Million Chinese Do the Hard Work and Bend the Knee to Jap Overlords

Though China began in the 7th century to seek sovereignty over Formosa, it was not till the 1500's that her people, first as pirates and then as lawful traders, began settling the island. They outnumber the Japanese more than 18 to 1, but have no voice in government. Of the 300,000 Japs, most are public officials, labor bosses, business men, and white-collar workers. Though Japan has ruled Formosa for 50 years, no Jap living there looks on the island as home (pages 6, 8).

most teamen away, there were not enough of us to hold a dance, and often we were unable to get together even a quorum for bridge.

Though we lacked most amenities of Occidental life, there were compensations. We never had to wait a week for our laundry, cling to straps in crowded buses, stand in long cafeteria lines, or live in stuffy apartments. We had commodious, airy living quarters and our own rickshas to take us about. Above all, although we worked conscientiously, we had leisure to think, to play, and to rest. No alarm clocks, ration cards, or hurried meals!

This sort of existence cushioned us against the effects of the trying climate, with its long summers and raw rainy winters, and the discomforts of the typhoons which lash this island with exceptional fury.

Visiting the Head-hunters

People often ask about the head-hunters. I saw them but twice.

Once I was allowed to make an excursion from Taihoku to a hill station some fifty miles away, and then only on condition that I would accept the "protection" of a policeman. The



The Paiwan Tribe's Double Loving Cup Is Two Feet Long

Paiwans are the most numerous of Formosa's seven aboriginal tribes. They like to decorate their houses and utensils with carvings of deer, snakes, and human faces, such as those on this wooden cup.

trip to the jungle was as interesting as the wild tribes themselves.

The first part of our journey was by train along Formosa's main trunk line, of narrow gauge like the railways of Japan.

All the train crew and station staffs were Japanese except the porters and other menials, who were Chinese.

We rode through a countryside verdant with the patchwork of miniature farms. Chinese peasants in wide-rimmed straw hats and indigo-blue pants tilled the fields. Farm labor is all handwork except in the Japanese-operated sugar cane plantations, where tractors and other machinery are used, and in the bottom lands, devoted to rice growing, where the water buffalo pulls the implements.

Farm coolies spend their days knee-deep in ooze, wrestling with a crude wooden plow and yelling at a sluggish, stupid beast.

But it takes this kind of toil to grow all the rice Formosa eats and exports to Japan. In upland fields the important crop is cane, sugar being the island's principal export and Japan's chief source of it.

Villages dot the green plains. Most homes, built of unbaked clay brick, with dirt floors and thatched roofs, have only one or two rooms.

Finer residences form three sides of a quadrangle, with an open court between the wings. Here and there, isolated from the rest, is a more pretentious edifice of brick, its tiled roof curved upward at the two ends of the ridge and its wide overhanging eaves also curved upward.

Many villages stand behind bamboo groves so dense they could stop a tank.

Chickens, ducks, pigs, and dogs swarm in these villages. The

pigs are slate-colored, ill-favored, and sway-backed. The ducks were herded by boys with long poles. If a duck tried to run away, a boy would give him the hook, pulling him back.

All along we saw fields of sweet potatoes, peanuts, and beans, as well as orange orchards, and banana and pineapple plantations. At stations, vendors offered large baskets of fruit.

Last lap of our trip was made uphill in a pushcart, a miniature flatcar. For first-class passengers, it has rattan seats and a top. It runs along an 18- or 20-inch gauge track and is pushed by Chinese coolies, from behind.

I preferred to walk, and came finally into a deep forest of evergreen trees: camphors, and various species of conifers—cousins of our cedars.

Forests and scrub cover about two-thirds of Formosa, but lumber production is small, as most of the good forests lie in inaccessible mountainous regions.

Formosan cedar, camphor, and hibiscus are used for cabinet-work and house construction; various woods are suitable for shipbuilding, especially cryptomeria.

Head-hunters Still Decapitate Japs

Formosa is the world's chief source of natural camphor. Workers go in groups into the mountains, fell camphor trees, and cut the wood into chips, which are processed in big iron kettles (page 22). The crude product is then brought to the camphor monopoly at Taihoku for refining. In early days, the hill tribes used to cut the heads off shocking numbers of Chinese and Japanese working in the camphor woods.

Lunchtime found me at a police station, where they gave us tea. By late afternoon we reached the crest of the ridge, at about 5,000 feet altitude, from which we had a magnificent view of the plain we had left. On the opposite side, beyond a narrow mountain valley, there rose a range of mountains twice as high as the one we were on. Here is the heart of the savage country.

A few minutes' walk from the top of the ridge brought us to our destination, the hill settlement, a few board shacks with tin roofs. One, larger than the rest, was a combined police headquarters and guesthouse. Another served as a trading station under police management. Still another was a school. As we approached, the policeman with me exchanged punctilious salutes with some colleagues who met him and said the senior officer was awaiting us inside.



Harrison Forman from *Esopent*

Pipe in Mouth, a Mother Admires Her Child

She's a tame, or "ripe," savage, and her mustache tattoo proves she's married (page 21). Like every island adult, she smokes—and local tobacco is good. Her pipe is of the brass bowl type, introduced by Japanese traders.

He was a Mr. Ando, little and wiry, with a shaved head. Tea was brought in, and after the customary exchange of compliments we launched into a discussion of the respective experiences of our two peoples as torch-bearers of civilization among backward races.

Ando said that he could not speak English, but could read it. He said on his last visit to Taihoku he saw a reference in an American magazine to a report dealing with Japan's efforts to civilize the natives, and that he had been puzzled by a comment in the magazine reading, "We would have thought it was a case of the pot and the kettle."

In reply to his request for an explanation, I said that our figures of speech were often



Frederick L. Hamilton from *Three Lions*

"Come on, You Lucky Number! Baby Needs Shoes!"

Orientalism are born gamblers. From the cradle to the grave, from fan-tan to cockfights and (among upper classes) even to American poker, they love a game of chance. These Taihoku Chinese urchins concentrate on picking a winning number. Boy on left boasts a lettered cap, similar to those advertising caps worn by some American gasoline station attendants.

very elusive and that I would want to see the entire article before I could undertake to interpret the allusion.

Our conversation was brought to an end by an announcement that my bath was ready. Afterward, I went out to look at the aborigines, some twenty of whom were standing around the post trading station, wrapped in hand-woven grass cloth blankets with bright-colored geometrical patterns.

These head-hunters were of slender build, but well muscled, taller on the average than Japanese. Some had distinctively Mongoloid features, while in others Indonesian characteristics, such as straight eyes and aquiline noses, predominated. Most of them were tattooed about the face.

Under their blankets these men wore a

shirt and a G string, made of the same material as the blankets. Some carried bows and arrows and others had guns. These latter, I was told, were lent to them by the Japanese, with a few shells, so they could shoot game.

I did not see any women, but there were some boys about dressed like Japanese school children.

Japs' Wire Fences Hold Back Tribesmen

Near the guardhouse a primary school is held, to serve the children. I went to see it next morning. When I praised its work, the policeman-teacher said there was much closer race kinship between the Japanese and the wild tribes than between either of them and the Chinese!

This claim of cousinship has not kept the Japs from encroaching on the domain of the aborigines. Japs purposely crowd in on them, to bring them under control and make them help in the economic exploitation of the island.

But to hold the tribesmen on their reservation, the Japanese have built a guard line by cutting a wide path along the mountain ridges on which the aborigines make their homes. Guardhouses stand at strategic points; the jungle path has been cleared to a width as great as one hundred yards to prevent surprise attacks; and in some districts wire fences and entanglements, charged with electricity, have been set up.

Nimble and jungle-wise, the tribesmen still take heavy toll of Japanese seeking to invade their territory. They are consistently cheated by the Japanese at the trading posts, where the produce and handiwork of the natives—tobacco, textile fibers, herbs, and hand-woven cloth—are bartered for metalware, trinkets, and other cheap Jap goods on an exchange basis very unfair to the tribesmen.

Forced labor is often exacted of the head-hunters, but they are poor workers. Nevertheless, in this war, the Japanese have used numbers of them as scouts and front-line bearers in their overseas jungle campaigns.

Languages of these tribes belong to the Malayo-Polynesian group of tongues, whose range extends from Hawaii in the east to Madagascar in the west. The tribes are of Indonesian stock and some of them bear remarkable racial, cultural, and linguistic resemblances to the mountain tribes of northern Luzon.

Bicycling Among the Head-hunters

They live in rude wooden or stone huts grouped in villages under a chief. There are seven main groups of tribes, each with distinct language, dress, and customs. They live by hunting, fishing, and a primitive agriculture—growing rice, corn, millet, and sweet potatoes. Their livestock consists of water buffaloes, cattle, dogs (used for food as well as hunting), and chickens. The men of some of the tribes are enthusiastic head-hunters, for much the same reasons, besides purposes of revenge and of ritual, that our young men prize athletic trophies.

Our tour of the settlement was interrupted by darkness and the call to supper, which consisted of rice, canned Japanese vegetables, and a special treat in the form of wild-boar meat, which had been brought in by a tribesman. After supper we were so cold and tired we went to bed early. Next morning one of the tribesmen wanted to trade clothes with me;

but I managed to persuade him, through the interpreter, that my suit was not well adapted to stalking game in thick jungles.

My next encounter with aborigines came months later when, on a trip to the southern part of the island, I stopped off for a side trip to Lake Candidius. The Japs call this lake *Jitsugetsutan*, or Sun and Moon Lake; it lies at an altitude of about 2,500 feet. From the nearest rail point I traveled this time by bicycle and without police escort.

At the lake I found a small colony of aborigines who had adopted a Chinese form of life. These civilized aborigines are called by the Japanese *jukuban*, or "ripe savages," and those in a wild state *seiban*, "raw savages."

Out on the lake I saw a group of these people fishing from long dugout canoes. Their large nets, hung from poles, they dip into the water and then raise.

After visiting the lake, my curiosity over what lay on the other side of the ridge led me on. As I began the ascent, the path got so steep I had to walk. A turn near the top brought me suddenly face to face with five aborigines, resting by the wayside.

They were armed with bows and knives and looked as if they could run fast enough to catch me. There was nothing to do but face them. When I came up I greeted them, set my bicycle down, and filled my pipe.

Then I passed the tobacco pouch and let them fill their long-stemmed pipes. I fingered their ornaments admiringly and they showed interest in my clothing and in the bicycle.

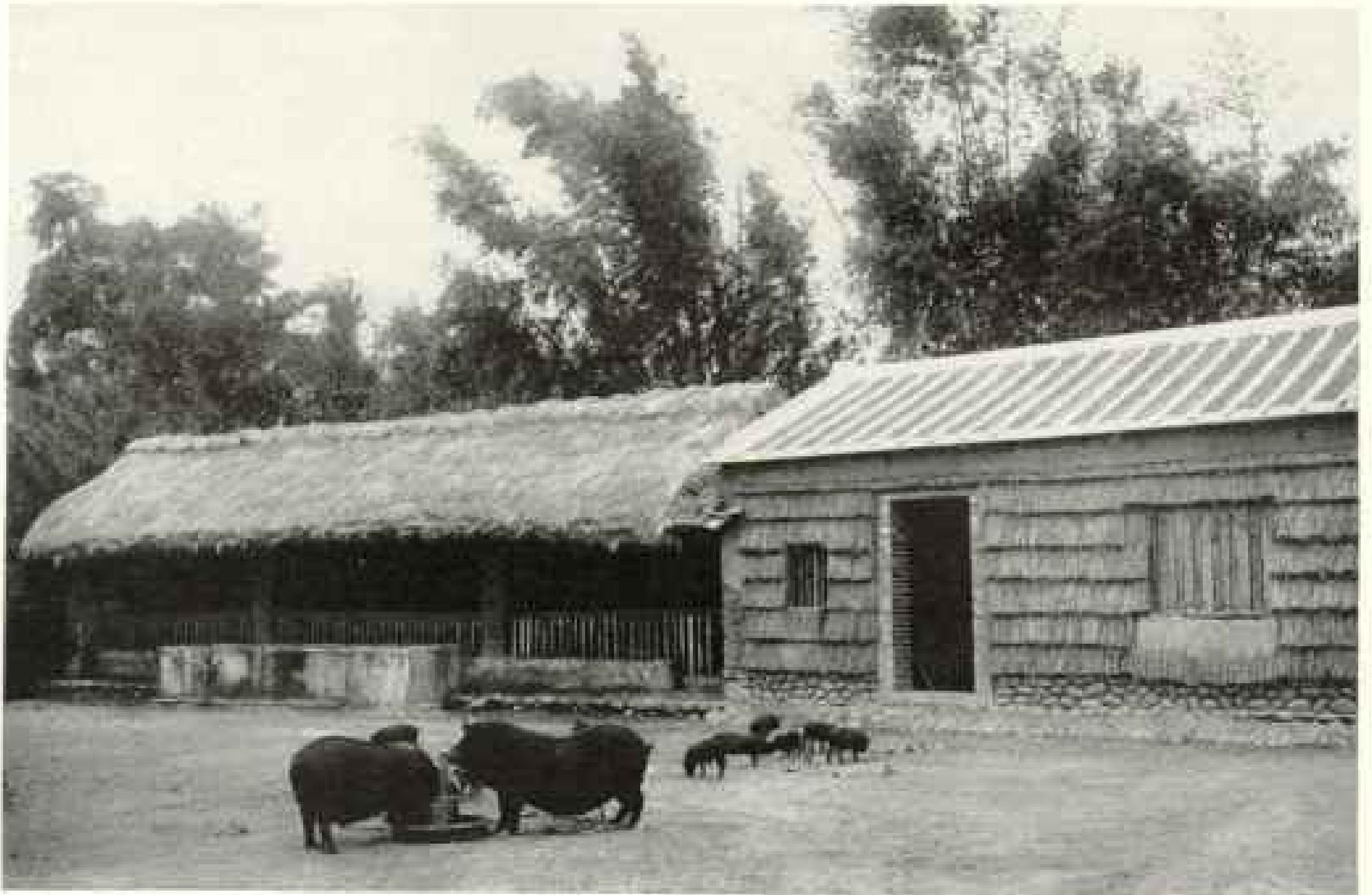
Their wild, excited chatter was Greek to me, but I certainly wished I could understand. In my uneasiness, I imagined they were arguing about who should have my pipe, or my clothes, or the mysterious wagon I rode on.

I might even have fancied they argued about who should have my skull, and that perhaps the most evil-looking man among them was saying he wanted it—that it would look fine hanging in his hut, beside that of a Jap with two gold teeth!

To stay too long I knew would be even more dangerous. So all at once I simply waved good-bye, jumped on my bike, and pedaled off.

Few Europeans Ever Lived Long on Formosa

I'd lost all interest, too, in further exploration of the Sun and Moon Lake. All I wanted then was to get back down that mountain, find an inn, and get some Dutch courage from a drink of beer. I did, finally, and never knew how good and stimulating even very warm beer could be!



Formosa's Sway-backed Swine Are Identical with Those of South China



Like Rats Gnawing, These Woodcutters Whittle Away on a Camphor Tree Stump

See their tool marks on the stump and the rude perch they sit on. Chips are collected and cooked in the making of gum camphor. Large forest areas of camphor trees have been planted in Formosa to replace wild trees that were exhausted by cuttings. To an increasing extent since the war, synthetic camphor has been manufactured in the United States (page 19).



Here the Policeman Must Also Serve as Schoolteacher

These children belong to the Taiyal tribe. There's much ado over educating wild tribe children, but results are superficial. Chief aim is to wean them away from tribal customs, to teach them respect for all Japanese—even to bowing to a passing bus or motorcar!

In the last half of the nineteenth century Formosa was visited with increasing frequency by Europeans and Americans. On several occasions their vessels were shipwrecked in Formosan waters, and their crews were imprisoned or killed.

W. M. Robinet, an American, was the first Occidental to begin trading in Formosa during the modern period. His activity anticipated by three years the Treaties of Tientsin, of 1858, under which ten Chinese ports were opened to foreign trade, including Tainan in south Formosa.

In 1860 two British firms pioneered in the camphor trade. A few years later tea cultivation was introduced from China, and eventually a number of British and American firms, already doing business at Amoy, China, set up offices in Taihoku.

In 1868 a steam sawmill was built at Suo on the east coast and some Europeans settled there—but no white man's venture here ever lasted long.

To the south of Suo are cliffs which rise 6,000 feet from the sea, the highest cliffs in the world. I well remember the occasion when I saw them.

We were skirting the coast on a small

steamer. I was called on deck by a fellow passenger. "Look, look!" he exclaimed. "Isn't it a wonderful sight?"

I hurried to the side and looked across the water to the land. I saw some cliffs with clouds above them. "I don't see anything to write home about," I told him.

"No, not over there," he objected, "but look up overhead!"

I looked skyward and was amazed to behold a line of rocky pinnacles reaching above the clouds. An area of cloud below the summit made it seem as if the pinnacles were standing on air.

One might have some idea of the sublime grandeur of the scene if he were to imagine himself looking from a steamer on the Hudson across to a structure five times the height of the Empire State Building.

In 1871 a Jap trading vessel was wrecked on the south coast of Formosa and fifty-four of its crew were murdered by head-hunters. After a second such incident occurred, the Japanese sent a punitive expedition, which attacked and defeated the tribesmen and remained in occupation of some territory until the Chinese Government paid an indemnity.

At the end of the war between China and



Nakajima from Pita.

Night Club Life, or Cocktail Hour, as Formosa Tribesmen Know It

Debutante guests in tribal party dresses stand in background. Tonight, after his people have done a hard day's work, the chief will entertain, serving rice wine from big jars.

Japan, in 1895, Formosa was ceded to Japan, but it took her seven years to pacify enough of the island to institute civil control.

Japs Try to Squeeze Wealth from Formosa

Despite intermittent native uprisings, the Japanese work vigorously to develop and exploit Formosa for their own benefit. They have put a lot of money into railways, roads, and power plants. To provide revenues, state monopolies were established for camphor, opium, and salt. Five Japanese sugar companies now produce 95 percent of the sugar.

The Japanese introduced pineapple canning, Formosa's output being exceeded only by that of Hawaii and Malaya; they introduced a new kind of rice which gives an increased yield per acre.

Production of coal, gold, copper, natural gas, and petroleum has become of some importance. Commercial banks have been set up and harbor facilities improved, to encourage trade.

Formosa, before the war, had one of the highest per capita foreign trades in the Far East. The bulk of this trade is, of course,

* See "Mindanao, on the Road to Tokyo," by Frederick Simpich, NATIONAL GEOGRAPHIC MAGAZINE, November, 1944.

with Japan. The two principal ports, Keelung in the north and Takao in the south (pages 4, 5), are strongly fortified; and a naval base stands in the Pescadores, which lie in the channel between Formosa and the mainland of China.

Formosa's Strategic Value in Any Far Eastern War

Just before Pearl Harbor, the island was heavily garrisoned by the Japanese Army, which had its headquarters at Taihoku. After Pearl Harbor numerous war industries were set up and became active.

This island is self-sufficient in foodstuffs and has much surplus for export.

Any military force holding Formosa, with its surplus agricultural production, might well use much of its vegetables, fruits, and other foodstuffs to feed its own army and to help feed the destitute people in the liberated areas of the Far East.

Formosa is also a base of the greatest strategic value in any operations against Japan, or the China coast.*

Chinese Formosans undoubtedly look forward to the day of liberation from the heavy yoke of Japan, when they can be reunited with their fellow Chinese of the mainland.

Indians of Our North Pacific Coast

BY MATTHEW W. STIRLING

Chief, Bureau of American Ethnology, Smithsonian Institution

MOST aristocratic of all the Indians north of Mexico were the tribes which dwelt on our wild and beautiful North Pacific coast.*

Unlike the vast majority of their North American kinsmen, they did not develop democracy. Instead, they set much store by wealth and family connections.

Above the Rio Grande, only the Pueblo Indians of Arizona and New Mexico rivaled their civilization.

With their famous totem poles, the Indians of the Northwest developed wood carving into exquisite artistry (pages 28, 50).

They excelled in dramatic performances. Their realism in the dance and in impersonation was matched by the skill of the carvers and painters who designed the masks and costumes (pages 26, 29).

Their leaders originated the celebrated "potlatch" ceremonials, in which the giver often impoverished himself in his lavish bestowal of presents on the guests (page 31).

Many were expert whalers. Others knew how to manufacture fish oil, an important element in their diet.

Warriors Wore Body Armor

A warlike group, their warriors were among the few in North America who wore body armor.

Usually we consider the development of agriculture and the knowledge of pottery making as signs of an advanced culture. Yet the Northwest Coast tribes achieved their exalted status without either.

This aristocratic group of tribes inhabited an area stretching from Yakutat Bay, in southern Alaska, to the Strait of Juan de Fuca, between Vancouver Island and the State of Washington. Their influence extended as far north and west as the Aleutians and as far south as California (Plate XI).

Their homeland constituted one of the most distinct cultural areas in North America, yet they were independent of one another and spoke many different and unrelated languages.

* This is the fourth in a series of authoritative articles by Matthew W. Stirling on the American Indian, illustrated with W. Langdon Kihn's paintings which are the result of careful study and extensive research. See, in the NATIONAL GEOGRAPHIC MAGAZINE, "America's First Settlers, the Indians," November, 1937; "Indian Tribes of Pueblo Land," November, 1940, and "Indians of Our Western Plains," July, 1944.

Each separate unit thus contributed its share to the unique customs common to this interesting region.

Along the northwest coast a rugged series of heavily forested mountains rises abruptly from the sea and extends inland in an almost unbroken succession of ranges to the Rocky Mountains.

A mountainous chain of islands, large and small, skirts the entire coast. These islands are separated, one from another, by an intricate maze of sea channels.

Sunken mountain valleys have produced a series of deep narrow inlets, or fjords, some of which penetrate far into the mountains.

Four principal rivers, of medium size, have cut their way to the sea: the Stikine in the northern, the Nass and Skeena in the central, and the Fraser in the southern part of the region.

Forests of Giant Trees

Except for the river valleys, the entire coast is rather effectively isolated from the interior, a factor which has contributed considerably to its individual development. Rainfall is heavy and, combined with the mild coastal climate created by the temperate Japan Current, has produced heavy forests. Trees often reach gigantic size (Plate X), especially in the southern section. Of most importance to the Indians are the red and yellow cedars, fir, hemlock, spruce, and pine.

Native villages hug the seacoast or main waterways. Fish and sea mammals are the inhabitants' principal food.

Salmon and candlefish, which ascend the fresh-water streams to spawn, are abundant. The Indians catch them with weirs, fish traps, nets, and rakes. They also harpoon salmon (Plate XIII).

In the sea, Pacific codfish and halibut are caught with hook and line, the latter made of long strings of kelp. Herring are taken in nets.

Whaling was an important industry of the Nootka and Quileute. It was not practiced by most of the tribes north of them, the Kodiak islanders and Aleuts excepted.

The Nootka pursued the whale in seagoing dugout canoes (Plate XVI), frequently far from land. Harpoons with broad points, made formerly of shell or stone but now of metal, fastened to detachable heads, were attached to long lines of whale sinew.



Harold F. Flint

Mustached Nootka Chiefs Pose in Ceremonial Attire

As a rule, American Indians plucked their scanty whiskers. Having heavier beards, many on the Northwest coast raised mustaches. These men from Vancouver, British Columbia, wear Chilkat blankets below their headdresses (opposite page). One holds a rattle (Plate IV).

To the lines were fastened floats of inflated sealskins, which served as drags when the whale had been harpooned. They also marked the whale's position when the lines were free from the canoes, and prevented the whale from sinking after it had been killed.

The leader of the whale hunt usually inherited his position and was required to indulge in special ceremonies to acquire a helping spirit. He prayed in a special shrine in the forest, containing numerous carved wooden figures and the skulls of whale chiefs who had preceded him in office. To acquire fortitude he wore clothing made from stinging nettles or of thorny wild rosebushes.

Special adornments such as human scalps

were left to the whim of the whaler, but generally he wore objects believed to give him additional supernatural power, for the whale was thought to be too powerful to be taken by unaided human effort.

The whaling canoe, built with special care, was about 30 feet long. Each member of the crew of eight men had his special task. A whaling party usually was composed of from three to ten canoes. The more canoes present, the more quickly the whale would be dispatched.

Sometimes a whale would tow a single canoe for three or four days before it tired sufficiently to be lanced and killed.

Daring Lancers Rode Whaleback

Whalers approached within a yard of the whale before thrusting the harpoon. They tried to attach the weapon as near the quarry's head as possible, because it was then easier to handle, and because it was dangerous for the canoe to be near the tail when the whale was struck.

The usual way of killing the whale was with long lances. One method, greatly admired, was for a man to leap on the whale as it was harpooned and thrust a long knife into its back, staying with the animal as it submerged. A respected, heritable Nootka name means "Stepping on a whale."

Very little of the whale was wasted. Flesh and skin were eaten, intestines were made into oil containers, sinew was used for making ropes, and blubber was eaten or made into oil.

The non-whaling tribes between the Queen Charlotte Islands and Kodiak Island were glad to make similar use of any whale carcass cast up on their shores.

Seals and porpoises were harpooned from

canoes in much the same fashion as whales. Generally a number of canoes participated in the hunt and attempted to encircle the animals.

In the early spring the eulachon, or candle-fish, start to enter the Nass and other rivers in large numbers. These small fish were the source of the fish oil which played an important role in the diet and economy of the Northwest Coast tribes. They were taken with nets which, early in the season, were placed under the ice.

The fish were thrown into pits to putrefy partially, for then the oil was more easily rendered. Then the somewhat decayed eulachon were placed in water in a canoe or large wooden tub.

When the water was brought to a boil by placing hot rocks in it, most of the oil would rise to the surface, where it was scooped off.

What remained of the fish was taken out by the women and pressed against their bare breasts to force out the remaining oil. Today fires are built under metal containers, and the residue is treated with lever-operated presses.

Trade Routes Were "Grease Trails"

In the old days eulachon oil was the most important trade item of the central Northwest Coast tribes. Not only did these groups trade with their northern and southern coast neighbors, but also with many Athapascan tribes of the interior. Routes over which this trade was conducted were known to early Hudson Bay traders as "grease trails."

Dried meats, berries, and other foods were dipped in eulachon oil before being eaten. Largely because of the lavish use of this oil, and the practice of storing it indoors, an old-time house, devoid of ventilation, was to European nostrils a highly aromatic spot.

Seaweed, berries, and roots were, and still are, collected by the women. Seaweed is worked into dried cakes which are preserved for winter use. Berries are prepared in much the same way. When the time comes for eating them, the cakes are dissolved in water and mixed with fish oil. Such food is stored in well-made wooden boxes, which in early times were decorated with elaborate carving.

In the mountains, mountain goats, deer, elk, and bear are hunted. Before guns were available, weapons consisted of bows and arrows, carried in wooden quivers. Arrow points usually were of bone, but stone and copper were also used. Small animals, and sometimes bear and deer, were trapped.

The Northwest Coast Indians, unlike almost all other American tribes, went barefoot the year round. It may be that since most

traveling was done in canoes rather than by land trails, they did not find it necessary to develop footgear.

The old men went about entirely nude in the summertime. While the men of many American tribes wore only a breechcloth, complete nudity was very unusual.

Details of costume differed somewhat among the various Northwest Coast tribes. Most conspicuous wearing apparel was the blanket. This was woven from a mixture of various proportions of mountain-goat wool, cedar bark, dogs' hair, and feathers. The weaving technique was about the simplest practiced anywhere on the continent, but the results in many instances were works of art.

Best weaving was formerly done by the Tlingits, who seem to have originated the art. From them it spread to the Tsimshian. The Chilkat Tlingit became the best known of the North Pacific coast weavers and are now the only ones who practice the art.

Their "loom" consists of a crossbar supported at either end by two uprights. From this was suspended a strong cord stretched from side to side, from which were doubled the warp threads cut to the proper length.

The woman seated in front produces the intricate patterns with her fingers alone, using neither shuttle, heddle, batten, or any other such aids. The design to be copied is first drawn on a pattern board, placed where the weaver can watch it as she works (Plate XV). The designs are woven in blue, green, yellow, black, and white.

The earliest known blankets had simple designs, purely geometric in character. Elaborate heraldic designs probably were not adopted until the general culture began to elaborate after contact with the whites. In this respect, the evolution of complicated patterns from simple beginnings parallels the known development of Navajo weaving.

Blankets of Cedar Bark

Similar techniques of weaving were practiced by some of the Salish tribes along the Columbia River. They used dogs' hair extensively, but the patterns were much more simple, and the colors were different.

In modern times the Chilkat produced shirts by this same method, and with the same type of design.

Threads for weaving are made with a spindle and by rolling them on the bare leg.

A less elaborate blanket was made of soft cedar bark, the weft being simply turned across the warp. These blankets were usually trimmed with fur. Some were formerly made of tanned skins, and it is probable that in

the days before the arrival of the Russians, sea-otter skins were standard for this purpose.

Since the coming of the white traders, woolen blankets have gradually replaced the native types except for display purposes. In the 1880's and 1890's it became a popular custom to decorate woolen trade blankets with buttons of mother of pearl (Plate VIII). These blankets are usually blue and further embellished with a design representing the crest of the owner, cut out of red cloth and sewed on the blanket.

Nowadays men wear a shirt under the blanket and women wear a dress. Before woolen blankets were introduced the women wore an apron made of shredded cedar bark, suspended by a belt of the same material. One of the few Indian tribes to use raincoats, the Northwest Coast Indians made a highly serviceable waterproof poncho of cedar bark for use in the wet season.

Men as a rule wore their hair comparatively short, keeping it out of the eyes with a fur or cloth headband. The women wore their hair in two braids.

Ear and nose ornaments made of bone, wood, and abalone shell were extensively used. The women of the northern tribes beautified themselves by wearing, in slits in their lower lips, wooden disks shaped like pulley wheels and 3 or 4 inches in diameter.

Tattooing was practiced especially by the Haida, who favored elaborate designs representing their family crests. The Kwakiutl and others painted their faces.

Two methods of deforming the head were practiced by the Northwest Coast Indians. The Kwakiutl bound the head in infancy so that the skull grew upward and back in an elongated fashion.

Tribes south of the Kwakiutl placed a pad on an infant's forehead, flattening the front of the skull and causing it to slope backward from the eyebrows. In addition to producing a beautifying effect, according to their standards, the deformed head was also the mark of a freeman, since slaves were not allowed to indulge in this vanity.

Wood Sculpture Highly Developed

The art of the Northwest Coast tribes found expression in the skillful weaving of baskets and blankets, in painting, and in the working of native copper and, later, silver. Most spectacular achievements were in wood sculpture and in stone. Wood sculpture was usually embellished with painting.

Northwest Coast carvers and painters produced highly realistic designs. Some masks or images were actual portraits.

For the most part, however, they preferred the grotesque representation of semianimal or semihuman mythological beings.

A curious stylization was developed wherein the artist dissected his subject, as it were, representing mainly those features which came to be symbolic of the creature he wished to represent.

The faces of a man, a killer whale, and a beaver, as carved on a totem pole or a box, might all look essentially alike. The beaver and the killer whale would be distinguished as animals, however, by representing erect ears on top of the head. They would be further distinguished by showing the dorsal fin of the killer whale, its accepted symbol, or the flat crosshatched tail and long incisor teeth of the beaver.

All animals and birds represented had from one to three characteristic symbols, which instantly told the observer which was intended.

In the opinion of many modern critics, this was the finest art work ever developed by any American Indians. To some the art appears Asiatic in inspiration. It has been suggested that it may have been introduced by the Polynesian or Asiatic crews of early European voyagers. Many such sailors, it is known, settled early among the Indians.

Explanation of the significance of the totem pole is not as simple as the name implies. It is oversimplification to say it is heraldic in nature, and represents the owner's mythologic genealogy.

Carvings on the house poles or memorial poles might be crests, or they might illustrate events in a myth.

Sometimes the figure of the owner is introduced as a touch of vanity, usually shown holding a valuable possession to indicate his wealth. Again, the figure of some rival whom he wished to ridicule might be shown.

Totem Poles Signified Social Standing

For example, a man of the Raven clan gave a potlatch to a rival of the Killer Whale group, bestowing the usual gifts. The latter became a drunkard and could not return the gifts as required by social law. So the Raven man carved on his totem pole the figure of a Raven biting the dorsal fin of a Killer Whale. The impoverished Killer Whale representative could do nothing to counteract the affront.

Totem poles might also record a notable event which had happened to the owner, such as being the first member of his group to see a white man, or being converted to Christianity.



Canadian Department of Mines

Trimmed with Feathers, a Tsimshian Headdress Ornament Is Inlaid with Abalone Shell

For rituals, a chief or dancer wore it, not over the face, but above the head. Eyebrows are paint; eyes are shell. Pacific coast tribes cut, polished, and perforated the abalone's beautiful shell (Plate 1).

One man carved on his pole a representation of the Tsar of Russia, to commemorate the sale of Alaska to the United States. Considerable latitude was allowed the owner in selecting his subject matter.

There was nothing sacred or religious about totem poles. They represented the owner's claim to fame and were a means of displaying to the public his prestige and social standing. They had about the same significance to him as a paragraph in the social register would have to a member of the "four hundred" in our own society.

The actual carving was done by professional artists, who were well paid. For easy handling, the backs of the large poles were usually hollowed out.

Time and place of origin of the totem pole are still somewhat obscure. There can be little doubt that it developed as an integral part of the specialized art and elaborate social system of the Northwest Coast tribes, which had its greatest center of growth in the general region of Dixon Entrance.

Probably the first totem poles were erected in the region of the lower Nass River among the Tsimshian, or among the Haida of the Queen Charlotte Islands.

Descriptions of totem poles begin to occur in the writings of travelers about the year 1790, at which time a few poles were standing in some of the Haida villages. It is probable that the custom did not begin much before this date.

On the other hand, the highly characteristic wood-carving art of the North Pacific coast was already fully developed by the middle of the 18th century, as can be seen from the excellent descriptions and illustrations of smaller objects collected by the expeditions of Captain Cook, Capt. George Dixon, Malaspina, and others.

Wooden house posts and grave posts were already well developed, although the first examples seem to have been much simpler than they became later on. There seems little doubt that the totem pole evolved from the practice of carving the center house post, with a few ideas from the grave post grafted on.

Iron tools were introduced by the Russians in the middle of the 18th century. With carving facilitated by them, it was easy to see how the desire of the Haida or Tsimshian aristocrats to outdo one another in making bigger and better house posts would result, first, in a house post reaching above the roof of the house and, finally, in one being erected as a detached mast.

Totem-pole Art Now Extinct

From these early beginnings totem-pole art gradually increased with respect to both size and merit, reaching its peak of development between the years 1840 and 1880.

From this period the art rapidly declined, when the native cultures began to break down as a result of the ever-increasing contact with the whites.

The Haida abandoned the custom of erecting totem poles (Plate II) shortly after the year 1880. In other areas it persisted until after 1900. The most recent poles have been erected at some of the villages on the upper Skeena River.

Now the totem pole is virtually extinct. Poles of recent vintage erected in various places outside their proper territory are historic imitations.

The practice of carving miniature totem poles for sale as souvenirs is almost a century old. Some of the early examples, carved from wood or from black slate obtained from the Queen Charlotte Islands, are of high artistic merit. The quantity made for sale reflects the nonreligious nature of the art.

The earliest totem poles probably were painted in red, black, and white pigments, but elaborate use of colors did not develop until the introduction of commercial paints.

During the latter half of the 19th century, ethnologists encountered many old Indians who remembered the development of the totem pole and the elaboration of the ceremonies that accompanied it.

According to the Haida, decorative designs were first painted, then carved on the slabs comprising the front of the house; next on a broad, thick plank, through the lower portion of which was the door opening.

This was finally elaborated into the totem pole, which at first always had a round opening at the base as the entrance to the house. Later the hole was eliminated and a regular door was built alongside the base of the pole.

A similar evolution was reported by the Tlingit. The final step was when poles were erected detached from the house. Among the interior villages of the Tsimshian, the poles were placed in a row, well in front of the houses. Sometimes these poles reached a height of more than 50 feet.

Occasionally the four principal supporting posts of the house were also carved. Only in houses of very wealthy people were inside posts carved. When such a post was used it was usually placed in the center of the rear wall, behind the fire.

Grave posts were arranged in various ways. Sometimes a single thick post supported a large square carved box in which were offerings and the remains of the deceased. Sometimes two posts were utilized to support a long box. Still another custom was to build a small mortuary house and to erect a memorial pole in another place.

These carvings normally represented the family crests of the dead, whereas the house-post carvings might be in the nature of illustrations to stories, with the addition of almost any items which might strike the fancy of the owner.

The placing of burial boxes on grave posts might have developed from the old custom of such tribes as the Nootka and Kwakiutl, who put them high up in trees, stripping off all of the limbs below.

Burial practices, however, were far from uniform. Some tribes put the bodies in canoes (Plate V), placed on scaffolds, taking the precaution first of rendering the canoe unfit for further use. On the Queen Charlotte Islands, burial boxes were sometimes concealed in caves.

The Tsimshian, Haida, and Tlingit all practiced cremation, only shamans (Plate IV) in these tribes being buried. Burial in the earth was generally viewed with horror, and it was with great difficulty that the Northwest Coast Indians were persuaded to adopt the practice. Now it is not uncommon to see a cemetery with white-marble tombstones, fashioned by Italian stonecutters, bearing the typical animal crests in regular totem-pole style and accompanied by Biblical verses.

The Northwest Coast tribes were, on the whole, a warlike group. Revenge for real or fancied injuries was the most common motive, although there sometimes was a practical reason—the acquiring of captives to be used as slaves. Other motives were trespass on hunting and fishing territory, or the desire of obtaining prestige through war honors. In aboriginal times, weapons consisted of the bow and arrow, spears, copper knives, and stone-headed clubs.

Rawhide Armor and Wooden Helmets

The Northwest Coast Indians were among the few in America who used body armor. One kind was a rawhide sleeveless shirt, made of several thicknesses of heavy skin. A more elaborate type was of vertical wooden rods, held closely together with stout twine wrappings. Wooden helmets also were worn. A warrior so attired was relatively secure from damage by weapons of aboriginal type.

When enemies were killed in warfare, the heads were generally taken as trophies. In later times, the Tlingit collected the scalp, which included all of the head hair and the ears.

War honors were much valued, but, unlike other honors, had to be earned and could not be transmitted by inheritance.

Captives did not always supinely accept their fate. There is a totem pole at one Tsimshian village which has carved on it the figure of a woman holding a human head. This commemorates an occasion when the Haida raided the Tsimshian and took a number of captives. One woman succeeded in escaping and returning to her people. However, she first went to the trouble of killing and beheading her captor, bringing his head with her as a souvenir of the event.

Characteristic of the Northwest Coast tribes from Oregon to Alaska was the holding of a series of big winter ceremonials, which had various purposes of importance to the Indians.

These included the giving of names to the children of important families, their initiation into secret societies, the building of houses, erection of totem poles, sale of coppers (page 32), and memorial services.

Basic idea behind all was the acquiring of rank and social status by the giver of the ceremony, for himself or for his descendants.

Feasting and singing, spectacular costumed dramatic performances, and formal distribution of property, usually in the form of blankets, marked the ceremonies. The general name for such rites is "potlatch" (Plate VII).

This name is taken from the Chinook jargon, general trade language of the region,

and is a corruption of the Nootka word *patshatl*, meaning "giving."

Details of the potlatch differed among the several Northwest Coast tribes, but the underlying idea was always the same. The giver of the potlatch sometimes completely divested himself of all his possessions, but gained much prestige in so doing. Also, he would actually be potentially richer than before, since self-esteem dictated that when others gave potlatches they must return to him an even greater gift than the one they had received.

The basic social concept out of which the elaborate systems of such tribes as the Tsimshian, Kwakiutl, and Haida arose was probably widespread on the Pacific coast before the coming of the whites, reaching from northern California to Alaska.

Fundamentally, there were but two recognized social classes, freemen and slaves.

Technically, the slaves should not even be considered a social class, since they had no rights and were regarded as much the property of their owner as was his canoe.

Each tribal group of freemen was in effect an extended family, whose other common interests were greatly strengthened by the blood tie. At the head of each such group was a leader who obtained his position by heredity.

The heir was the eldest son of the eldest sister of the chief among the Tsimshian, Haida, and Tlingit. Among most of the other tribes he was the son of the chief. The chief was in effect the symbol of the group, in whose custody was placed the tribal wealth and in whose person was vested the right of giving permission to use tribal lands.

Chiefs Controlled Hunting, Fishing Rights

Every foot of territory throughout the area, including coastal water, was "owned." This did not imply ownership of the land itself, but rather the ownership of hunting and fishing rights and the right of exploiting products of the soil.

Usually the first seasonal products of the streams and the forest were given to the chief as a token of his custodianship. When fish or berries came in season the chief would call on the group to build a fish trap or to hold a community berry gathering. The resulting food supply would be turned over to the chief.

He used it to give a general feast, during which he formally announced his hereditary right to the use of the spot, and then told the group to go ahead and use it for themselves. Thus the priority rights of the chief were always kept freshly in mind.

In general, outsiders were not allowed to

make use of such "owned" places. Violation of these rights was a frequent cause of wars. Individuals other than the chief owed their social grading to the amount of personal wealth and property they possessed, a status which was to a certain extent dependent on their own industry and ability.

Below the person of the chief, strictly speaking, there were no social classes. Although there was a wide difference in individual status, as in our own society, there was equal opportunity. However, none could aspire to be chief, since this office was strictly determined by heredity.

The possession of wealth was basic to the entire idea of social status and position in the Northwest Coast, but in a sense the wealth possessed by prominent leaders was not personal. It represented the holdings of his entire group, for whom he acted as representative or banker.

Basic unit of exchange was the woolen trade blanket. The value of any object was expressed as being worth so many blankets. In earlier times blankets of sea-otter fur were apparently used, but it is also probable that the complex financial system of these Indians did not develop until after the advent of the trade blanket.

In lieu of high denominational banknotes, the Indians used curious large shield-shaped plaques of copper, painted and engraved, which acquired their value through sale and resale. These were called "coppers" and their possession was greatly esteemed (Plate XII).

Purchase of a well-known copper constituted one of the most elaborate of northwest-coast ceremonies. Coppers were always sold to rivals. If an offer of a copper for sale to a rival group was refused, such refusal constituted an admission that the rival group could not raise sufficient wealth to make the purchase, and the group was correspondingly humiliated. Therefore, when a man accepted such an offer all the members of his group had to agree to back him to the limit with loans of blankets.

7,500 Blankets for a Copper

Once the offer was accepted, details of the purchase were arranged in advance. But the public sale resembled an auction, during which there was lavish display of the blankets offered in payment. The intended purchaser first made a low offer, which was at once accepted by the owner, who had to show how little he cared about money. His friends, however, vigorously protested and demanded more, citing the amounts of previous sales. This continued until the agreed-on price was finally

reached and the property transfer took place.

Each copper had a name, and its history and value were well known. In 1893 one copper worth 7,500 blankets was called "All Other Coppers Are Ashamed to Look at It." Another valued at 6,000 blankets was named "Steel-head Salmon," i.e., it glides out of one's hands like a salmon. A third copper worth 5,000 blankets was called "Making the House Empty of Blankets."

Among the Indians living near Prince Rupert, rivalry between chiefs also developed in the destruction of property. At a formal feast to which a rival was invited, a chief might burn blankets, destroy a canoe, kill a slave, or break a copper. If the rival was not able to destroy quickly an equal or greater amount of property, his name was considered "broken," and his prestige was lost. The victorious chief had added luster attached to his name and a corresponding increase of prestige.

In prehistoric times a man could not do much to advance his status, because of the limited amount of property which it was possible for him to accumulate. With the coming of the white traders an influx of material wealth descended on the northwest coast, so that among the tribes rich in furs and other produce their rather simple social system became greatly elaborated.

Among the Haida, for example, there were three social grades. These might be called the aristocrats, commoners, and slaves. Membership in these groups was dependent on heredity and was based on degree of wealth. There were gradations of status within the first two groups, dependent partly upon heredity and partly upon the actions of the individual himself. Heredity among many of the Northwest Coast tribes is carried on through the mother's family line.

The aristocrat was greatly esteemed. He had inherited his status and was respected in proportion to the number and elaborateness of the potlatches he gave. The individual who had not inherited caste was a social outcast who could never change his status. He could, however, attempt to elevate himself and his children to the status of aristocrats by giving potlatches.

The commoner who did this got some approval from the other tribe members, but was not accepted as a social equal. He was regarded much as a newly rich social climber.

Slaves were obtained by capture in war, through debt, or by purchase. They were not permitted to marry, had no rights, and were required to do menial work for their masters. As a rule, they were badly treated.

At potlatches, when the owner was making

Totem-pole Builders



© National Geographic Society

Oil Painting by W. Langdon Kim

Shaiks, Late Head Chief of the Tlingit, Carries a Killer-whale Staff of Office
"Bear" teeth in his cedar headdress are abalone shells. Human hair decorates the hat and staff.

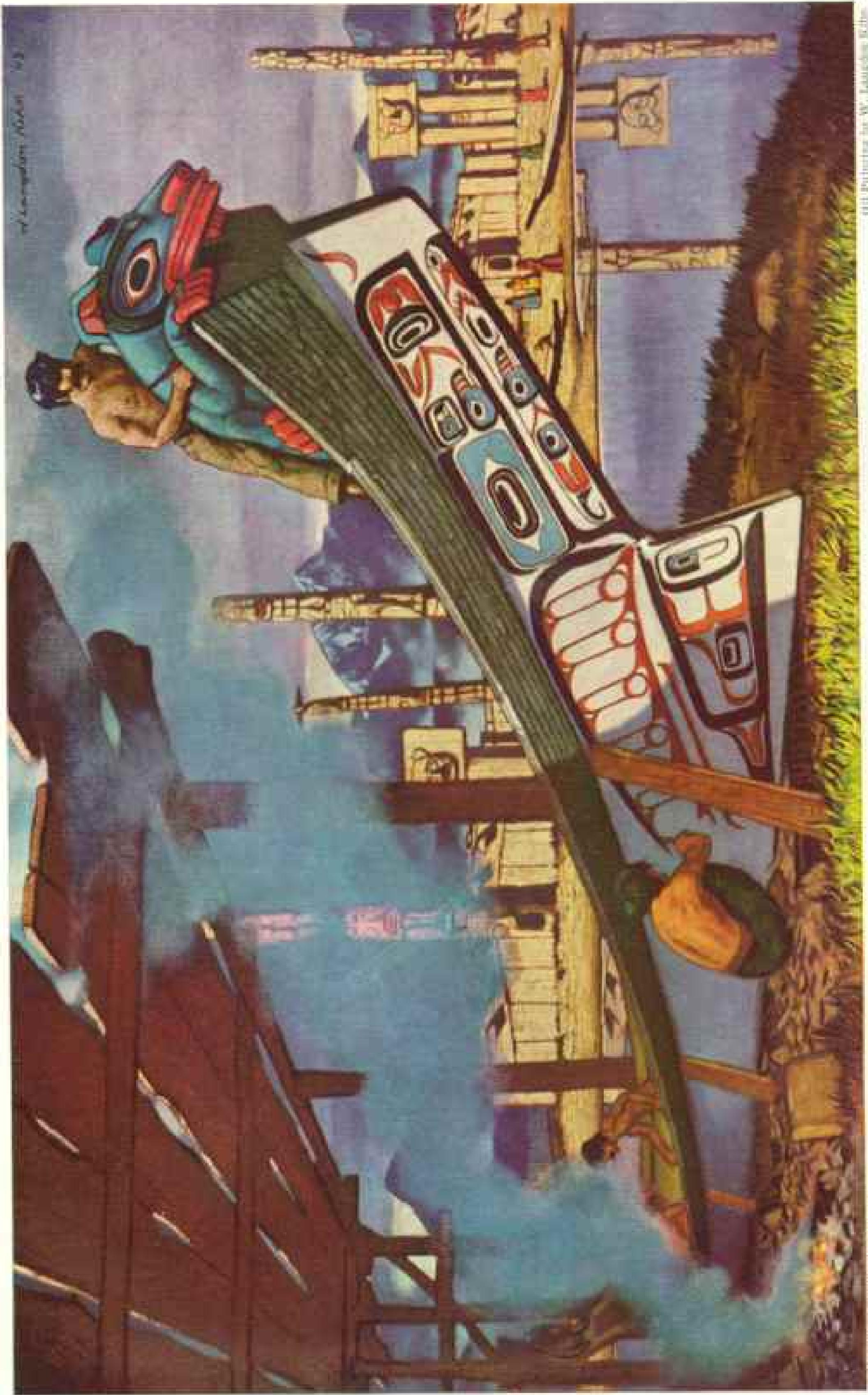


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Oil Painting by W. Langdon Kilbr

As a Memorial to a Departed Chief, Haida Raise a Totem Pole, Lofty Esceutcheon Bearing His Coat of Arms

Downward from the Eagle, clan totem at the crest, the figures represent: the chief himself, Thunderbird, and one of the chief's ancestors. Projections on other poles stand for fins of killer whales. Posts are not idols, but proclamations of prestige. Carving this cedar log took months. To participate in its erection, guests have assembled in ceremonial robes. Such villages no longer exist. Christianized Haida abandoned theirs around 1880. Zealously they cut down poles or sold them.

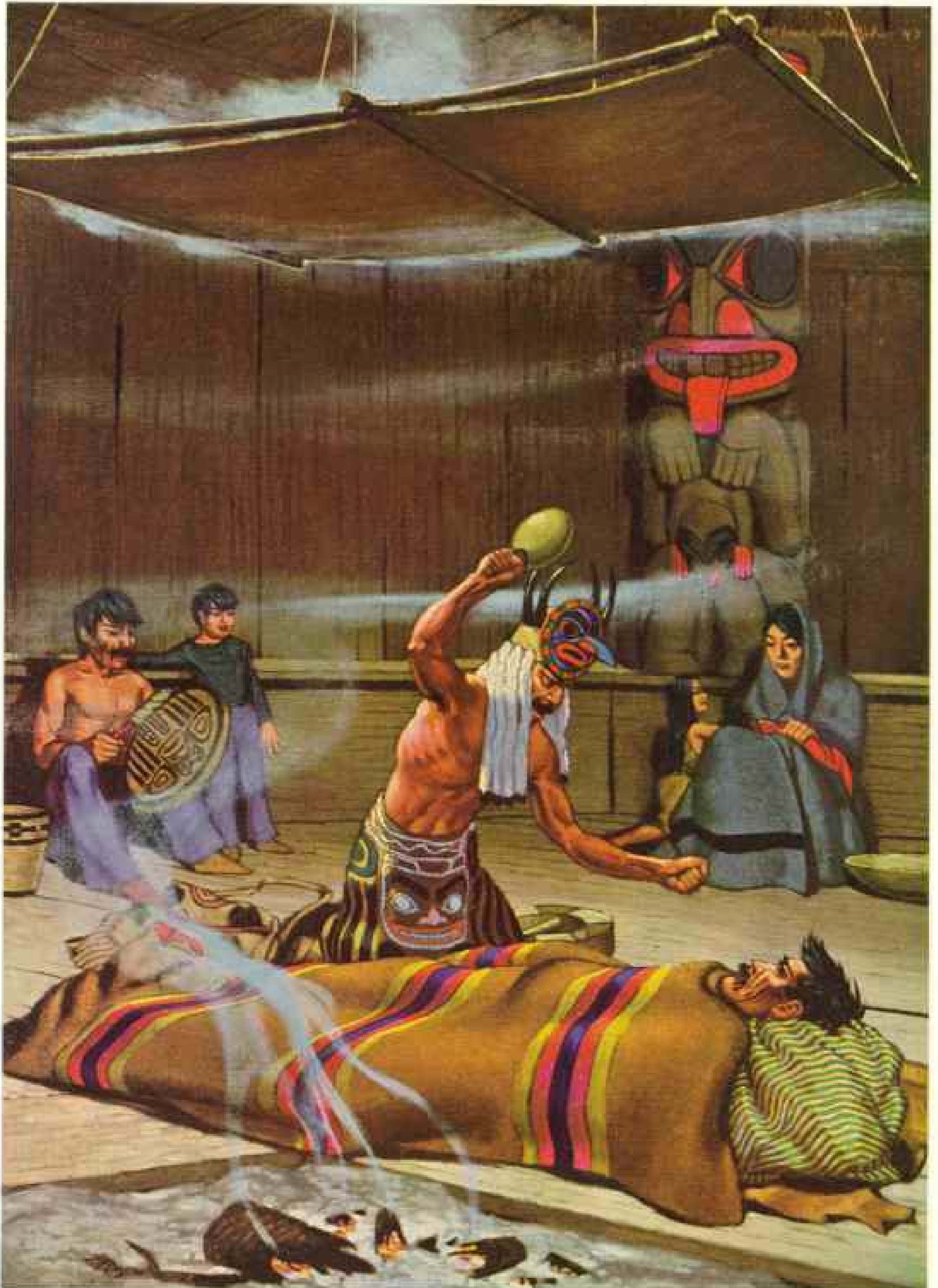


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Printed by W. Lamson Kirby

An Oceangoing Canoe, Dug Out of a Cedar Log, May Carry 60 Men on an 800-mile Cruise Down the Coast

Canoes were to the totem-pole folk what horses were to the Plains Indians. Water travel was encouraged by the Northwest's many rivers and bays. Paddles did most of the work, but cedar-bark sails were hoisted at times. The log's easily worked interior has been adored beneath the shelter. Fire, used for charring, has helped hold the interior. Now decorations are being painted. The prow's design represents a whale; the figurehead is a bear.

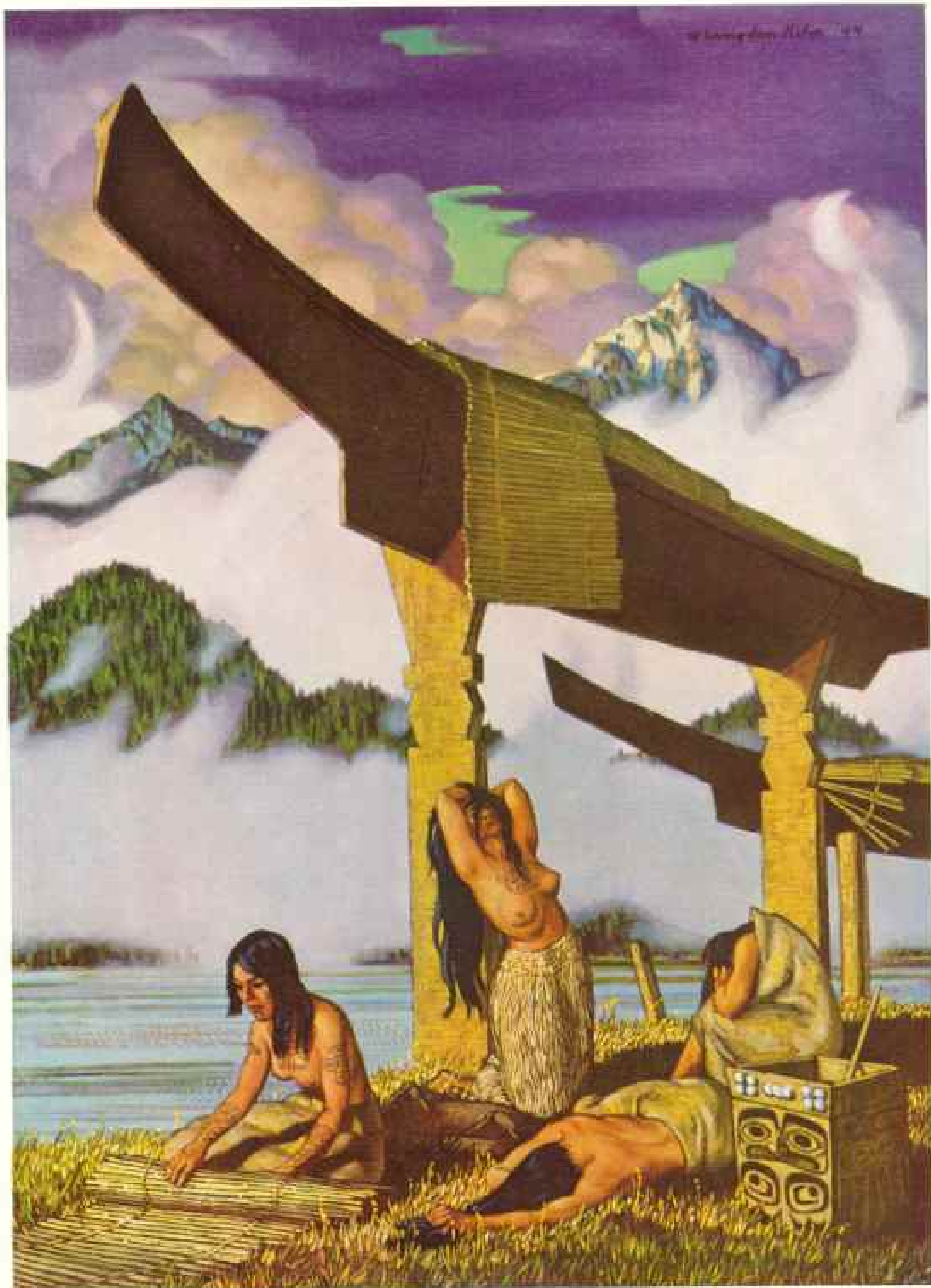


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Oil Painting by W. Langdon Kilmer

A Sorcerer Wears His Spirit Helper's Headdress; His Earthly Apprentice Beats a Drum
With his right hand the Tlingit shaman shakes a sacred rattle; with his left he conjures away the "evil" of his patient's malady. Below the smoke hole a cedar-bark mat shields the fireplace from rain.

Totem-pole Builders



© National Geographic Society

Oil Painting by W. Janssen Kiths

Tattooed Widows Wail for a Chief Buried with His Head Toward the Sea in a Canoe

Indians learned to damage burial canoes lest white renegades steal them. Civilization taught the canoe tribes to inter their dead and cease sacrificing slaves at funerals. Mats covering an earlier burial fall apart.



Illustration K-604 '93

© National Geographic Society

Home from the Trap Lines, a Carrier Indian Surveys His Totem-pole Village, One of the Last to Exist

Oil Painting by W. Lanchon Kuhn

His packs laden with furs, the hunter has returned just heavier snows isolate him. Some 150 miles from the current-warmed seacoast, his Skeena River village has a severe climate. His country's rich furs attracted Russians, Canadians, and Americans. Contact with white men led his people to abandon totem poles, as did the sea tribes. Depicted by the artist as they were in the 1890's, these posts actually are crumbling. They stood on totem art's eastern limits.



© National Geographic Society

1911 Painting by W. Langdon Kuhn

Actors in Masks and Slaves at Paddles, Celebrants Arrive in Totem-pole Town for Potlatch, an Extravagant Gift Giving

From Oregon to Alaska, potlatch was the main social event. Dancing, singing, and feasting were on the program. Hooded men impersonated animal characters of the legends. On the water front, a new house or totem pole was erected. Guests were laden with food and blankets. Temporarily impoverished by his hospitality, the canoe host won fame for generosity. As a guest at future potlatches, he expected repayment, plus interest, of all he had given. At potlatches today Christian Indians bestow trade goods bought with wages.



© National Geographic Society

Oil Painting by W. Langdon Kuhn

A Niska Chief Wears His Clan's Carved Totem, the Eagle of His Mythological Origin

Now a cannery worker, he poses in old-time regalia. His button blanket takes its name from the row of pearl buttons. Red-flannel design is applied on blue wool. Dyed-leather wands represent the fireweed crest.

Totem-pole Builders

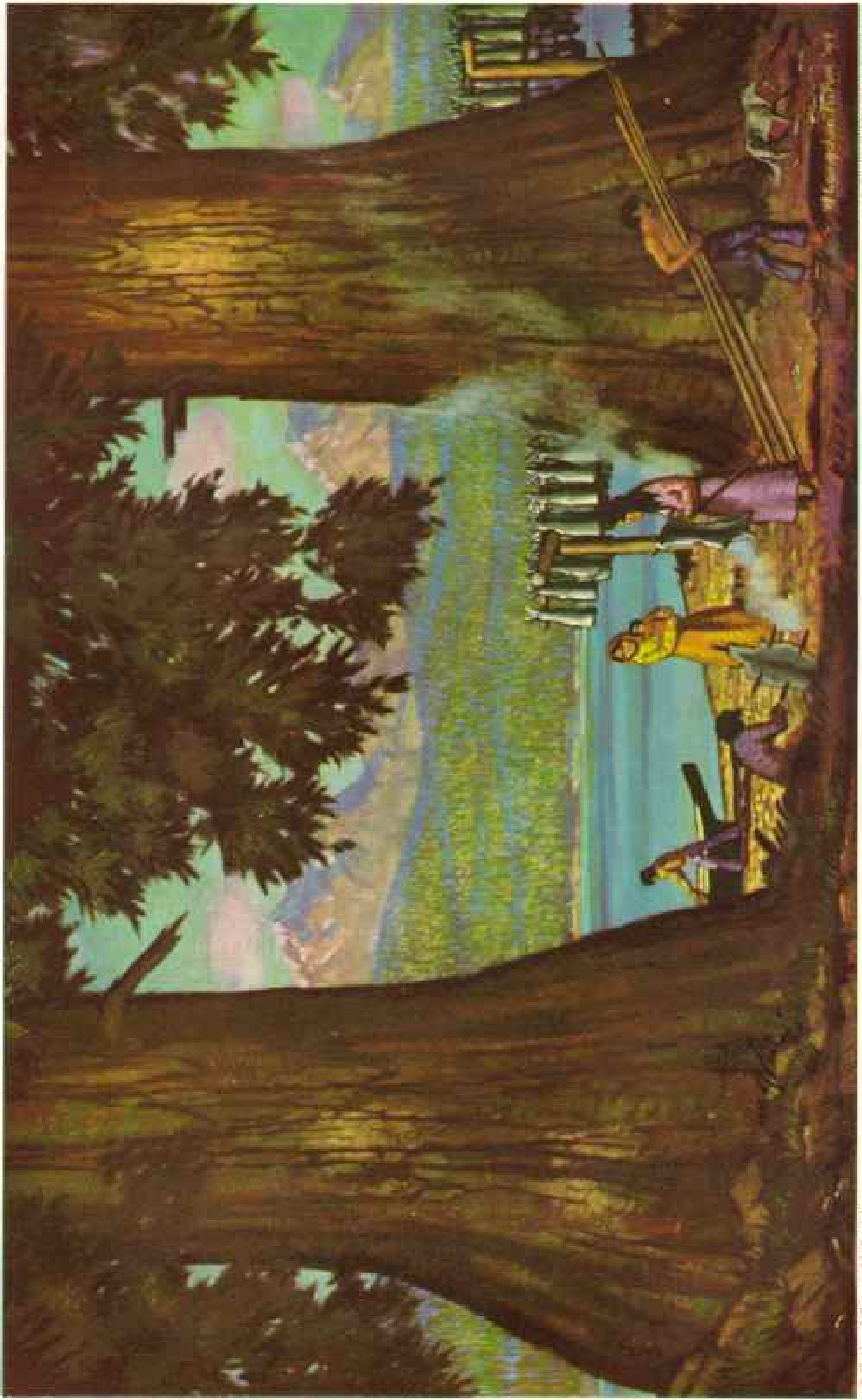


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Oil Painting by W. Langdon Kihn

Headdress and Rattle Represent Raven, Emblem of a Bellaçoola Girl's Clan

Swan's-down, sign of good will, clings to her button blanket, as it does to the chief's (Plate VIII). When she dances, fluff will float off like snow. Ermine skins trim her headdress. A silver bracelet represents a bear.

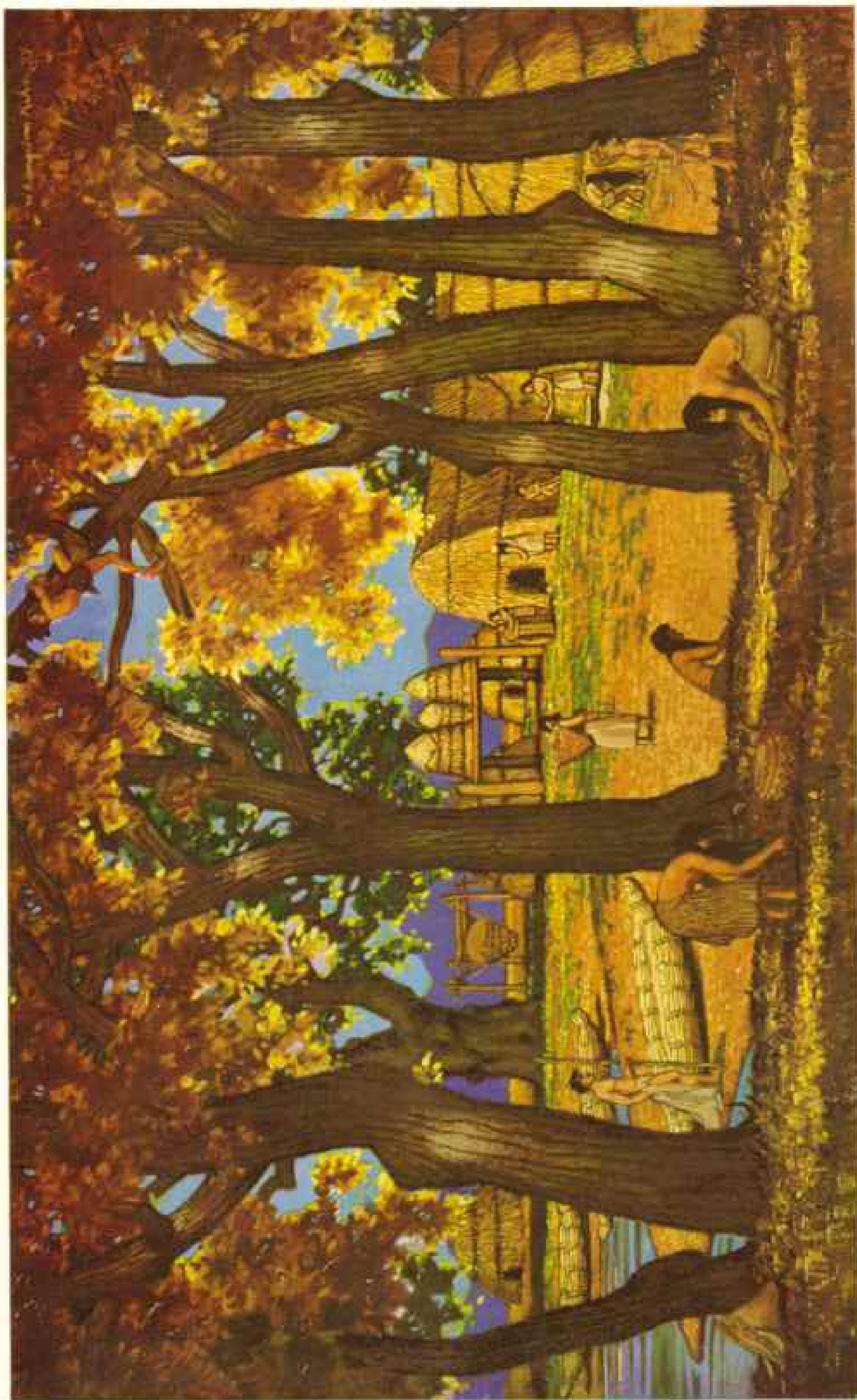


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Beneath Massive Canoe Cedars, Salmon Steak Broils over a Campfire and Winter's Filets Dry on Racks

Fish were to the Northwest tribes what corn was to Pueblo peoples and buffaloes were to Plains nations. Fishing's easy harvest prevented famine and allowed leisure for winter's rich ceremonial life. Each spring salmon choked the rivers. Men took them with hooks, nets, weirs, and spears (Plate XIII). Women cut off heads and hung slices to dry. These modern Indians camp beside the Chilkat River. Even in the cannery age, treaty rights still protect some tribes' fishing grounds.

Oil Painting by W. Langdon Kirby

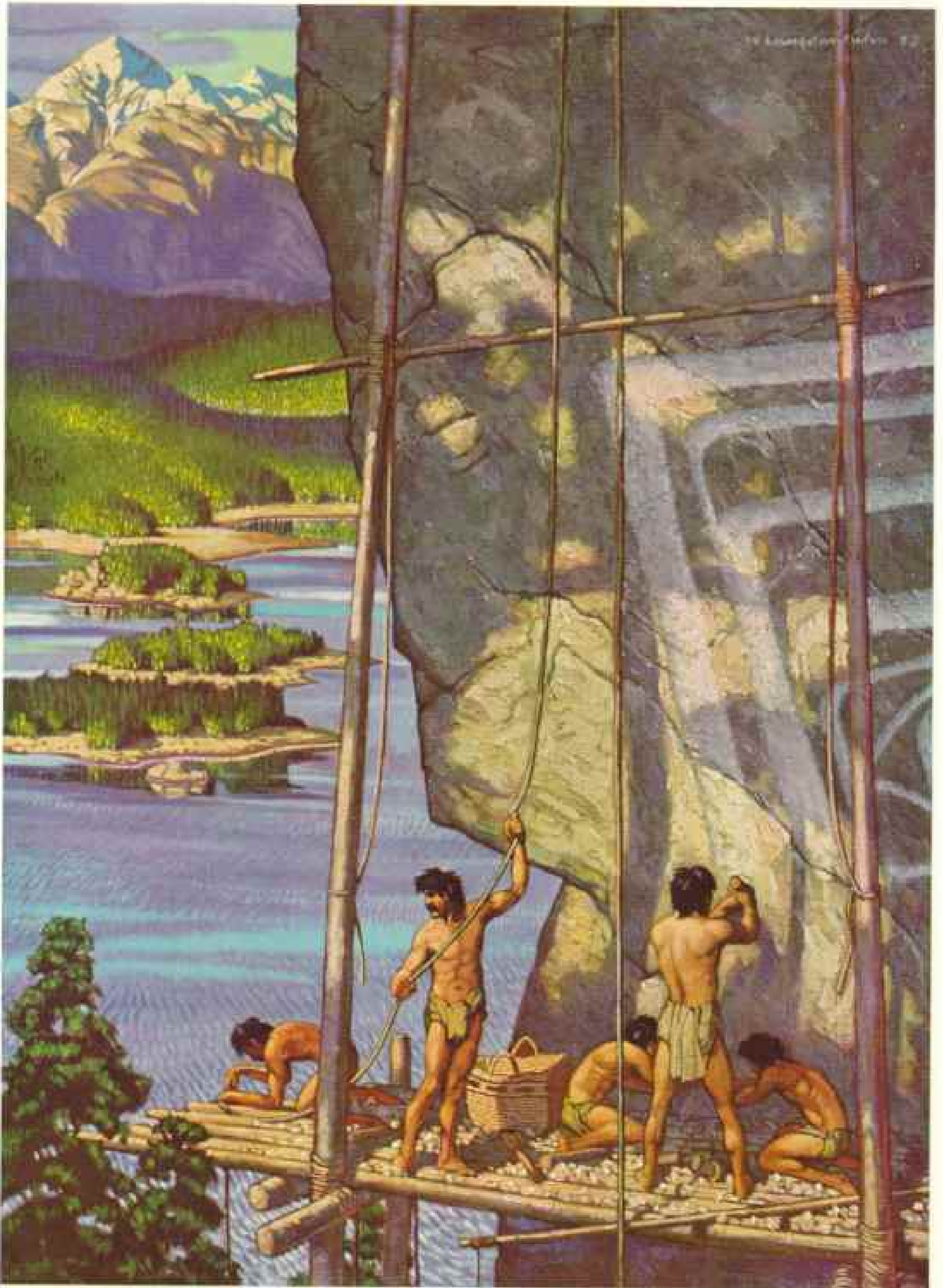


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In a California Reed-bud Village, Pomo Indians Gather Acorns, Their Staple Food, for Storage in Hive-like Granaries

Art Printing by W. Lamech Kibbe

Their boats were buoyant bundles of tule reeds, resembling the balsas sailed by Andean Indians. Pomoos, like other Pacific Coast tribes, did not farm. They turned wild acorns into flour by pounding and filtering until bitter tannic acid was leached out. California tribes, with a few exceptions, had virtually no totem organization. Simple and unwarlike, they fell easy prey to white invaders.



© National Geographic Society

(11) Painting by W. Langdon Kille

Above Nass River, Haida Carve a Battle-victory Billboard for Every Tribe to See

One hundred and fifty years ago, whale-hide ropes lowered artists to the scaffold. There they chiseled and painted 14 coppers, symbols of wealth. Rock carving was a form of the picture writing seen on robes and canoes.

Totem-pole Builders

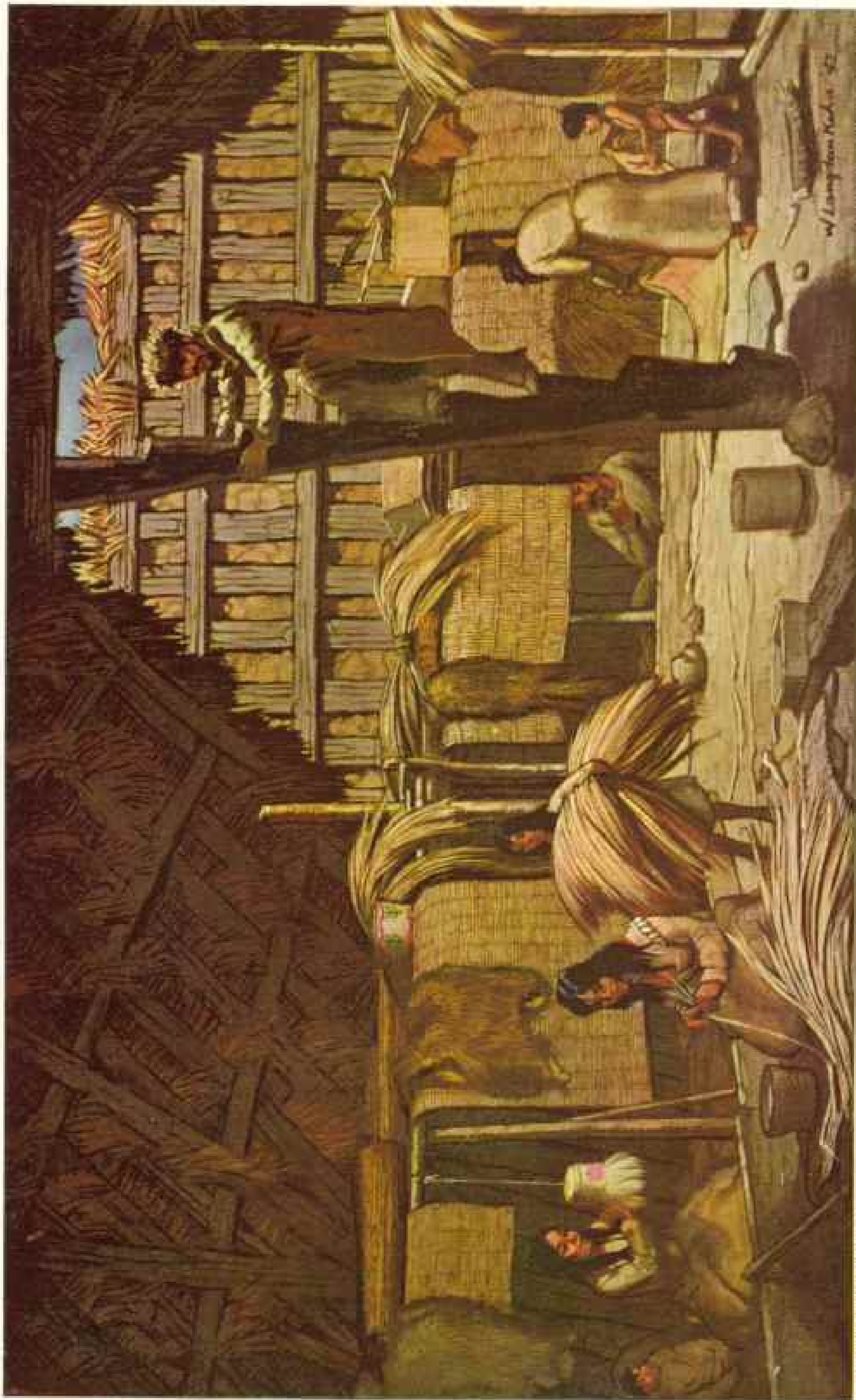


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Oil Painting by W. Langdon Edou

Above a Rapid, His Chief's Exclusive Fishing Ground, a Tsimshian Spears Salmon

A gorge where leaping fish exposed themselves to the harpooner was a highly prized possession. The owner invited kinsmen for the season. Across the river, a basketlike fish trap hangs from the platform.



© National Geographic Society

In a Barabara, Asia-type Pit House, Aleut Women Weave Watertight Baskets, Splitting Each Strand with Fingernails

Carved from a log, the ladder, too, way of a kind used by Siberian tribes. Entrance and smoke hole were one. In this community house, each family had its quarters. Beside the weaver, a tub of water kept the straw moist. Labor of several years' spare time, a fine basket may sell for \$300. Modern Aleuts live in frame houses. Most of them were evacuated when Japan threatened the Aleutians, but invaded Attu's colony has not been heard from to this day. Aleuts who fled to the wooded mainland pined for their treeless islands. They have gone back home.

1911. Photograph by W. Langdon Kilham

W. Langdon Kilham '11



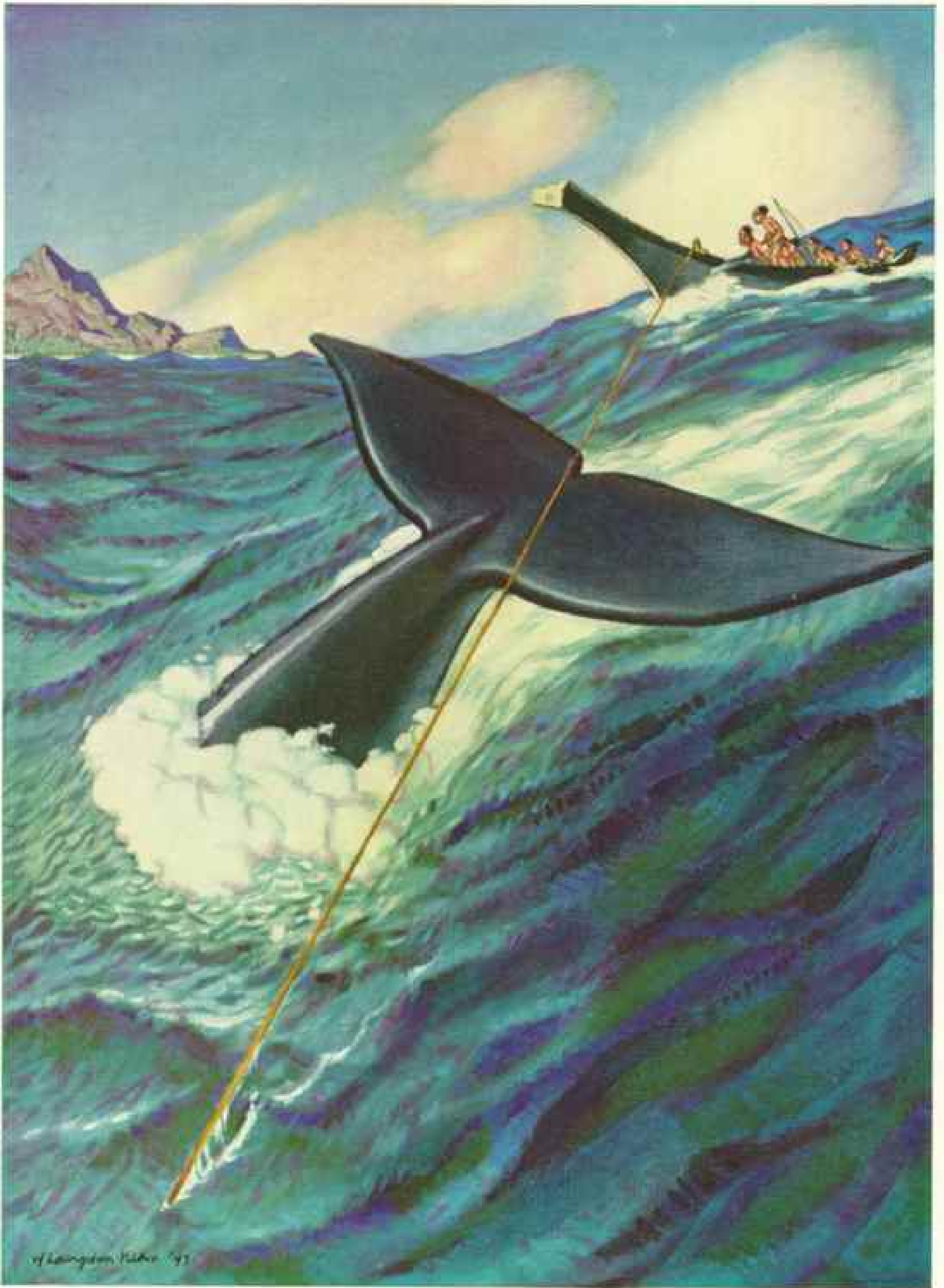
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In the Frog Clan's Carved and Painted Community House, Tlingit Women Spin Mountain Goats' Hair and Weave a Chilkat Blanket

From the generations-old pattern board to her right, the weaver copies designs. Pendant bags are not weights but wisp threads tucked up to prevent dirtying. Not shown, the warp is of cedar-bark threads. This purely aboriginal art style produced masterpieces of finest weaving. A finished example is draped over the chief. Cedar-bark collar, a dance regalia, is worn by the man at the right. Monotonous gray trade goods supplanted the gay Chilkat blanket. Lately its weaving has been revived.

Wingsden, 1911, p. 42

Old Painting by W. Longfellow Kibon



of Livingston Fisher '93

911 Peabody St. W. London, Ohio

A Tense Moment for the Nootka—Will the Harpoon Stay Fixed in the Sounding Whale?

Soon sealskin floats will be attached. One blow from the flukes will smash the frail canoe, or it may be towed for days before lances finish the beast. For the killing, bolder Nootka leaped with knives on wounded whales' backs.

his display of wealth, he would sometimes kill a slave in much the same spirit as he might sink a canoe or break a copper. Later, when white occupation made it difficult for the Indian to kill slaves, the same gesture of relinquishing property was made by the less dramatic method of setting the slave free.

One feature in which the North Pacific coast social system differed sharply from our own was that a big majority of the group belonged to the aristocrats. Derelictions of any individual in the family group reflected on the entire family line. For this reason, when an individual gave a potlatch, all his relatives chipped in to help out.

In the same manner, when parents were too lazy or too devoid of pride to give potlatches, or when children were orphaned, these children were ceremonially adopted by a paternal uncle to save the family name and thus acquired the same status as the actual children of the new parents.

Since illegitimate children had no recognized paternal relatives, no one could adopt them and thus it was impossible for them ever to be anything but commoners.

Keeping Up with the Joneses

The complicated system of giving and distributing property, with corresponding obligations required of the recipients, apparently was an elaboration of the widespread custom of exchanging gifts as goodwill tokens.

The expectation of a return gift brought about the white expression, "Indian giving."

The psychology involved was very much the same as our own practice of giving parties, or birthday and Christmas gifts—a custom which has its beginning in a simple goodwill expression but which sometimes takes on social implications. The recipient of the gift frequently feels that he or she must respond with a more expensive present or a bigger party. This results finally in a cycle not so unlike the potlatch, where the underlying feeling was that prestige was at stake.

No modern diplomats or militarists were ever more sensitive to protocol than were the prestige-seeking Northwest Coast Indians. Seating at formal feasts was carefully arranged in accordance with rank, and aristocrats were continually on the alert to see that the family's prestige was maintained.

If a dignified person should slip and fall in the mud and thus be made to appear ridiculous, he could prevent any further reference to the incident by giving a small face-saving potlatch.

Similarly, if his group received an accidental favor from the opposing group, such

as the rescue of a drowning child, a potlatch would be given at once. This was not an expression of gratitude, but a move to prevent his group from being laughed at for loss of dignity.

Vengeance potlatches were given by an individual who had been insulted by a member of a rival group, if the person delivering the insult was of equal rank. It was therefore customary to ignore, as best as one could, insults from a person whose clan wealth was greater. It was also customary to ignore insults from individuals of lower social status, as being beneath notice. Furthermore, since blood cannot be extracted from a turnip, there would be no profit involved in potlatching such a one.

All Northwest Coast tribes are divided into two or more groups which control marriage and descent. Among the Haida, for example, everyone is born either a Raven or an Eagle. One must always marry in the opposite group: so, when a man is a Raven, his wife and children are Eagles, since among the Haida descent is reckoned only through the mother.

The southern Tlingit are divided into Ravens and Wolves. The Tsimshian have a somewhat more complicated system, being divided into four groups: Eagles, Wolves, Ravens, and Killer Whales.

Among the Kwakiutl marriage took the form of a property exchange. The bride herself was not the object of the exchange, but the acquisition of privileges for the expected children. This is because, among the Kwakiutl, descent is reckoned only through the female line. Clan privileges were passed on only through marriage, to the son-in-law of the possessor, who acquired them for his descendants.

The son-in-law acquired these privileges by paying an agreed amount of property at marriage. The wife was then given to him as a first installment on the return payment. When children were born, the clan privileges were formally given, along with other material property, and the amount increased with the number of children. For a single child 100 percent additional was paid, and for two or more, 200 percent.

When this payment was made, the marriage was considered annulled, since the father had redeemed the payment made on his daughter, who could stay with her husband or leave, as she chose. Sometimes the son-in-law made a new payment for his wife at this stage, so that he might retain a claim on her.

In case no daughter was born to a marriage, provision had to be made to prevent extinction of the name. Under such circumstances a man



© Fred Lord

A Modern Pole Shows Totem Decadence

To old-time carvers, this Vancouver Island column would have seemed an atrocity. Raven (long bill) and Wolf (below) are traditional, but Deer (above) has no totemic sanction. A carved Indian face is of the cigar-store variety. This 30-foot pole of Friendly Cove compares with some 70 feet high. At its base, two chiefs wear headdresses.

wishing to acquire the family name and privileges performed a sham marriage with the son. If no children had been born, a marriage ceremony was performed with a leg or an arm of the name bearer, and the privileges were passed on exactly as in a real marriage.

Since the principal object of the marriage was the acquisition of the clan crest and privileges, a large portion of the accompanying ceremony consisted of performances during which mythological episodes involving the clan traditions were dramatized.

The ceremony in which the marriage money with an increment was returned to the son-in-law, along with delivery of the clan crest, was usually a part of one of the big winter ceremonials.

Dr. Franz Boas, when among the Kwakiutl some 50 years ago, heard of an instance in which a man punished his father-in-law who had delayed the repayment of the purchase money and was evidently evading the obligation of giving up his name to his son-in-law.

The son-in-law carved an image representing his wife and invited the populace to a feast. Then placing a stone around the neck of the image he threw it into the sea. Thus he humiliated his father-in-law and indicated that he regarded his daughter as worthless.

Excelled in Drama and Dance

Probably no Indians of aboriginal America ever equaled the Northwest Coast peoples in the presentation of dramatic performances. These vivid and realistic dances, with participants elaborately costumed and masked to represent animals and legendary beings, were electrifying in their realism and dramatic power.

This effect was not only due to the skill of the performers, but to the unequalled artistry of the wood carvers and painters who designed the masks and costumes.

Some of the masks were elaborate affairs, with movable parts attached to strings cleverly operated by the performers. Uncanny jugglery and sleight of hand also was practiced by many of the participants.

These theatrical displays by the secret societies dealt with mythological subject matter, supernatural "seizures," and miraculous restorations, but they were nevertheless more social than religious. A feature of many was the initiation of new members into the society.

A typical form of initiation was for the novice to be captured by his hereditary spirit animal and taken away to the forest. Later he was returned, apparently dead. It was then the duty of the ceremonial attendants

to restore him to life. Usually such ceremonies lasted four days. Two descriptions made by travelers about the middle of the 19th century well illustrate the vividness of these displays.

"During the song and dance, which at first seemed to present nothing peculiar, a well-known slave (one, however, who was in a comparatively independent position, being employed as a sailor on board the steamer *Thames*), suddenly ceased dancing and fell down on the ground, apparently in a dying state, and having his face covered with blood.

"He did not move or speak, his head fell on one side, his limbs were drawn up, and he certainly presented a ghastly spectacle. While the dance raged furiously around the fallen man, the doctor, with some others, seized and dragged him to the other side of the fire round which they were dancing, placing his naked feet very near the flames.

"After this a pail of water was brought in, and the doctor, who supported the dying man on his arm, washed the blood from his face; the people beat drums, danced, and sang, and suddenly the patient sprang to his feet, none the worse for the apparently hopeless condition of the moment before.

"While all this was going on, I asked the giver of the feast whether it was real blood upon the man's face, and if he were really wounded. He told me so seriously that it was, that I was at first inclined to believe him, until he began to explain that the blood which came from the nose and mouth was owing to the incantations of the medicine man, and that all the people would be very angry if he did not afterwards restore him.

"I then recalled to mind that in the early part of the day, before the feast, I had seen the doctor and the slave holding very friendly conferences; and the former had used his influence to get a pass for the latter to be present at the entertainment, to which, probably, he had no right to come. . . ."

"On the morning of December 13, another strange ceremony began, by the king's firing a pistol, apparently without a moment's warning, close to the ear of Satsat, who dropped down instantly as if shot dead on the spot.

"Upon this all the women set up a most terrible yelling, tearing out their hair by handfuls, and crying out that the prince was dead, when the men rushed in, armed with guns and daggers inquiring into the cause of the alarm, followed by two of the natives covered with wolfskins, with masks representing the wolf's head. These two came in on all fours, and taking up the prince on their back, carried him out, retiring as they had entered.

"The celebration terminated with a shocking and distressing show of deliberate self-torment.

"These men, each with two bayonets run through their sides, between the ribs, walked up and down in the room, singing war songs, and exulting in their firmness and triumph over pain.

"The religious ceremonies (in another village) were concluded by 20 men who entered the house, with arrows run through their sides and arms, having strings fastened to them, by which the spectators twisted, or pulled them back, as the men walked round the room, singing and boasting of their power to endure suffering." †

The witnesses quoted did not understand the significance of what they had seen.

Aleuts Lived in Communal Houses

The inhabitants of the Aleutian Islands, when first encountered by the Russians in the 18th century, presented an interesting combination of traits reflecting influences from the Eskimo, the eastern Siberian tribes, and the tribes of the northwest coast.

In common with the Northwest Coast people, the Aleuts had a social class system, with slaves, and lived in large wooden communal houses (Plate XIV). Some of these were as much as 240 feet long and accommodated up to 40 families or 150 people.

They were built underground. The roofs were made of driftwood poles or whalebone covered with a layer of dry grass, which in turn was covered with sod.

The largest houses had five or six entrances, each of which was a small roof opening. The entrance stairway was a notched log.

The houses were heated and lighted with stone lamps burning seal or whale oil.

Modern Aleut houses have side doors and are much smaller. They are, however, still built partly underground and have sod roofs.

Wealthy Aleuts were buried in boats suspended from poles. Formerly they had painted ornamentation in their houses and on wooden tombs. They made carved wooden masks. They wore wooden hats decorated with painted scenes. Like the Nootka and the Makah, they were expert whalers.

The stone blades of their whale lances were smeared with a powerful poison obtained from the roots of the monkshood, which grows abundantly in the islands. A whale struck by such a lance would die within two or three

* Gilbert M. Sprout, *Scenes and Studies of Savage Life*, London, 1868.

† *The Captive of Nootka, or the Adventures of John R. Jewett* [Jewett], Philadelphia, 1841.

days and the carcass would wash ashore.

The boats of the Aleut were like those of the Eskimo, consisting of small closed skin-covered canoes for one or two men, used primarily for hunting sea mammals, and a large skin-covered open boat used for transportation and often capable of carrying 30 persons.

Like the Eskimo, the Aleut's principal weapons were javelins or harpoons, propelled by a throwing stick. This weapon also was once used to some extent by the Tlingit.

Aleut whaling ceremonies were similar to those of the Nootka. Only the whaling leaders knew the secret of preparing poison and they made the remainder of the populace believe that it achieved its magical potency from the fat of corpses.*

When first encountered by the whites the Aleuts were frequently engaged in warfare, but later they became a peaceful people. In addition to the spear thrower, they used bow and arrows as weapons and in war carried wooden shields or wore rod armor.

The latitude of the Aleutian Islands is the same as that of England and Germany, so temperatures are not severe. The warm waters of the Japan Current here encounter the cold northern waters, producing almost continuous fogs and overcast conditions.

Aboriginal costumes were Eskimolike. The men wore long shirts, made from feathered birdskins sewn together, while women wore similar garments made from the skins of fur seal or sea otter, outfits which today would be the envy of any Fifth Avenue dweller.

Aleuts Wore Hooded Raincoats

In rainy weather, light transparent waterproof raincoats were worn. They were made from strips of seal intestines, decorated at the seams with tufts of bright-colored feathers. The raincoats were equipped with a pointed hood to protect the head, like the modern woman's oil-silk raincoat with hood. They had drawstrings on the hood and wrists.

Because of the abundant food supply—sea mammals, fish, birds, and birds' eggs, mollusks, and various berries and roots—the Aleutians were about as densely populated in aboriginal times as any section of America.

In 1740 there were probably 25,000 natives in the islands, but the effect of white contact was disastrous to them. In 1834, according to the missionary Veniaminoff, there were fewer than 2,500 remaining. The smallpox epidemic in 1848 reduced them to about 900.

The Aleut language is related to that of

the Eskimo, and there seems little doubt that their ancestors moved out onto the islands from the American mainland.

Then Came the Japs

After a long period of relative peace and quiet, the vicissitudes of the Aleuts began anew with the Japanese invasion of the western islands in 1942. There have been told many tales of heroism on the part of the Aleuts, who at last had a chance to prove some of their old skills in warfare.

The fate of those occupying Attu is still unknown. When the Americans reoccupied this island, all of the natives were gone.

Most of the things of which we have spoken are now memories of the recent past. Excepting for those which have been set apart and guarded in parks or museums, only a few rotting totem poles still stand where they were once so proudly raised (Plate VI). Plenty of old men and women still live who were an integral part of the old life.

Their forebears inhabited the entire northwest coast region from Puget Sound to the Copper River Delta in south Alaska. Northernmost were the Tlingit, who came into contact with the Eskimo and the Ahtena Indians. They were the first northwest Indians to encounter European civilization, when they were visited by the Russians in 1741.

South of them were the Haida, who occupied the Queen Charlotte Islands and the southern part of Prince of Wales Island; and the Tsimshian, who lived along the coast from Portland Canal to Milbank Sound and pushed inland to the headwaters of the Nass and Skeena Rivers.

From a point south of Skeena River to the northern coast of Vancouver Island dwelt the Kwakiutl, but their territory was almost split in two by a Salishan tribe, the Bellacoola (Plate IX), who lived along Dean Channel and the Bella Coola River.

Southernmost of the typical tribes was the Nootka, occupying most of the west coast of Vancouver Island.

Their colorful cedar dugouts now have given way to the gasoline launch. The hunter pursues the deer and the wild duck with rifle and shotgun. The sea otter, which once supplied the Northwest Coast Indian with his standard of value, is now almost extinct.

Skill in war has been handed down to the present. Descendants of the Eagle, Raven, and Thunderbird now ride the backs of P-38's, Mosquitoes, and Flying Fortresses in the United States and Canadian Air Forces. Sons of the Killer Whale and the Sculpin serve in the United States and British Navies.

* See "Riddle of the Aleutians," by Isobel Wylie Hutchison, NATIONAL GEOGRAPHIC MAGAZINE, December, 1942.

Seafarers of South Celebes

BY G. E. P. COLLINS

With Illustrations from Photographs by the Author

HADJI BADONG was about to sail for Salajar, an island south of Celebes in the Netherlands Indies, and had asked me to go with him. His ship, the *Mula Mulai*, was one of about eighty that crowded the prau harbor in Makassar, lying so closely packed that many were touching.

Their sterns rose like the high poop of the *Santa Maria*. There was a good reason for the resemblance, for not long after the *Santa Maria's* day some Portuguese caravels called at Makassar on their way to the Spice Islands (Moluccas).^{*} The south Celebes seafarers copied these Western ships, adding similar high sterns to their own low hulls (page 56).

I had been in Makassar for about a week, and had spent my time talking with masters of ships in the prau harbor. We had no difficulty in understanding each other, as the prau masters spoke Malay, the widespread language that is a necessity to them on their voyages in the Netherlands Indies, where at least 250 languages and dialects are spoken. I had picked up "basic" Malay during a former stay of some years in Malaya, and in Java and other islands of the Malay Archipelago.[†]

Hadji Badong's fellow countrymen, the Buginese and Makassaran peoples of south Celebes, are among the finest shipbuilders and sailors in the islands. Though they number only some two million out of the 72,000,000 population of the Indies, they play a highly important part in Indonesian life as carriers of interisland cargoes.

Islands Had 4,000 Ships

Before the Japanese occupation there were about four thousand Indonesian-owned sailing ships in the Netherlands Indies. Their sails were to be seen in all Malayan seas from Sumatra to New Guinea, from Mindanao to Timor.

From the decks of steamers, travelers in the archipelago frequently saw the familiar praus sailing to and from the principal ports: Batavia, the capital of the Indies; Soerabaja and Amboina, the main naval bases; the oil ports of Palembang in Sumatra, of Tarakan and Balikpapan in Borneo; Makassar, where each year about 7,000 clearances were issued to Indonesian sailing ships; and Singapore.[‡]

In normal times the praus carry imported or locally manufactured goods from the larger ports to smaller places, and return with island produce. They are the only sea transports serving numerous small islands and coastal

villages at which the interisland steamers and motor ships never call.

Their cargoes range from jungle produce to textiles, metal tools, sewing machines, and old American and British newspapers shipped in tightly compressed bales to be used as wrapping paper or wallpaper (page 55).

The soap you use may—in normal times—have been made from copra produced by coconut palms in a remote island of the Indies; and in partial return for providing you with soap, the Indonesian owner of the palms may have the pleasure of looking at American beauties portrayed in the social pages of a newspaper pasted on a wall of his house.

Or it may be a sheet with no pictures but with an enormous headline about the Brooklyn Dodgers. Of course the Dodgers and their doings may be upside down, as the Indonesian neither knows nor cares which is the top. Many times I have bent down and twisted my head to read such an inverted newspaper, and have finished up in the most comfortable position for such reading—lying on my back on the floor, looking up at the paper over my head.

Copra, Edible Birds' Nests, and Rattan

Watching praus unload, you may see widely assorted cargoes come from their holds: rice, maize, and copra; rattans and rubber; coffee and tobacco; edible birds' nests; spices and trepang (*bêche-de-mer*). They transport livestock, too; mostly horses and goats, for the Moslem faith of most Indonesian seafarers forbids them to take part in the pig trade.

At times they find no cargo and have to sail in ballast, with tons of heavy stones or coral in their holds.

The *Mula Mulai* was sailing in ballast. I was sorry for Hadji Badong's sake that this voyage would bring him no profit, but glad for my own, as I would have a good opportunity to see how his high-pooped ship behaved

^{*} See supplement map, "Southeast Asia and Pacific Islands, from the Indies and the Philippines to the Solomons," NATIONAL GEOGRAPHIC MAGAZINE, October, 1944.

[†] See "Around the World for Animals," by William M. and Lucile Q. Mann, NATIONAL GEOGRAPHIC MAGAZINE, June, 1938.

[‡] See "Behind the News in Singapore," NATIONAL GEOGRAPHIC MAGAZINE, July, 1940, and "Singapore, Crossroads of the East," March, 1926, both by Frederick Simpich; and "Fire-Walking Hindus of Singapore," by L. Elizabeth Lewis, April, 1931; "Celebes: New Man's Land of the Indies," by Maynard Owen Williams, July, 1940.



Staff Photographer Majnard Owen Williams

Bronze Sailor in a Lofty Perch Surveys Makassar

Descendant of pirates, he is peaceful and fun-loving. His ancestors used the antique oblong sails still serving Moro boats. Even this rigging, copied from Europeans, is outmoded. Two tribes, Makassans and Buginese, sail Celebes praus (page 53). From Makassar the author began his remarkable voyage in a prau manned by islanders,

under bad conditions, beating against the wind, with no cargo to load her down and prevent her from making much leeway.

We sailed from Makassar after sunset, when the night wind rose from the land. With shouts of "Héla! Héla! Héla!" the crew set the sails and weighed anchor. From some ships around us came a throbbing of drums and a ringing boom of gongs that the crews were beating to bring good luck to their coming voyages. Sometimes the sailors beat them at sea, too, to scare away sea monsters by making them believe that land is near; that the booming is the roar of surf on reefs or rocks! They usually take a cock with them for the same reason.

"Sharks," they say, "swim away as fast as they can when they hear a cock's crowing, for they think they are just going to be washed ashore and left high and dry on a beach."

Hadji Badong offered me his cabin, but I preferred to sleep on deck, as below were many cockroaches, rats, spiders, and centipedes, as well as foul-smelling bilge water.

After a cool night on deck I awoke ravenously hungry and was glad to find that the mate, who was also chief cook, was already preparing breakfast. He was blowing the galley fire through a piece of bamboo. His stove was an old kerosene tin which had been placed in the ship's dugout canoe to prevent it from falling overboard.

Fishing with a Cloth and Feather "Fly"

While the cook was busy with breakfast, others of the crew were trying to catch fish for the next meal. The bait was a strip of white cloth tied to the hook and, above this, two circular sprays of white feathers. We were hopeful as the hooks and lines were let out astern, but we caught only one small fish



Staff Photographer Maxwell Owen Williams

14,000 Ship Miles from Boston, an Old Newspaper Holds a Celebes Vender's Roasts

For wrappers, the Netherlands Indies imported American papers in bales. Some were pasted, often upside down, on walls. To read them, the author lay on his back (page 53). The second paper is in Chinese or Japanese.

that would provide no more than a mouthful for each of the eleven hungry men on board.

In fact, this was the only fish we caught during the whole voyage. People often say to me, "I suppose you catch plenty of fish when sailing among the islands." My experience has been that when sailing in a ship such as the *Mula Mulai* you usually catch either too much or too little fish, and far more often than not it's too little. It depends on whether you happen to sail through an area where fish are plentiful.

As for catching fish, this trip was far different from voyages I have made with professional fishermen such as the Bajaus (Orang Laut), who sail in their canoes to areas where fish find food and are more abundant.

Though the crew were all Moslems, only Hadji Badong had made the pilgrimage to Mecca; hence his title, *hadji*, "pilgrim." He prayed regularly, facing west and bowing his forehead to the deck.

Since about nine out of ten Indonesians are nominally Moslems, there is in the islands widespread interest in Arabia, the holy land of Islam. Some hear about it from the Arab residents of the Indies, who number some 70,000. But the majority get their knowledge

from their fellow Indonesians. In prewar times shiploads made the yearly pilgrimage to Mecca.

Because of their contacts with the center of the Moslem world, knowledge of Middle East affairs and problems—economic, political, and religious—is more widespread among Indonesians than knowledge of the rest of the world.

Praying for the Right Monsoon

The mate of the *Mula Mulai* usually prayed in the dugout. After standing and praying for a while, he knelt and lowered his head until his forehead touched the bottom of the boat. As his head went down his elbows came up, braced against the sides of the dugout (page 67).

He certainly needed the dugout for his prayers after the first day out, for when we sailed out of the Strait of Makassar into the Flores Sea the ship pitched wildly as she beat against the wind of the east monsoon.

There are two distinct seasons in the islands, which in time correspond roughly to our summer and winter: the dry season of the southeast monsoon, approximately from April to October, and the northwest monsoon, Novem-



Beautiful but Clumsy, *Mula Mula* Sails Close-hauled off Salajar

The Celebes pran is built in two stages. Low and undecked at first, she is the primitive *pajala*. When a high poop deck is added, she becomes a *palari*, resembling her model, the Portuguese galleon of 400 years ago. Before the war, builders began making modern sailing vessels,



Outboard Helmsmen Steer *Mula Mulai* with Bare Feet

The two tillers, set at right angles to the rudders, point out like horns. A sleeping steersman drops in the sea. "Tillers pointing fore and aft are no good," said the skipper, "as then helmsmen sit in comfort on deck and sleep."

ber to March, which brings heavy rain. These seasons are called the east and west monsoons.

In the transition periods, around April and November, and in many of the islands even during the so-called "dry" season, there are light and variable winds and frequent thunderstorms. The change of the monsoons is not simultaneous everywhere. In the south of the archipelago, for instance, the duration of the east monsoon is longer, and that of the west monsoon shorter, than in the northern part.

During the east monsoon the wind picks up fine particles of dust from the vast Australian deserts and carries it far over the islands, so that distant views are hazy. But when the air has been washed by the rain of the west monsoon visibility is high.

A few years after my voyage in the *Mula Mulai*, when I had a high-pooped Celebes prau of my own and was sailing in her off Soembawa, I saw a striking example of this high visibility. Shortly before sunset one day Rindjani, the great volcano on Lombok, appeared in the west, outlined sharply against a light-green sky. The angular lines of Rindjani's distinctive silhouette were so clear that the volcano looked as if it were a small neigh-

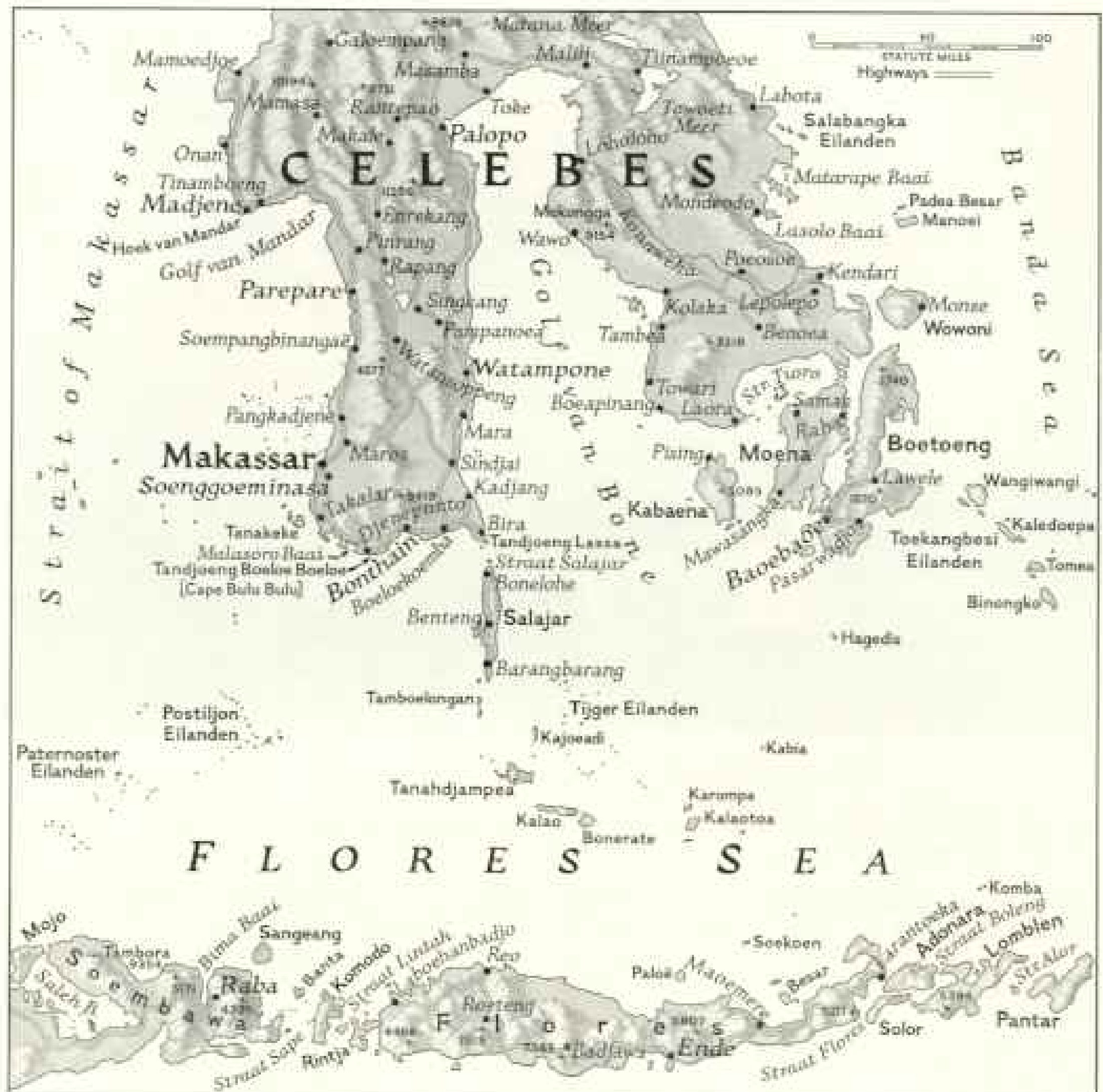
boring mountain instead of a 12,000-foot peak nearly a hundred miles away.

Day and night for nearly two weeks the *Mula Mulai* struggled against the wind, working her way slowly eastward off the coast of south Celebes. Again and again sails were torn and rigging damaged. Usually they were repaired at sea; but twice, when one of the masts threatened to fall—it was continually working loose—Hadji Badong took his ship into one of the two sheltered bays on this coast. Before the pirates of the islands were driven from the seas, these inlets were among their most notorious haunts.

One night, when some unusually steep seas were making the ship pitch with sharp jerks and I was being bounced around on the poop, I went amidships where the motion was less violent. I knelt and put my head down into a hatch.

Coming up from the darkness I heard shouts and noises of things falling. Someone below managed to light a hurricane lantern, so I could see what had happened.

Some loose planks of the 'tween decks where the crew slept had slipped out of place, and half a dozen sailors with their baggage and bedding had fallen to the bottom of the hold.



From Makassar to Salajar, a Fair Day's Sailing, the Author Fought Head Winds Two Weeks

In vain the prau *Mula Mulai* tacked along the south Celebes coast. Sails were ripped and anchors lost. In desperation the ship turned into Flores Sea, later swinging north. In January, 1942, the Japanese fleet, plunging through a hail of bombs in the Battle of Makassar Strait, picked off the Celebes. In this action, United States and Dutch naval units and planes sank or damaged some 40 Jap ships.

They were all mixed up in a scrambling heap of bodies and baskets, heads and mats, waving arms and kicking legs, and from the struggling mass came roars of laughter.

There was one part of the coast—Cape Bulu Bulu (Tandjoeng Boeloe Boeloe), the most southerly point of Celebes—that we tried again and again to pass, only to be driven back. "Off Bulu Bulu," Hadji Badong told me, "there's always trouble."

One day, after many unsuccessful attempts to get past the cape, he was certain we were going to make it. But we were out of luck again. "Look, Tuan!" he shouted to me.

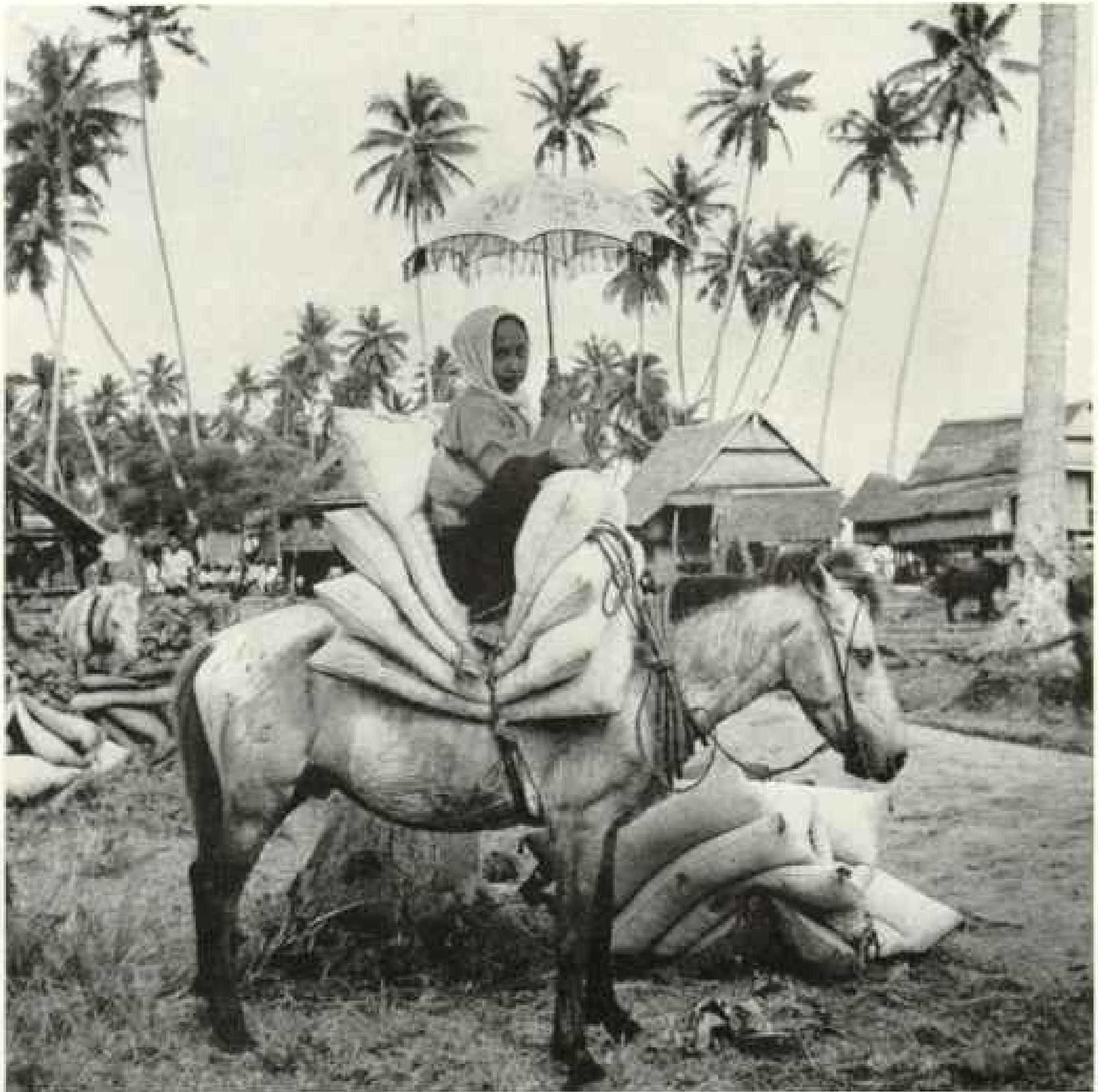
"Just when we're sure to pass Bulu Bulu, that comes along!"

"That" was a distant mound of darkness rising from the sea in the east. As we watched, it came toward us fast, growing higher and wider and darker. Hadji Badong had most of the sails taken in.

"This is a wicked one!" he shouted. "Black like night!"

The *Mula Mulai* Balks at Bulu Bulu

For a moment there was a loud hissing sound. Then the squall hit the ship with a high-pitched shriek of wind and sudden dark-



The Saddle Shows Her Rank: She's a Four-cushion Lady

At Bira, three and five cushions denote lower and higher grades than hers. The sunshade is for pomp, as the sun has declined. Spectator at a fencing match, she is riding home to her village (page 64).

ness, driving rain and spray across the deck. Though it blew hard it was only a small one; but it was enough to drive the ship back some distance to the west and to prevent her once more from clearing Bulu Bulu.

It was not only our failure to pass Bulu Bulu that was worrying Hadji Badong. Several times we had been compelled to anchor hastily, fully exposed to the wind, to prevent the ship from being driven on reefs.

When we anchored over a reef in an exposed position, the pitching ship tugged at the anchor cables, scraping them over the sharp coral so that it gradually cut through the tough fibers. Hadji Badong had then to decide whether to risk losing an anchor or to set

sail again and try to get clear of the reefs.

The fibers of the anchor cables, like stiff black horsehair, came from areng palms, which also provide sugar for the people of the islands. These cables are stiff and prickly, and many prau masters prefer the more flexible ropes made from coconut-husk fibers.

We had already lost two anchors through the cutting of the cables by coral, and now only one remained on board.

"I don't want to anchor again," said Hadji Badong. "We'd only lose another, for it's clear that Allah has forgotten us. And if we go on beating about near Celebes we shall only be driven back. We'll have to sail south to Flores."



© Screen Transfer Dept. Gimbau

Makassar's Prau Harbor Is a Thicket of Masts and Rigging

Praus lie packed so closely that many touch. In tarboosh and fedora, sarong, shorts, and trousers, the harbor crew shows the impact of Western styles. Sacked soybeans are the shipment. Japan grabbed this haven early in 1942. By the fall of 1944, Allied bombers were firing wharves and oil tanks.



© Seven Traveler from Gaidhou

To Makassar Harbor Went Tough, Flexible Rattan for Export the World Over

Rattan starts life as a climbing, vine-like palm in the jungle; it ends as polo sticks, chairs, baskets, Malacca canes, and cordage. On the *Mula Mulai* much of the cordage was made of rattan.

The *Mula Mulai* then sailed south into the Flores Sea. Hadji Badong intended to do what eastbound prau masters often do when they fail to clear Bulu Bulu in the east monsoon.

They sail south across the Flores Sea to Soembawa, or to the west end of Flores if they can keep far enough to the east; and then, using the night winds that blow from the land, they work their way eastward along the chain of the Lesser Sunda Islands.

One evening, when we were well on our way to the Lesser Sundas, I asked Hadji Badong how far we had come.

"We'll go below, Tuan [sir]," he answered, "and look at the chart."

We went down to his cabin, where we sat cross-legged on the floor with an old small-scale chart between us. Under the flickering light of a hurricane lantern we looked down on what the cockroaches had left of the chart. They had eaten some fairly large areas of sea and islands, but the section of the Flores Sea that lies between the Postillion (Postiljon) and Tiger (Tijger) Islands was intact except for a few nibbles.

Hadji Badong put his finger on the chart half way between the Postillions and Bonerate, and then, moving it around in a circle that en-

closed a full 3,000 square miles of sea, said decidedly:

"That's where we are, Tuan."

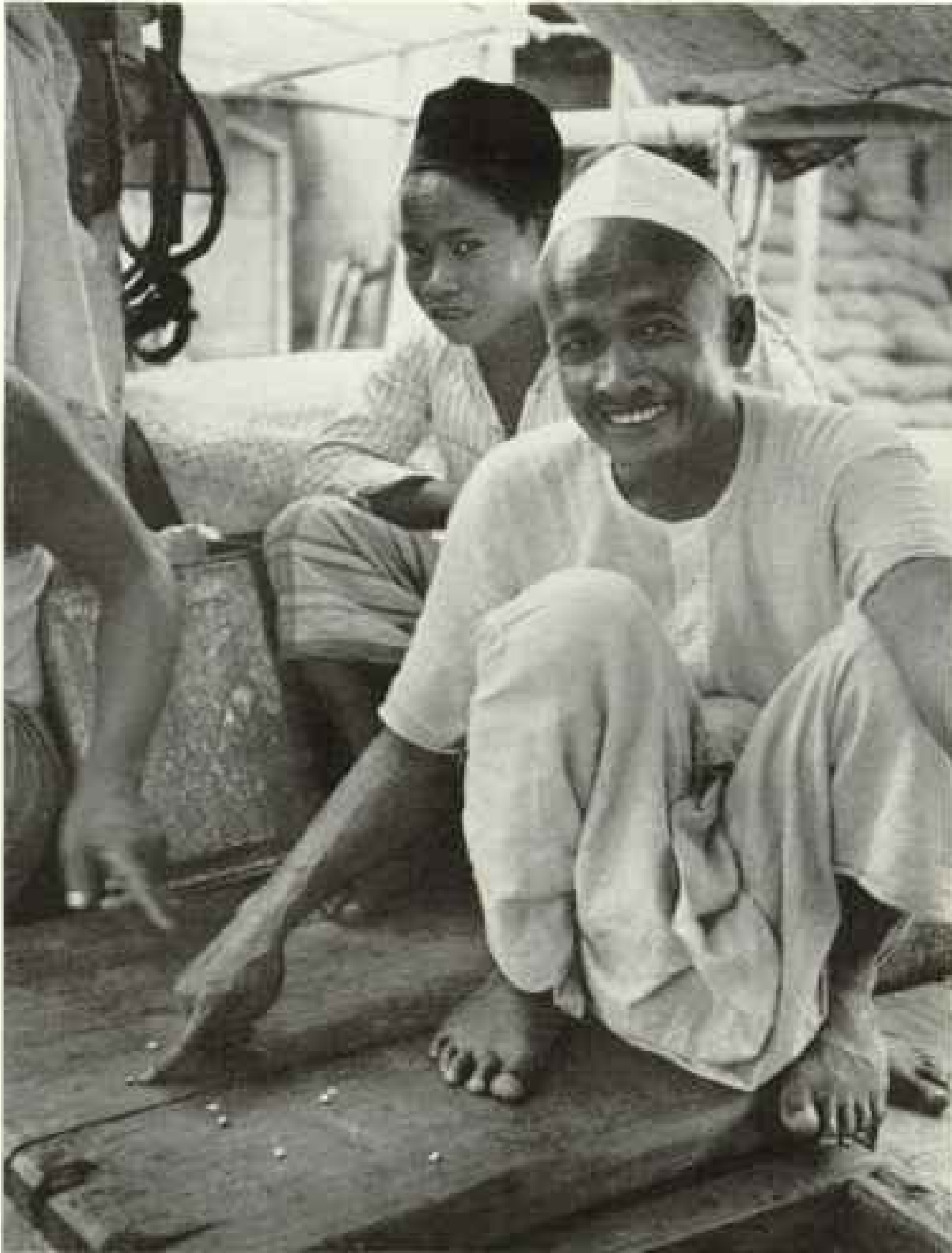
To Hadji Badong his chart was little more than a plaything. In his youth he had learned from an older generation a wide and detailed knowledge of reefs, tides, currents, and winds; knowledge slowly and perilously gathered during hundreds of years by the men who sail among the islands (page 62).

Japs Commandeer Ships and Seafaring Men

I often wonder what Hadji Badong is doing now. One thing is certain: if he is still at sea, and if the *Mula Mulai* is still afloat, the Japanese are trying to use him and his ship.

Faced with a dangerous shipping shortage, the Japanese have made every effort since they occupied the Indies to gear to their war machine the shipbuilding and seafaring manpower of the islands.

They need ships urgently, to carry raw materials to the industrial centers in Japan, to take troops and supplies to war theaters, to replace losses. Their program for building wooden ships in the Indies is intended to provide them with a fleet for interisland shipping, to release steel ships for ocean routes, and to augment their ocean fleet directly.



With Corn-kernel Islands, Hadji Badong Charts the Indies

In Makassar harbor, the *Mula Mula's* master handed the author a grain and asked: "Now, Tuan, where is your country?" To emphasize the distance, the writer threw the kernel into the next prau! Generations of seafarers had taught the skipper. Without chart or compass, he could plot his course by looking at the sea (page 51).

As the wooden ships being built in the Indies are slow as well as small, their total tonnage has to be greater than that of the larger and faster steel ships which they replace if they are to carry the same amount of cargo in the same time. But they are not to be despised, for if there are enough of them they can do just what the Japanese want.

General MacArthur has announced that 1,727 Japanese coastal vessels, barges, and schooners have been sunk by United Nations' forces in two years in the Southwest Pacific, enough to move a 50,000-man army.

To build the large numbers of wooden ships they require, the Japanese have in the

islands abundant supplies of both timber and manpower. The professional shipbuilders alone, it is true, could not construct a fleet of any large size, but throughout the archipelago are numerous skilled carpenters who are accustomed to building wooden houses, grain stores, warehouses, and bridges. From this source of skilled labor the Japanese have recruited or conscripted workers for their shipyards.

Many of these house builders or bridge carpenters may never have seen the sea, or anything but a river boat or canoe before the Japanese took them to the shipyards. But under the supervision of Japanese or Indonesian experts they could be used at once for most of the work required in the construction of the wooden ships that, according to the Japanese radio, are being built in the islands.

These ships, the Japanese tell us, range up to 500 tons; some are said to be driven by Diesel engines, some by sail with

auxiliary motors, others by sail alone.

Japan's lack of shipping is so great that in addition to these ships she has promoted vigorously the building of almost any craft that carries cargo, praus large and small, even freight-carrying canoes.* The Japanese also claim to have built a number of large rafts to help to relieve their shipping shortage.

As in the case of the shipbuilders, the professional seamen of the Indies are far too few for Japanese requirements. To train men for

* See "Japan and the Pacific," by Joseph C. Grew, NATIONAL GEOGRAPHIC MAGAZINE, April, 1944, and "Springboards to Tokyo," by Willard Price, October, 1944.

the wooden-ship fleet, therefore, schools for ships' masters and officers, for engineers and seamen, have been opened in various places in the islands.

In Soerabaja, for instance, principal naval base of the Indies, the Japanese say instruction is given in various types of technical training. For the Soerabaja marine schools the Japanese have a good source of human material in the neighboring island of Madoera, whose sailors have a high reputation for seamanship.

It may be that some of the *Mula Mulai's* crew, after "graduating" from the Jap school in Makassar, are now masters or officers in the Japanese merchant marine.

The *Mula Mulai* Arrives at Salajar

The *Mula Mulai* did not have to sail to the Lesser Sunda Islands after all, for when we were about halfway across the Flores Sea the wind swung toward the south, so that we could turn and head for Salajar.

When at last the ship was at anchor off Benteng, on the west coast of Salajar, Hadji Badong told me that it had been an unusually bad voyage.

With a fresh and favorable wind the *Mula Mulai* could have sailed from Makassar to Salajar in 24 hours. Beating against the adverse wind of the east monsoon, she had taken two weeks. If she had gone west from Makassar instead of east, in the same period she could have sailed right through the Java Sea to Sumatra. But then the voyage would have been of far less value to me.

"All my life, Tuan," Hadji Badong told me when we reached Salajar, "I have sailed in praus. But never before have I lost two anchors in one voyage."



Soapsuds in Eyes, He Winees

When other crewmen went ashore at Salajar in the dugout, the skipper's brother-in-law remained on board washing clothes. His unposed expression delighted the author. Another prau is anchored in the distance.

He was very tired. Two photographs that I took of him at the beginning and end of the voyage show how much he had been affected by the wakeful nights of anxious watching. He was hardly recognizable as the same man.

For a long time—since I was four years old—I had wanted a ship of my own in which to sail among tropical, palm-fringed islands. So far, the nearest I had come to getting what I wanted had been on Bali, where I had an outriggered sailing canoe.

Dancing and Fencing in Slow Motion

After the voyage in the *Mula Mulai* I decided to have a ship built of the same type. And so on Salajar I said farewell to Hadji Badong and his crew and sailed in another



On an Old-fashioned High Poop Deck, Crewmen Push the Mizzen into the Wind

In a light breeze, the clumsy *Mada Madai* needed assistance in going about. Her stern is modeled on those of Portuguese galleons visiting the Indies in the Columbus era. Nailheads pit the deck. Despite putty caulking, salt water seeps in and rust rots timbers.

boat to Bira, one of the main Indonesian shipbuilding centers.

I reached this corner of Celebes just in time for a festival, one of the most popular attractions of which was a series of Indonesian fencing matches.

The main bout for the local championship was preceded by a dance. While a few men beat drums and gongs to a slow, steady rhythm, the two fencers stepped out into the arena, a wide circle in the middle of the crowd of spectators.

With extremely slow movements they began to dance, just as if they were imitating a slow-motion film. After much strained balancing on one leg, while the other was slowly being raised, they began to quicken their movements, twisting their arms and hands in time with a faster rhythm of the gongs and drums (pages 68 and 69).

When the dance was over, the umpire came forward, and for a moment the two fencers

stood still with their right arms stretched out so that their hands touched each other. Then the umpire stepped back, and with extended fingers they fenced.

There were no really hard blows, no swinging smacks, but just straight thrusts. They thrust and parried and feinted, circling round each other. Now and then one of the contestants struck home on his opponent's body with the tips of his fingers, scoring a point.

"Do they ever use kris'es?" I asked one of the men near me.

"They once did," he replied, "but their use is forbidden now. If they want to, they may use wooden kris'es or swords."

When the match was over, some of the spectators who had come from other villages mounted their horses and set out for home. The men rode bareback, but each woman was perched high above her horse's back, her body wedged between the ends of cushions lying one above another. The cushions were so shaped



Riding an Our, Sailors Tighten the Shrouds Staying the Mast

Buffeted by head winds, the *Mula Mula* anchored for repairs in Malasoro Baai (Bay), only an hour by motor from Makassar, whence she had sailed a week earlier (map, page 38). Here the crew grins, having had two nights' sleep, in contrast to a week's cat naps. As two men lend their weight, a third takes up on the lanyards.

that their thin middles formed her seat and their fat ends rose fore and aft to keep her steady.

The women had three, four, or five cushions, according to their rank. Before they rode off they opened their sunshades, more for show than for protection, as the heat of the day was past (page 59).

In the shipbuilding center of Bira I made friends with Daeng Marinyo, an old prau master, who, with his brother and their large families, owned more than fifty ships. He knew as much as anyone in Bira about the building of *palari*, as the high-sterned praus are called.

Author Builds His Dream Ship, a *Palari*

As soon as he heard that I was going to build a *palari*, he welcomed me wholeheartedly as a prospective Indonesian shipowner and passed on to me much of his full and de-

tailed knowledge of shipbuilding (page 72).

I soon found that there was a centuries-old struggle between shipowners and shipbuilders, and heard numerous tales of how each group had tried to get the best of the other. Judging from these stories, it seemed that usually the builders outwitted the owners.

After a six weeks' course in Indonesian shipbuilding, under the expert instruction of Daeng Marinyo, I designed a *palari* for myself, with a large cabin instead of cargo space, as I did not intend to carry freight or do any trading. After I had completed the usual bargaining with the builders, the keel of my ship was laid and the occasion celebrated by ceremonies and a feast.

Besides supervising the building of my ship, I had much to do and see in Bira. Soon after I arrived one of the principal festivals of the year took place. Though it was supposed to be a Moslem celebration in praise of



"Pull Together, Lads!" Rowing out of Becalmed Anchorage

Torn by the monsoon, the jibs have been mended. Lashed to the bowsprit, bamboo poles are used to hold ships apart in harbor. In heavy waves, *Mula Mula's* bowsprit pointed to the sky, then came crashing down on the sea until it seemed it would break.

Allah, in many ways it was more typical of the older animistic religious rites of the islands.

For several days women and children had been making model houses to be hung in the mosque where the festival was to be held. Much care was taken in their construction, for the spirits that were expected to stay in them were believed to have the power of bringing many sorts of good and bad fortune.

This festival took place in the sailing season, during which nearly all the able-bodied men are at sea and the population of Bira consists mostly of women, children, and old men. But many of the ships' masters, after sailing to the Moluccas and New Guinea to cut bark for tanning, had called at Bira for a few days

on their way to Java, where they were going to sell their cargoes. They had timed their voyages so that they would be at home for the festival.

After sunset I joined the Karaeng (Chief) of Bira at his house, then went with him and a group of minor chiefs to the old mosque where the ceremonies were to be held. Festivals that are a combination of Moslem and animistic rites take place in this mosque; the new one is reserved for Islamic worship.

The mosque was already so crowded that the Karaeng's escort, a dozen men armed with spears, had to force a way for us through a tightly packed throng of men. Slowly we moved forward until we came to a wooden barrier, beyond which was a crowd of gaily dressed women and children, many with glittering gold ornaments around their necks.

We passed on through the women and children until we came to the inner end of the mosque, to the pulpit

from which are read passages from the Koran. Here the mosque officials were assembled, sitting behind trays piled high with food—cakes, fruit, and globes of dried fish, two feet in diameter and covered with omelets that felt like rubber sponges (page 74).

The festival began with a series of Islamic songs, choruses of men, women, and children singing one after another. After a while the men quickened the rhythm of their singing and jerked their bodies violently up and down, to and fro, with every syllable. Again and again they shouted their rousing songs, ending with a staccato chorus of "Allah! Ah! Hu! Ah! Allahu! Ah! Hu! Ah!"

In strong contrast with the men, who

became more and more excited as the night went on, the women and children sang calmly without showing any emotion. Many of the children slept.

In the early hours of the morning the singing suddenly stopped, and all who were still awake made frantic grabs at cakes and fruit that hung from the ceiling and walls of the mosque.

And the Wall Came Tumbling Down!

After the interval the singing went on, still wilder than before. The men who were near me were leaping up and flinging their arms into the air.

One of them slipped, caught at the next to recover his balance, and then five of them went down together, crashing against the wall. A long rumbling roar followed.

Part of the wall had collapsed, and heavy coral boulders were rolling down the side of the hill on which the mosque was built. But as the roof was supported not by the walls but by strong timber pillars, the building stood

firm. No one gave a thought to the collapse of the wall, and the singing went on—"Allah! Ah! Hu! Ah! Allahu! Ah! Hu! Ah!"—until at last, through an open door at the east side of the mosque, beyond dark palms, appeared the faint gray light of dawn.

Before I arrived in Bira I intended to have a bamboo and palm-thatched house built by the beach, where I could live near my growing ship. But when I saw the local guesthouse—a small wooden pavilion on the side of a steep hill, with a fine view over the Gulf of Bone (Golf van Bone), I decided to stay there.

I hired one of the Karaeng's retainers to do odd jobs and cook for me; as I lived on local



Bacho, the Mate, Prays to Allah in the Ship's Dugout

When the sea pitched, Bacho used the small boat because its sides gave elbow and feet a grip. On deck he might have struck his forehead, as his hands clutched his knees. Often as not, Mecca, the focus of his devotions, was behind him. A mischievous sailor placed sticky coconut below Bacho's forehead just as it touched bottom (page 55).

food, he had no difficulty in preparing my simple meals.

Very little food grows in the country around Bira, as there is hardly any good soil and most of the rain that falls here sinks straight down into the porous honeycombed limestone that forms this corner of Celebes. Maize, the staple food of most Birans, is imported from Salajar, and rice from Soembawa and Lombok.

Every three days there is a market, to which come trains of pack horses from the more fertile land to the north, bringing fruit and vegetables, brown palm sugar, tobacco, cloth, soap, and sundry wares.



Just before the Duel, Gongs and Drums Are Beaten for the Fencers' Warm-up Dance

Preceding a championship match, the rivals are wont to perform in slow motion to the music's steady beat. At this ritual the crowd is solemn. When fencing begins, faces will light with joy (page 64).

Among the food plants that do grow on the rugged Biran hills are two that are known locally, because of their hardness, as "wooden potatoes" and "stone rice." I found them far more palatable than their names suggest, perhaps because I led a very active life and was always hungry.

Some of the local trees provide plenty of green food, especially one with oval leaves about an inch long that taste like spinach. The smaller houses are sometimes built with these trees as posts, so their owners can climb through a hole in the roof or up the side of a wall and bring back fresh food for dinner.

Another tree, besides having edible leaves, is useful in several other ways. Both the fruit

and the bark are eaten; oil is obtained from the crushed seeds; the wood makes the best mallets used in shipbuilding, and the leaves—believed to contain a magic power—are used in love charms.

At first I tried to pay for these leaves, but Bahu, my cook, refused to accept anything for them.

"No one ever buys or sells them, Tuan," he told me. "There's always more than enough for all of us. I just tell one of my children that you want some and he goes and gets them."

One of Bahu's sons had already made two voyages to Soembawa, though he was only seven years old.



Biran Fencers Use Bare Hands in Place of Forbidden Steel Krises

Happy spectators form a ring. Third man in it is the referee. Though they call their sport boxing, contestants feint, jab, parry, and circle like swordsmen. Points are scored with fingers, not fists or palm.



Beachbound, Sailors' Sons Pretend They Are Captains and Model Boats Are Praus

Once Biran men took even 5-year-olds to sea. The Colonial Government, however, convinced parents that school should come first. Hulls of smaller boats are coconut husks; sails are palm leaf.

The Karaeng had a copious knowledge of local customs and history, and was renowned as the best storyteller in the district. We had a talk nearly every day. On the way to his house along Bira's "Main Street" were many reminders that his people's livelihood came from the sea, for there is hardly a house in Bira that some old ship has not helped to build. Arches are formed of curved ships' timbers, of stems and sternposts, and planks bored through by marine worms still make good walls.

Though some of the houses were strongly constructed, others looked very frail; yet when there was a series of earthquakes for several weeks, the wooden houses of Bira swayed and survived, whereas in Bonthain and Boelokoemba, where the quakes were no more severe, several brick and stone houses collapsed or were damaged beyond repair.

World Mapped on a Coconut

The Karaeng was keenly interested in geography. As he had only a hazy knowledge of the world, but for the Malay Archipelago and the pilgrimage route to Mecca, I made a globe for him by scratching the outlines of continents, countries, and islands on the smooth green skin of a coconut. I ordered a collapsible rubber globe, and when, after many months, it came, he laughingly compared it with the coconut to check up on my geography.

When the Karaeng was a boy, toward the end of the nineteenth century, education in Bira consisted mainly of religious instruction and the learning of local history, of long epic tales that are still chanted by the older men. But the men and women who have grown up in more recent years have had the chance to get more modern and more useful education. Some of the younger generation have gone to high school in Makassar.

One man, whose father was formerly Karaeng of Bira, was keen on writing and used to talk with me about Shakespeare and Bernard Shaw. Abbreviated versions of their works he had read in Malay translations.

In return for what I told the Karaeng about the different lands and peoples of the world, he gave me much information about his own people and country, with scores of local tales. One of these stories explained the origin of the name "Celebes."

There are several explanations of the name. Some make "Celebes" plural and put the accent on the first "e." But locally it is considered singular and is pronounced "Celébes."

The origin of the name as told to me by the Karaeng accords with this local pronunciation.

"When the Portuguese first came to Makassar," he said, "they went ashore and were met by some of the Raja's men. The Portuguese asked them the name of the country. But though the white men spoke Malay, which they had learned in Malacca, the Makassar people couldn't understand them very well.

"They had seen the white men's eyes fixed intently on their kris—they were probably on their guard against a sudden attack—and, thinking they had asked the name of the weapons, answered 'Selé besi' (iron kris). The Portuguese dropped the 'i' and called the island 'Celébes.'"

The Ships Come Home

When the rainy season of the west monsoon was approaching, scores of women and children, with a few old men, climbed the hills every day to watch for the ships that had set out at the beginning of their sailing season eight months before. Some used to wait in front of the guesthouse, and one morning they called to me:

"The ships, the ships, Tuan! The ships are coming home!"

Rounding the sheer cliffs of Cape Lassa (Tandjoeng Lassa) came two white ships, their rigging gaily dressed with flags. As they sailed to the anchorage, we heard a boom of gongs and drums the crews were beating to celebrate their home-coming. Some of the women recognized their men's ships and hurried down to the beach to welcome them.

During the next month 118 ships returned, some of them sailing alone, others in groups. One of the praus was wrecked near Boetoeng. It is a fortunate year for the people of Bira when all their ships return safely. Though few of the high-sterned Celebes praus are lost in the open sea, each year some of them are driven on the coral reefs that abound in the Malay Archipelago.

In their eight or nine months' voyaging each year the Bira praus sail east as far as the Moluccas and New Guinea, and west to Java, Sumatra, and Borneo.

The immense sail area of the *palaris* is designed to make full use of the monsoon winds. The sailing season, therefore, begins shortly before the end of the west monsoon, usually in March, when the ships sail from Bira with a following wind that takes them to the Moluccas and New Guinea. Here, during the change of the monsoon, the sailors cut bark for use in tanning.

With their holds loaded with bark the ships then sail for Java, about 1,500 miles to the west, taking advantage of a favorable wind.



This Little Girl Wanted to Stay Awake and See the Fun

In Bira's old mosque, choruses of singers made a tremendous racket, hysterical men shrieked, and the camera flash exploded. But nothing woke the child; it was long past her bedtime hour (page 66).

On the way they usually call at Bira for a few days.

After the prau masters have sold their bark in Java the ships have no fixed routes, as they are ready to carry cargoes wherever they are wanted. One prau, for instance, may spend the rest of the sailing season making short voyages between Java * and the Lesser Sunda Islands, and another may pick up cargoes destined for more distant ports in Sumatra † and Borneo.‡

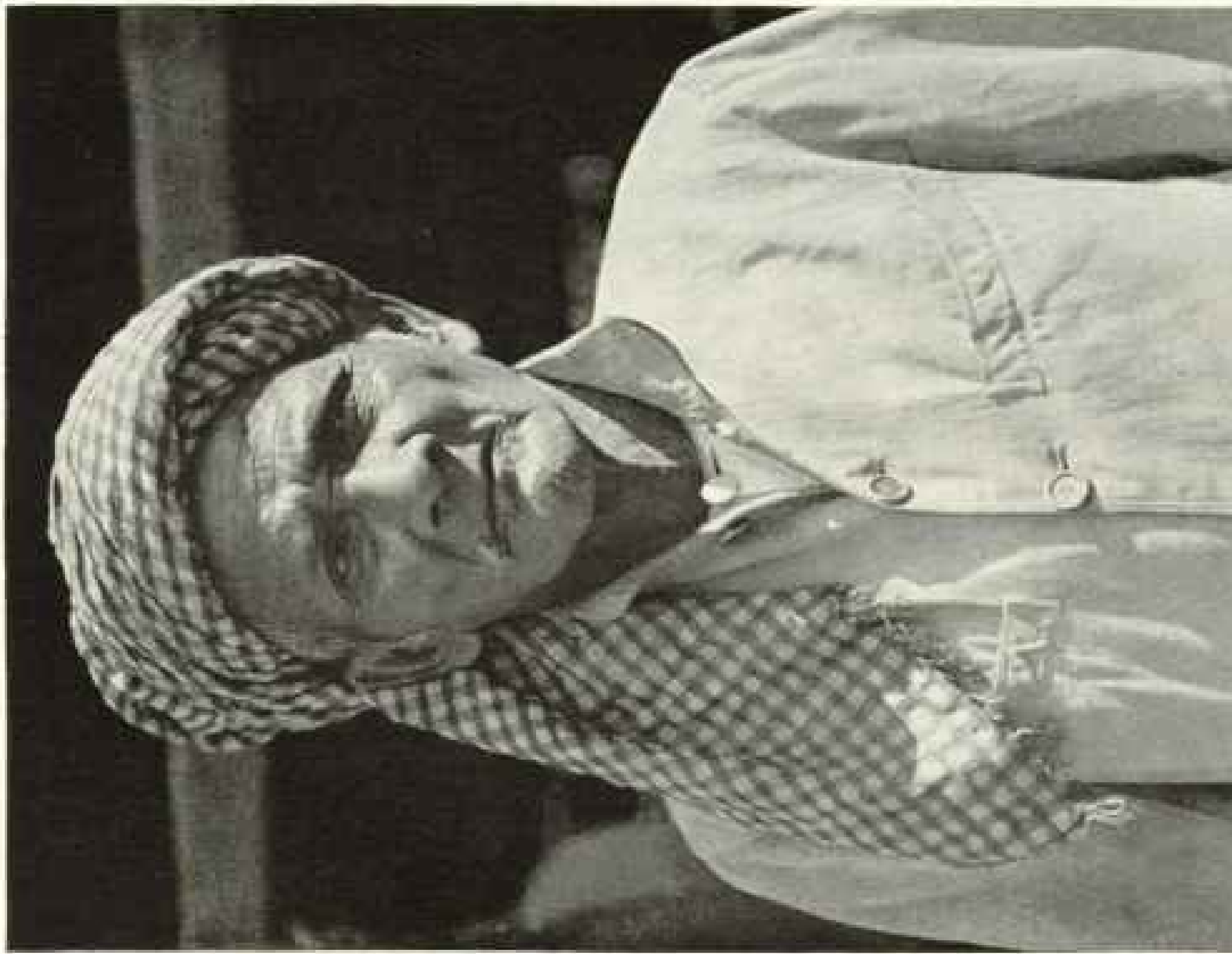
Some of the long-distance voyagers of Celebes have settled in small communities in islands far from their original homes, and as these groups have continued their seafaring life there are a number of the high-sterned

ships with home ports in various parts of the archipelago. But many of the praus in the Indies do not sail nearly so far from their home ports as the Biran ships, for their voyages are confined to areas—some large, some small—along the coasts of the larger islands or within island groups.

* See "Through Java in Pursuit of Color," by W. Robert Moore, NATIONAL GEOGRAPHIC MAGAZINE, September, 1929.

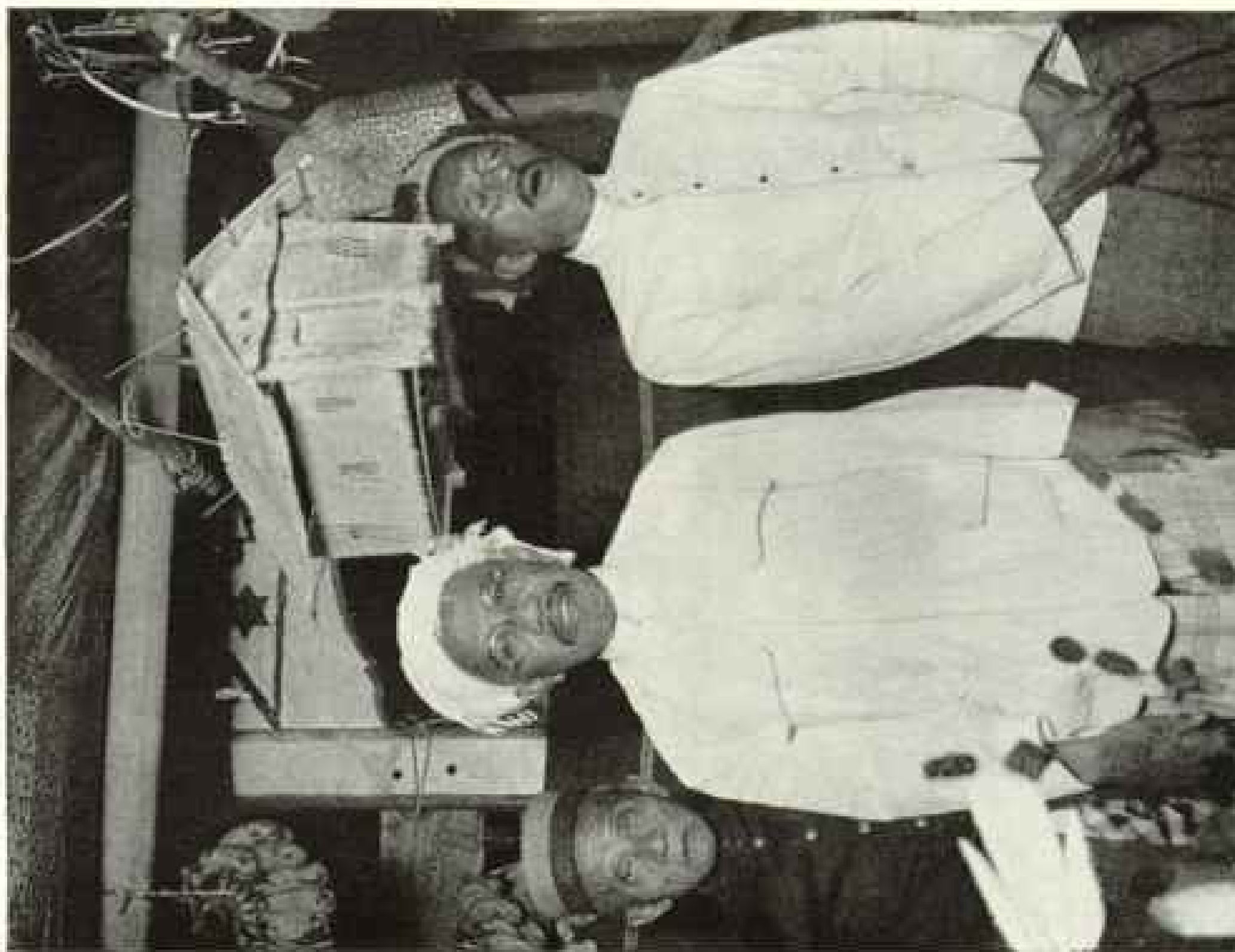
† See "Among the Hill Tribes of Sumatra," by W. Robert Moore, NATIONAL GEOGRAPHIC MAGAZINE, February, 1930, and "By Motor Through the East Coast and Batak Highlands of Sumatra," by Melvin A. Hall, January, 1920.

‡ See "Sarawak: The Land of the White Rajahs," by Harrison W. Smith, NATIONAL GEOGRAPHIC MAGAZINE, February, 1919.



Daeng Marinyo, a Prau Master Who Knew the Builders' Tricks

On learning the author wanted a prau, he exposed the sly practices by which contractors did less work for more money. For centuries Bira's builders and skippers have striven to outwit each other (page 65).



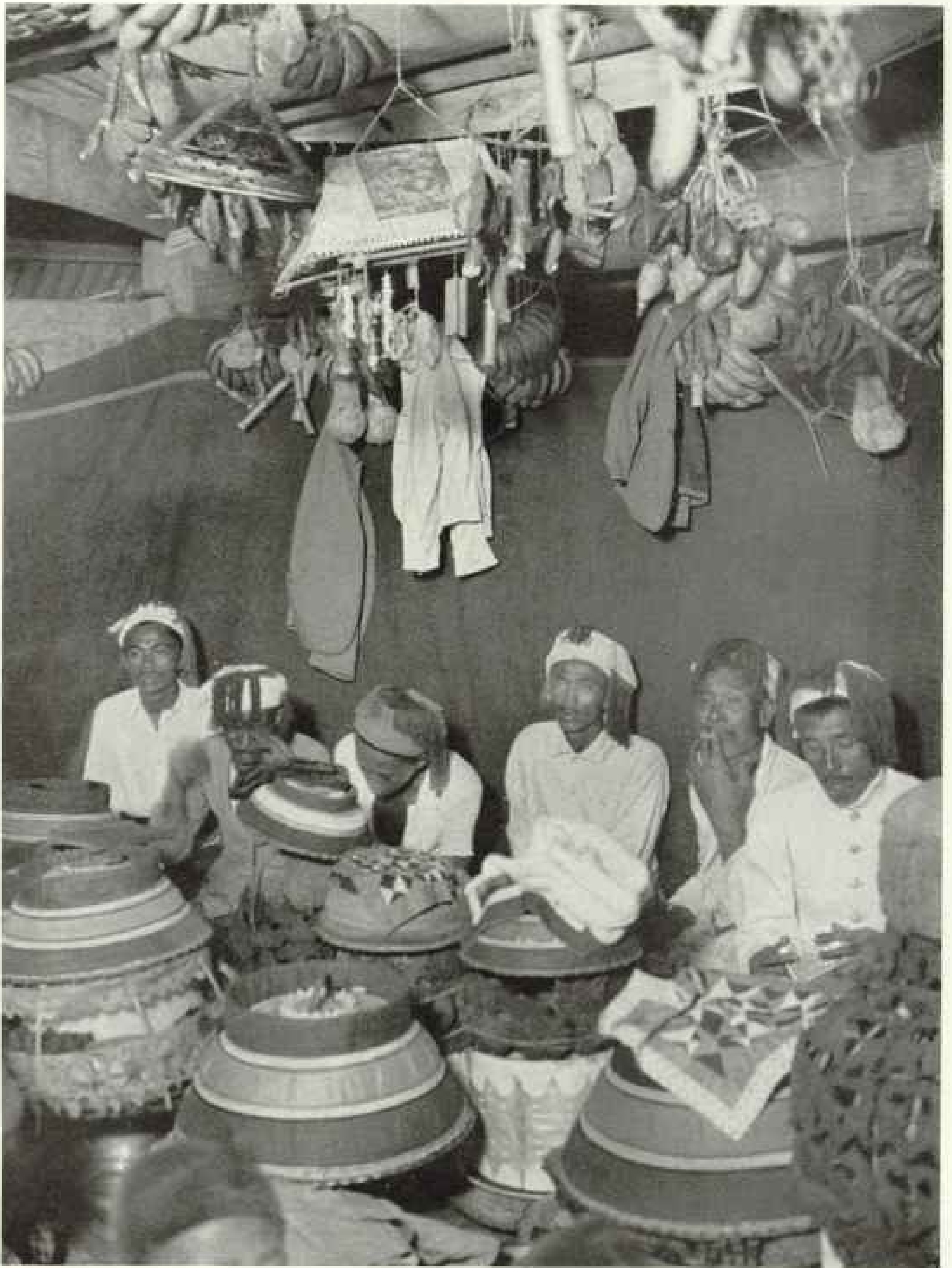
Between Islam's Leaders Hangs the Old Gods' Toy Abode

The Karaeng (chief) and Caliph (right) lead the singing in the old mosque at Bira. There Allah suffers the survival of a pagan rite. One of its symbols is the little paper house, stuffed with food (page 66).



Maidens with Powdered Foreheads Wear Golden Necklaces above Sarongs—Fruits Hang from Rafters as from a Christmas Tree

These Moslem girls suggest Hinduism, of which a trace is left in Bira. Their brothers, however, wear the orthodox turbans. Mothers have alkent head scarfs. Wooden beams, curving like a water buffalo's horns, identify the pulpit where Koranic texts are read (page 66).



Mosque Officials Watch over Food Baskets Displayed by Proud Owners

At a nightlong festivity they celebrated the home-coming of Bira's seafarers. For the hungry, fruits were strung on rafters; they did not touch the display baskets. An open-work globe at the right is made of fish and is topped by an omelet. These six assistants to the Caliph wear ceremonial jackets and tasseled caps.



Like Tug-of-war Teams, Celebes Sailors Pull a Prau out of the Sea.

Yearly, during the west monsoon, ships are beached for inspection and repairs at Bira. Their bottoms are covered with oil and burned coral as protection against shipworms. Logs laid like railroad ties prevent the vessel from sinking into the sand.

In the western part of the Indies, to take a few examples, are the two-masted ships that carry firewood to Singapore from the neighboring Riouw Archipelago; in the center, the ship belonging to the Chief of the Postillions, which sails among these remote and beautiful islands loading copra and then brings it to Makassar; and in the east, various types of praus whose voyaging is limited to the Moluccas, the Aroe Islands, and the Kai group—where many of the best boats are built—and other islands in the Banda and Arafura Seas.

Ships Hauled up on Beaches by Manpower

When the ships return to Bira at the end of the sailing season the sailors are paid, receiving not fixed wages but shares of their ships' earnings. During the voyages they get advances from the prau masters, often borrowing so much that when they are paid they get little or nothing.

After the last of the ships had arrived, arrangements were made to haul them up on the beaches for refitting and repairs. As no ship can be hauled by her own sailors alone, all the crews get together and help each other.

Gomek, the commodore of the local fleet, called a meeting of prau masters one morning, under shady palms by one of the beaches.

By his side sat a man with a list of the ships and the numbers of their crews. As he read down the list, each prau master reported how many of his crew would be available to help to haul the ships.

About 800 men were required to haul each of the larger ships, but as the Biran sailors numbered about 1,500 there was no difficulty in getting enough manpower.

A few days after the prau masters' meeting, a crowd of sailors gathered at the ship that was to be hauled first. Her masts had been lowered, and she had been pulled onto the shore at high tide, until her keel rested on



Up the Beach Stern First, a Prau Is Pushed and Pulled by Many Hands

One gang shoves poles against the bows; a second pushes with hands flat against the hull; while a third, by far the largest, hauls her with anchor cables and wire hawsers. Since one crew cannot haul its ship alone, as many as 800 sailors get together and help one another.

the lower end of a row of logs that had been laid down the beach.

The men were divided into three main gangs. As many as could find room were as close to the ship as they could get, some crouching low beneath the hull with their backs to it, others standing in rows with their hands raised, palms flat against the hull.

Another gang held long poles that were fixed to the ship's bows.

The third gang, by far the largest, stretched far up the beach, a solid column of several hundred men with a dozen or so wire hawsers and anchor cables in their hands.

When the men were all in their places, a

prau master began to prance up and down the beach, shouting at the top of his voice one of the formulas used to rouse the sailors when they haul their ships.

Camera's Lure Distracts Workers

When the men should have been worked up by his cries he screamed at them "Himbang! Himbang! Himbang!" (Heave! Heave! Heave!) But nothing happened, for the men had forgotten all about the prau and were looking at the camera I was aiming at them.

I put away the camera, went among the sailors, and made a great noise. As I knew nothing of the regular formulas for rousing



A Straining Crew Fits a New Sternpost on a Beached Prau

A Biran boat's life may be prolonged indefinitely. After her first 20 years, fresh timbers are added as they are needed. Eventually the owner has a ship reminiscent of the poor man's coat, patched so often it is new.

the men except the word for "heave," I roared for about as long as the prau masters had, and then with a "Himbang! Himbang! Himbang!" the ship began to rock with a quick fore-and-aft motion. The men whose hands were against the hull pushed in time with my shouts, and those with the poles thrust them against the bows.

More and more the ship rocked on the logs beneath the keel, until at last with shrill screams of "I-á! Le-le-le-le-le!" the hundreds of men at the cables and hawsers began to haul her up the beach.

She did not go far, and I was disappointed that my shouts had roused the men to so small an effort. But later in the day I saw that

this was nothing unusual on so steep a beach. The praus go up a little at a time, and each time the man who does the shouting almost loses his voice.

Author Commandeered for Shouting

The prau masters, amazed and delighted to find a throat that could produce such lusty sounds, implored me to shout again. As there were 117 other ships to be hauled, I gave up all attempts to photograph this one and went again among the sailors and roared. It took seven separate hauls to take the ship up to the top of the beach.

That night I learned one of the best formulas for rousing the men, and for a week or so



Lest Jackets Be Soiled, the Hands-on-hull Crew Exerts Only Gentle Pressure

For such work, says the author, it is foolish to wear more than shorts. Birans, desiring to be like Europeans, believe that wearing European clothes is enough to effect the transformation. To move the sailors, the prau master shouts himself hoarse (page 76).

divided my time between shouting at the sailors and photographing their efforts. Toward the end of the hauling not one of those who had "taken the tree"—as the job of leading the men is called—could speak in anything but a hoarse whisper.

When at last the 118th ship had been hauled, Commodore Gomek came to me, sweat dripping from his brow. "Thank you, Tuan," he whispered. "I've never heard anything like the noise you made!"

Epidemics Take 5,000 Lives

Soon after the ships returned, severe epidemics of malaria and dysentery broke out in Bira and the neighboring district. Work on my half-built ship stopped.

I helped the Netherlands Indies Public Service, distributing quinine and persuading the Birans to let themselves be inoculated against dysentery. Many were afraid of inoculation. In the four months that the epidemics lasted, more than 5,000 people died in the corner of Celebes where I was staying.

When at the end of the west monsoon the epidemics had been stamped out by quinine and inoculation, the Bira fleet sailed for the

Moluccas and work on my ship was resumed. In this period I foolishly neglected my food, eating polished rice and not much else, with the result that I ran short of vitamin B₁ and got beriberi.

Off for Tropical Isles

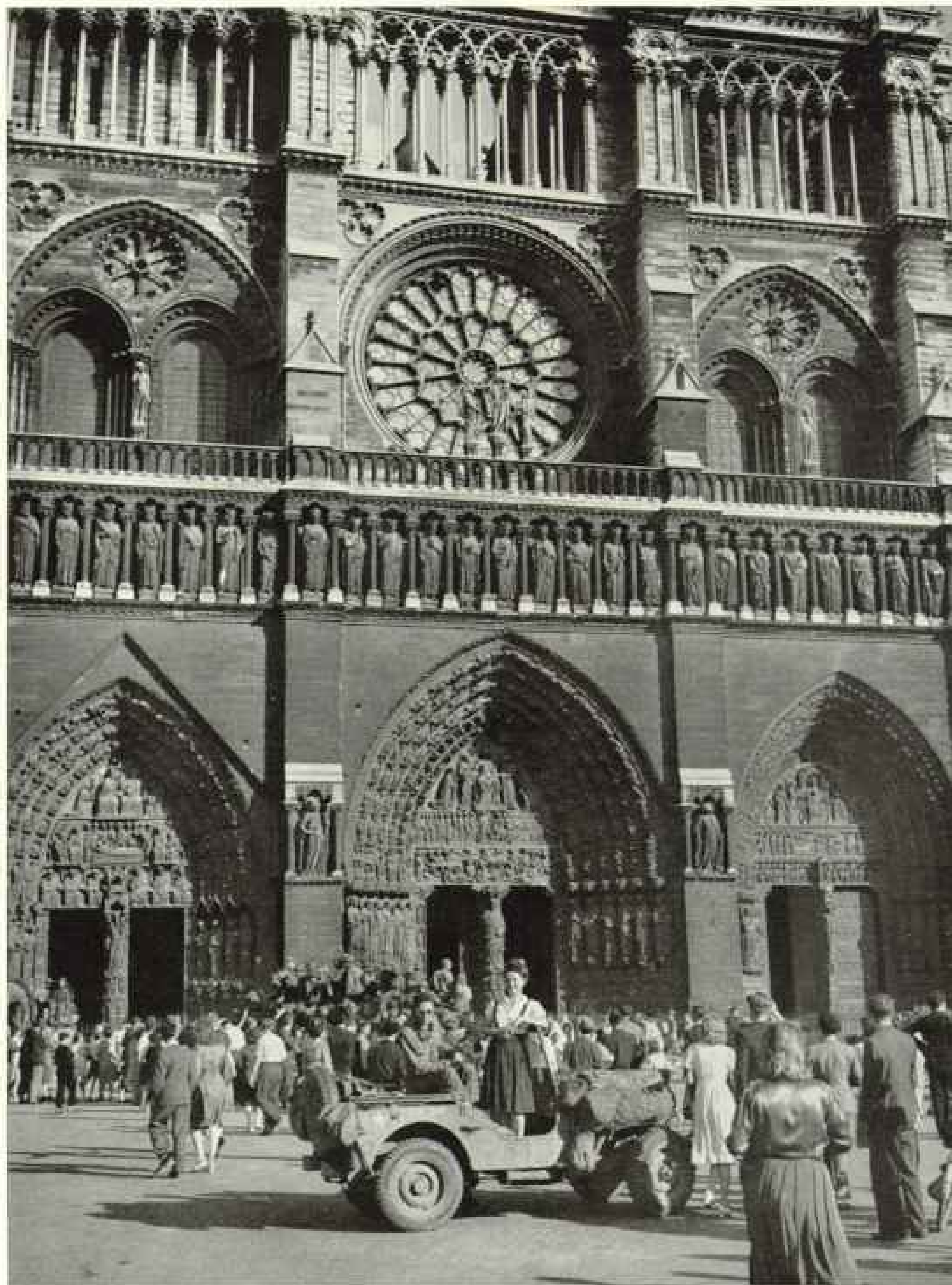
During the epidemics I had malignant malaria and dysentery, so that with the beriberi coming a few months later I had by this time fairly good experience with tropical diseases.

Halfway through the east monsoon my high-pooped ship was completed, after 15 months in Bira that had taught me much about the vigorous and enterprising seafarers of Celebes and their praus.

As crew I chose six men who usually sailed in the palaris of my friend Daeng Marinyo; and at last I was able to do what I had wanted to do since I was a child—sail away in a ship of my own to tropical palm-fringed islands.

The outbreak of war in 1939 took me from my free life of sailing among the islands and placed me in a government office in Batavia to organize propaganda for the varied peoples of the Indies.

Paris Delivered



U. S. Army Signal Corps, Official

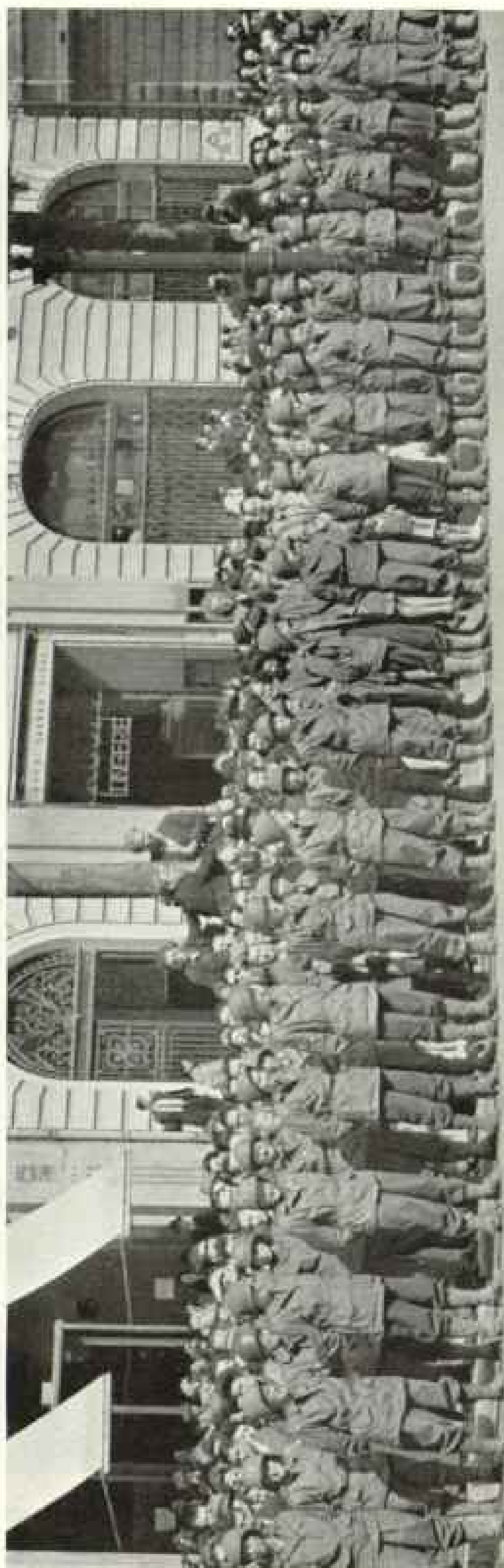
Cheering the Yanks on Liberation Day, Paris Gives Thanks That War Spared Notre Dame

A sergeant's jeep holds a lone girl. Some accommodated nine! Joyously the crowd mobs other GIs (rear). Above them stand 25 sculptured Old Testament kings. Begun in 1163, the Cathedral became the Revolution's "Temple of Reason." It saw Napoleon crowned. From the August, 1944, fighting, it bears a few bullet scars.



In the AEF's Footsteps, American Infantrymen March Past the Arc de Triomphe in the Victory Parade August 29, 1944

Since the fall of Paris in 1940 the Champs Elysées had echoed the clump of Nazi boots. To Parisians' delight, the Yanks' soft-soled shoes were virtually silent.



U. S. Army (Hines) Corps. Official

Trousered WACS in Field Jackets Turn Their Backs on a Lingerie Shop to Watch a Parade in the Champs Elysées

WACS landed in France ten days after D Day. When France grew cold last autumn, they were grateful for a GI loan of long, warm undies.



© L. A. ...

Paris, City of Light, Shines after Four Years of Darkness—Looking across the Seine, an Air View Shows the Left Bank Hub of a dozen avenues, Place de l'Étoile is rightly named Star Place. Napoleon's victory monument, the Arc de Triomphe, divides the wide avenue, Champs Élysées (upper left) and Grand Armée. Below the Arc rests the Unknown Soldier, whose Eternal Flame burned throughout the occupation.



U. S. Army Signal Corps, Official.

From Battle, into Battle, the Yanks March through Paris without Pause for Fun

This infantry division had not had a formal parade since it left training camp. It had done most of its marching single file on dirt roads. Its march through Paris was a surprise approach to battle. By dawn the next day (August 30) the division struck the retreating Germans. By night it had fought 15 miles from its parade ground. Americans missed Paris' honking, dilapidated taxicabs. Lacking gasoline, many of these spectators rode bicycles. A few arrived in horse-drawn carts.



U. S. Army Signal Corps. Official from Army

Three American Sergeants in a Perfume Shop—Paris of 1918 Never Saw the Like

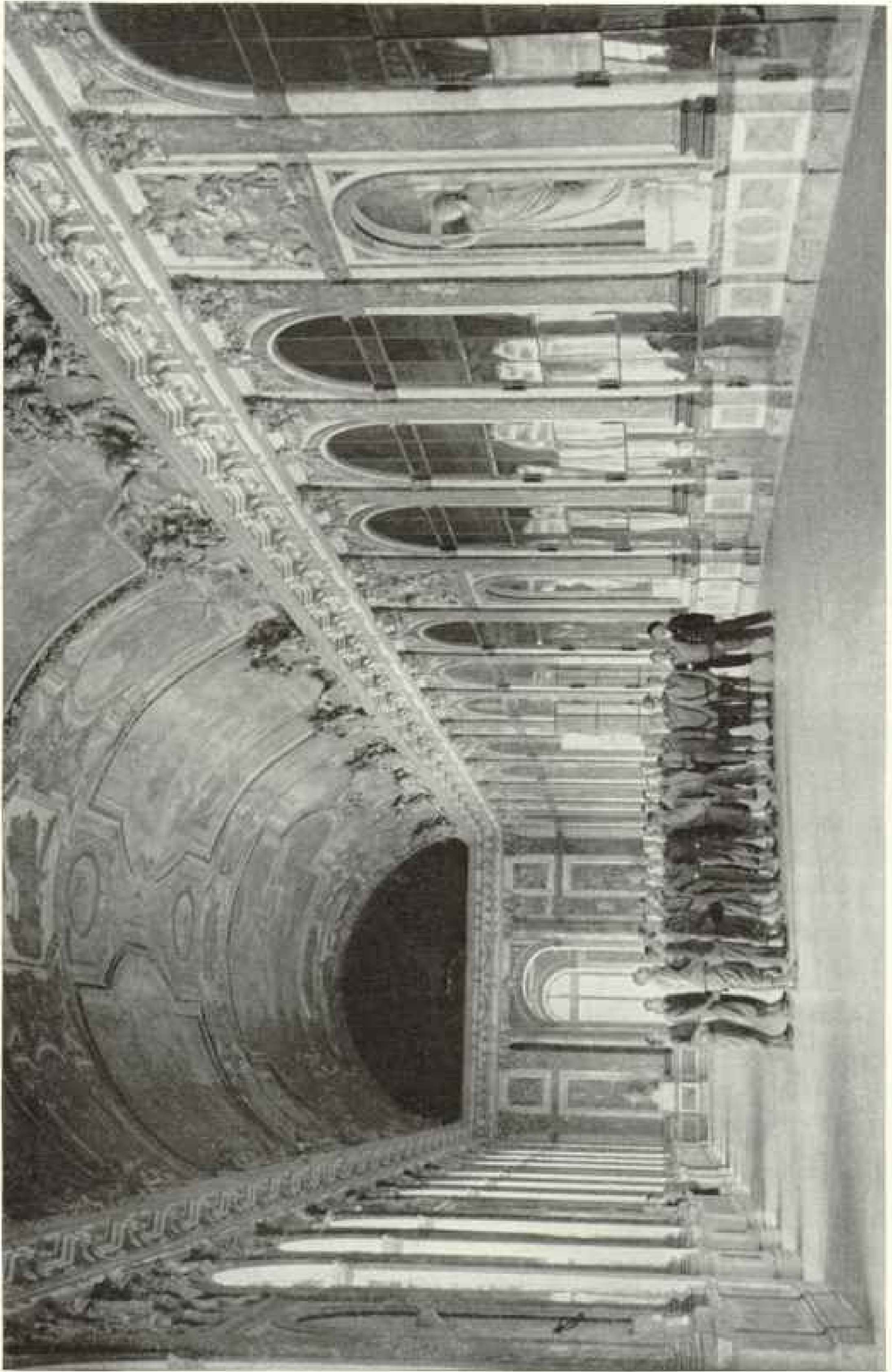
WACS say perfume gives the feminine touch to uniforms and, besides, regulations don't forbid it. They tried Paris hairdoes but bemoaned high prices. More than 100 WACS run the Army's switchboard in Paris.



Army

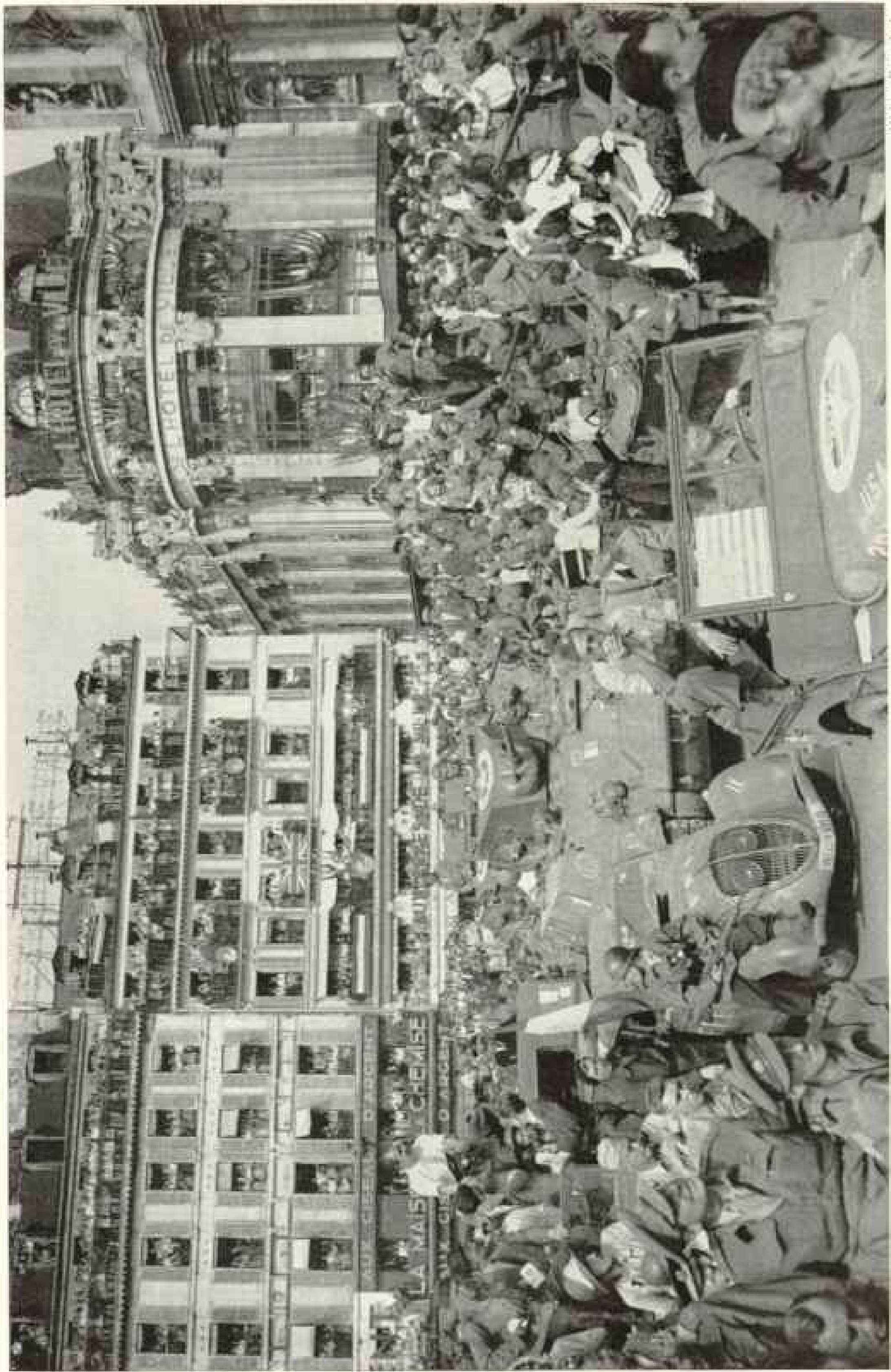
"Parlez-vous Français, Madame?" Yanks Try Out Their Textbook French

"Knowing a little French will help you get along with the people," the War Department told these soldiers in its language guide. Until this moment they did not fully appreciate the Department's advice.



"Here Defeated Germany Signed Peace in 1919," a French Guide Tells Yanks in the Hall of Mirrors, Versailles Palace

AP/WIDE WORLD
Their forefathers won British recognition of American independence by 1783's Treaty of Versailles. Though Hitler denounced 1919's "dictate of Versailles," he spared the palace; its art treasures were hidden from him. Louis XIV built the palace to house French kings; now it is a public museum.



AP Photo Press Ass'n

After This Picture Was Taken, Joy Turned to Terror as Snipers Fired into Place de l'Hôtel de Ville (City Hall Square)

Here in 1789 the Revolution hanged its first victims and here in 1871 some 600 rebels were killed. For local importance, however, history could not match Gen. Charles de Gaulle's home-coming, August 26, 1944. As shots were fired at him, civilians dashed under American tanks and jeeps.



U. S. Army Signal Corps Official

Paris Gives a Preview of What America and Britain Will See When Berlin Falls

Photographed from the Arc de Triomphe, United States Army vehicles swing four abreast into the Champs-Élysées. Thousands who wept at the German entry in June, 1940, cheered, "God bless you!" shouted some, and others, "Got any rum, Yank?" Much of their ardor had been spent acclaiming French troops, first to arrive.

Fiji Patrol on Bougainville

By DAVID D. DUNCAN

First Lieutenant, U. S. Marine Corps

With Illustrations from Photographs by the Author

THE dugout headquarters was cool under its massive roof of palm logs and sandbags. An orderly presented me to the officer behind the desk. He was Lt. Col. Geoffrey T. Upton, commanding the 1st Battalion of the Fiji Infantry Regiment on Bougainville in the Solomon Islands.*

"So you're the U. S. Marine who wishes to enlist in the Fijian Army," he chuckled as we shook hands. "Now just what can we do for you?"

"Colonel, as a photographer for the Aviation Division of the U. S. Marine Corps, I am making a motion picture of SCAT [South Pacific Combat Air Transport Command]," I replied. "I have heard of the exploits of the Fijians in their behind-the-lines fighting with the Japs. Parachute drops, many by SCAT planes, supply their jungle outpost at Ibu, in the heart of enemy country. I need pictures of those drops; they must be extremely colorful. I would like permission to join your men in their stronghold."

At dawn next morning I reported to the pilots' shack of the Army Air Forces Cub Command. Men of this group fly the frail two-man planes which so effectively spot artillery fire.

"Here we are at Cape Torokina, on Empress Augusta Bay," the captain explained, pointing to a map.† "There's Ibu, the Fiji outpost, on the other side of the island—barely 10 miles from the Japs at Numa Numa. To get there you'll have to ride our grasshopper up the canyon of the Laruma River, then through the pass in the Crown Prince Range (p. 89).

"Thirty seconds after taking off, you'll be over enemy country. In all those mountains and jungle"—he waved a hand across the island—"there's only one little spot where you can safely land. That's Ibu. You had better take another good look.

Over Jap Country in a Grasshopper

"Planes lost in this country are never seen again," he added. "The jungle or the Japs get them. One Fijian who crashed fought the jungle for 20 days before he reached friendly hands. The pilot gave up after the Fijian, who had carried him for four days, could no longer lift him. He was never seen again."

As our tiny plane banked and climbed away

from the bomber strip, I realized how small our toe hold is on Bougainville. We were already beyond our front lines! Down below was nothing but green jungle—Jap country.

Here I was flying to war in a plane so small the kids used to bounce them around in pastures at home. I was a United States Marine, being flown by an Army pilot, going to join in a campaign with Fiji islanders. Everyone was in on it but the Navy! Yet the Navy also was to play an important role before I next saw Empress Augusta Bay.

My reverie ended abruptly. Wind struck my face as the plane sideslipped into the pass. Veils of rain hid most of the peaks of the Crown Prince Range. Bougainville's beautiful and most active volcano, Mount Bagana, was lost in its daily storm. It was a far different Bagana from the one I photographed on a clear day with its plume standing straight up—one of the rarest sights in the Solomons (Plate II).

Another squall loomed dead ahead. Fouring on full throttle, the pilot flipped into the next canyon. Its walls reared higher than the plane. Diving barely over the treetops, he followed the zigzagging course of the stream. Sunlight spilled from the clouds. We squirted out of the canyon just in front of the rain.

Fiji Outpost Like a Movie Set

Twenty minutes after our take-off from Torokina, we were over Ibu, the Fijian stronghold, with its miniature airfield.

Spiraling for the approach, I got my first good look at the field. It was really something! While shooting pictures around the chicle camps and coffee plantations of Central America, I thought I had seen the ultimate in microscopic airports. Compared with Ibu's, they rivaled New York's La Guardia Field.

Enormous trees choked one end of the strip. The runway clung to the crest of a ridge and disappeared over the edge of a canyon. That strip was only 350 feet long. It looked like a melon patch.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "A Woman's Experiences Among Stone Age Solomon Islanders," by Eleanor Schirmer Oliver, December, 1942, and "Jungle War: Bougainville and New Caledonia," 17 paintings, by Lt. William F. Draper, April, 1944.

† See Map Supplement of "Southeast Asia and Pacific Islands," in THE GEOGRAPHIC for October, 1944.



Sprouting Ferns Like a Dead Stump, a New Zealand Lieutenant Reports Back

His platoon has held off several hundred Japs in Tokuo village for 24 hours. Hand grenades and carbine clips fill his bulging pockets. New Zealand and Fiji officers commanded the Fiji Battalion.



In Wild Bamboo Highlands of Bougainville, a Radioman Talks with Torokina

Having scouted in the heart of Jap country for 60 days, these men now pause during the 5½-day walk out over Mount Balbi (page 96). The Australian-made portable transmitter never failed them.



Into a Rain Squall Flies a Piper Cub, Bound for Ibu, the Fijians' Outpost

Bouncing through typical Bougainville weather, the "grasshopper" wings up the Laruma canyon through Jap-held country. Often the tiny planes drew small arms fire from the jungle, where a forced landing would have been fatal. It took 20 minutes to fly from Torokina headquarters to the outpost, where the Fijians had built a 350-foot landing strip (page 87). Besides making these daily flights, U. S. Army Air Forces Cubs spotted artillery fire for the Empress-Augusta Bay beachhead on Bougainville, Solomon Islands.

Had Hollywood created Ibu as the background for a guerrilla band, the setting could not have been wilder. Dense, forbidding jungle pressed in from every side. An old lattice-walled mission house served as headquarters. Steps were hewn from tree trunks.

The clearing around the house was a profusion of ferns, bamboo, palms, and wild ginger. Mount Balbi, the 10,171-foot volcano, towered over the vine-festooned trees.

Dramatically dressed in multihued silks of discarded parachutes, heavily armed Fijians roamed the camp, completing the illusion of a scene from movieland (Plate VI).

"Do we surprise you, Lieutenant?" queried a soft voice at my shoulder.

I was startled. No one had been near me a moment before. Whirling, I stared into a vast, coppery chest, from which deep laughter rolled. Towering over me stood one of the most powerful men I have ever seen.

Under one arm he carried a log of telephone-pole dimensions. In the other, a submachine

gun. Around his waist this bearded giant wore a bright-blue skirt!

"Permit me, Lieutenant, to assist with your equipment. I am going that way with this rafter for the medical dugout." I was dumbfounded, first because of his English, then that he could carry still more.

After supper that evening, as rain beat down over the jungle, I sat back from the lamplight, listening to the conversation. Matches flared, momentarily high-lighting the faces. The major was speaking earnestly, so low that I could scarcely hear.

"Tomorrow we do it again. This morning new Japanese troops moved in near the deserted village of Pipipain. They still have no natives to guide them. They may have forgotten our last little party; so we'll give them another."

No one smiled, not even the major. That "last party" had trapped and killed twenty-two Japs. One Fijian also lost his life. It was no picnic.



Friendly Islanders Brought Coconuts, Papayas, Squash, and Taro to the Ibu Garrison

The Japs had stripped local gardens of Bougainville; so it was a tribute to the Fijians that the natives should part with their valued produce, which they exchanged for stick tobacco and parachute silk (page 93). Men carrying bows and arrows led the silent processions; women and children brought up the rear. Bamboo sections in background are water carriers.

"Now, let's check the setup." Pushing back his packing-crate chair, he stepped to the chart table. After a glance at the large-scale map, he called to his batman in the darkness. "Go down to the camp and tell Bero, the Papuan scout, that we must see him immediately."

While the major waited, other officers crowded around. Flashlights traced lines across the battle chart, as though each was silently choosing an ambush along the network of trails (opposite page).

Soon bare feet whispering over the floor announced the arrival of Bero. Squat, barrel-chested, tattooing around his eyes, he was of the jungle. A pair of khaki shorts, with a kris at his waist, was all that he wore. But what held me was a feeling of something untamed prowling that veranda. Only a thread of civilization seemed to hold him in check.

While I oiled and cleaned my carbine, a junior officer beside me on the bunk told me about this sinister-looking soldier.

"He's tough, that bloke. Massive shoulders, powerful legs, unlimited endurance, and chopped from mahogany. Not much like a Solomon islander, is he?"

"But what place does he fill in your Fiji battalion?" I asked.

"Before the Japanese came, the Australian Government conducted a police school at Rabaul, New Britain," he explained. "The most intelligent and toughest men from New Guinea, boys like Bero, were trained as a constabulary force to maintain law and order throughout the Australian Mandated Islands.*"

"Like you Marines, we Fijians had never seen Bougainville until a short time ago. To campaign behind enemy lines, we needed scouts who knew the country. The police boys were the answer. Bero and his Papuan friends, who were stationed on Bougainville, know the island like the floor of their homes and are invaluable to us."

Later, I asked Bero how many Japs he had killed and he gave two answers: first, those he had shot with his carbine; then, with a laugh, those he had finished in the way of the

* See, in *THE GEOGRAPHIC*, "Into Primeval Papua by Seaplane," by E. W. Brandes, September, 1939; "Unknown New Guinea," by Richard Archbold, March, 1941; and "Treasure Islands of Australasia," by Douglas L. Oliver, June, 1942.



With Flashlights, Officers Plan Patrols and Ambushes Against the Japs.

From this headquarters in an old thatched mission house at Ibu, the Fiji Battalion scouted Japanese positions around Numa Numa, only ten miles away. The Fijians found that enemy garrisons on Bougainville, their supply ships sunk and planes destroyed, could be left to "die on the vine."

jungle, using only his kris or his bare hands. He had several dozen Japs to his credit.

When the major had completed briefing his officers for the next day's action, he came over and sat on the bunk.

"Tell me about your Fijians," I said. "Is it true that no men in the Pacific make better jungle fighters?"

"Correct!" he replied. "These men possess three remarkable assets. First, their uncanny sense of perception. Out in the jungle, they see, hear, and even smell things beyond the powers of you or me.

"Second, their tremendous good nature. Whether the day is sunny or rainy, they will convulse each other with stories and jokes, then sing the rest of the time. It isn't that they can't be serious. Wait until you have lain in ambush or made an attack with them.

"Finally, their complete lack of fear of the enemy and their indifferent attitude toward death. No Fijian worries about being killed any more than he questions the sun's not rising. Thorough training, too, has molded their natural abilities into a hard-hitting machine, capable of stalking the enemy in any jungle of the Pacific."

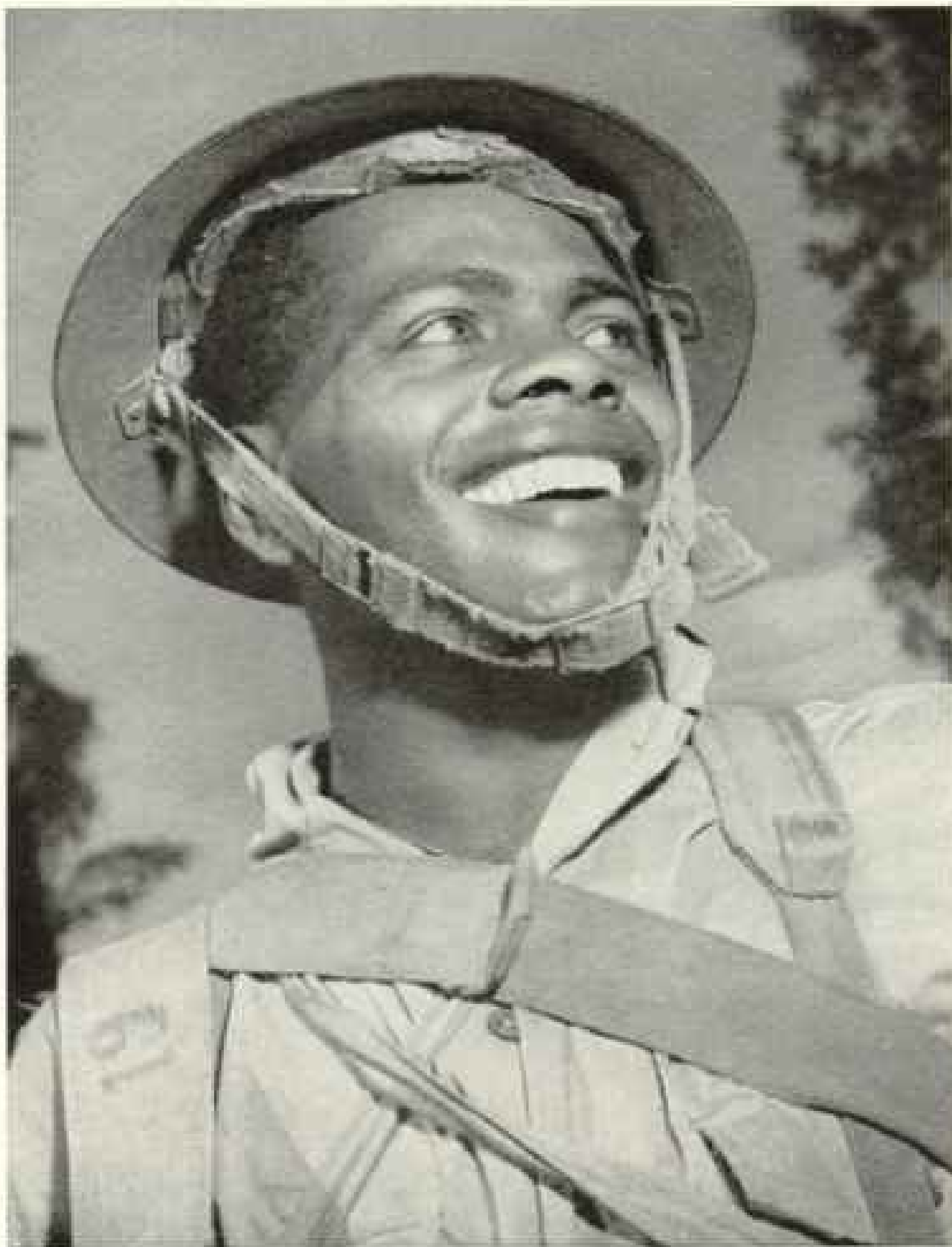
"What about your officers? They are not all Fijians?" I asked.

"No," he replied. "Some are Fijians; the majority, though, are New Zealanders. For jungle sense, the Fijians beat us Kiwis every time! But enough of this—tomorrow we have a big job to do! Good night."

Action filled each day of the following weeks. The battle party to Pipipaia effected a complete surprise. Led by a young New Zealander, Lt. Bruce Dent,* the patrol stole out along the trail from Ibu. From the high-ridged flanks of Mount Balbi, the Fiji riflemen could see the east coast of the island. Numa Numa Plantation, the Japanese headquarters on eastern Bougainville, lay just out of range for good sniping.

Creeping silently down the jungle path, scouts sneaked into the Pipipaia clearing before sentries could give the alarm. Then the Japs rushed out, too late. Blasts of Fijian fire cut them down and tore through the thatched huts. Japs carpeted the ground

* Lieutenant Dent, later killed in action against the Japanese, was posthumously awarded the British Military Cross for his outstanding leadership during the Ibu campaign.



Gay and Fearless Is the Fijian Jungle Fighter

Pvt. John Seduadua, like most of his companions, has served in the Army since Britain declared war on Germany. When he goes on patrol in the "bush," his helmet will stay behind because it makes too much noise against vines and branches in the jungle. Ferns will hide his soft olive-drab cap (Plate VIII).

around the village breadfruit tree. Not one Fijian was wounded. The ambush was perfect.

Back at Ibu the next day there was great excitement. Word sped in from lookouts that planes were low over the mountains, coming in fast. I dived for the jungle.

Food Floats Down from the Heavens

Looking back over my shoulder, I saw Fijians crowding into the clearing. Instead of dodging bombs, they were hiding their weapons under trees, then running into the open. With heads thrown back they watched the sky.

In a tornado of sound, a giant shadow swept over the treetops. Suddenly overhead long cylinders shot into the air. Parachutes ex-

ploded in bursts of brilliant colors. Tumbling cylinders jerked back to swing down into the clearing with loud crashes (Plate I).

Another SCAT plane swooped in above the clearing, spilling more 300-pound para-packs. Each cylinder bulged with supplies—ammunition, grenades, flares, surgical dressings, field rations—everything needed in jungle fighting. All supplies for the Fijians reached them by air; none came in overland.

To the Fijians it was a fascinating game. They'd stand transfixed watching the cylinders tumbling down. Just as the skull-crushing loads clipped their caps, they'd corkscrew to the side without getting squashed. It was great entertainment—perhaps more dangerous than fighting Japs!

I saw two argue priorities on a drop, neither man giving way an inch. One even ignored the falling cylinder, nonchalantly rolling a cigarette. As the heavy pack hit the ground, two blue posteriors disappeared in the dust and ferns. Wild applause greeted the victor; he hadn't even spilled his tobacco.

Sometimes a chute failed to open. Its cylinder shot down like a bomb, at a hundred miles an hour, smashing everything in its path. Only the mission's sheet-iron roof prevented demolition by the silk-tailed meteors.

Pilots took great pains to drop the chutes into the canyonlike clearing, because if they fell in the jungle they were impossible to retrieve. One parachute caught in a giant tree in the clearing and had to be shot down because tree ants made climbing "too hot"! We were anxious to get it down, too, because its canary-yellow canopy might be visible from Numa Numa and stir up the Japs.

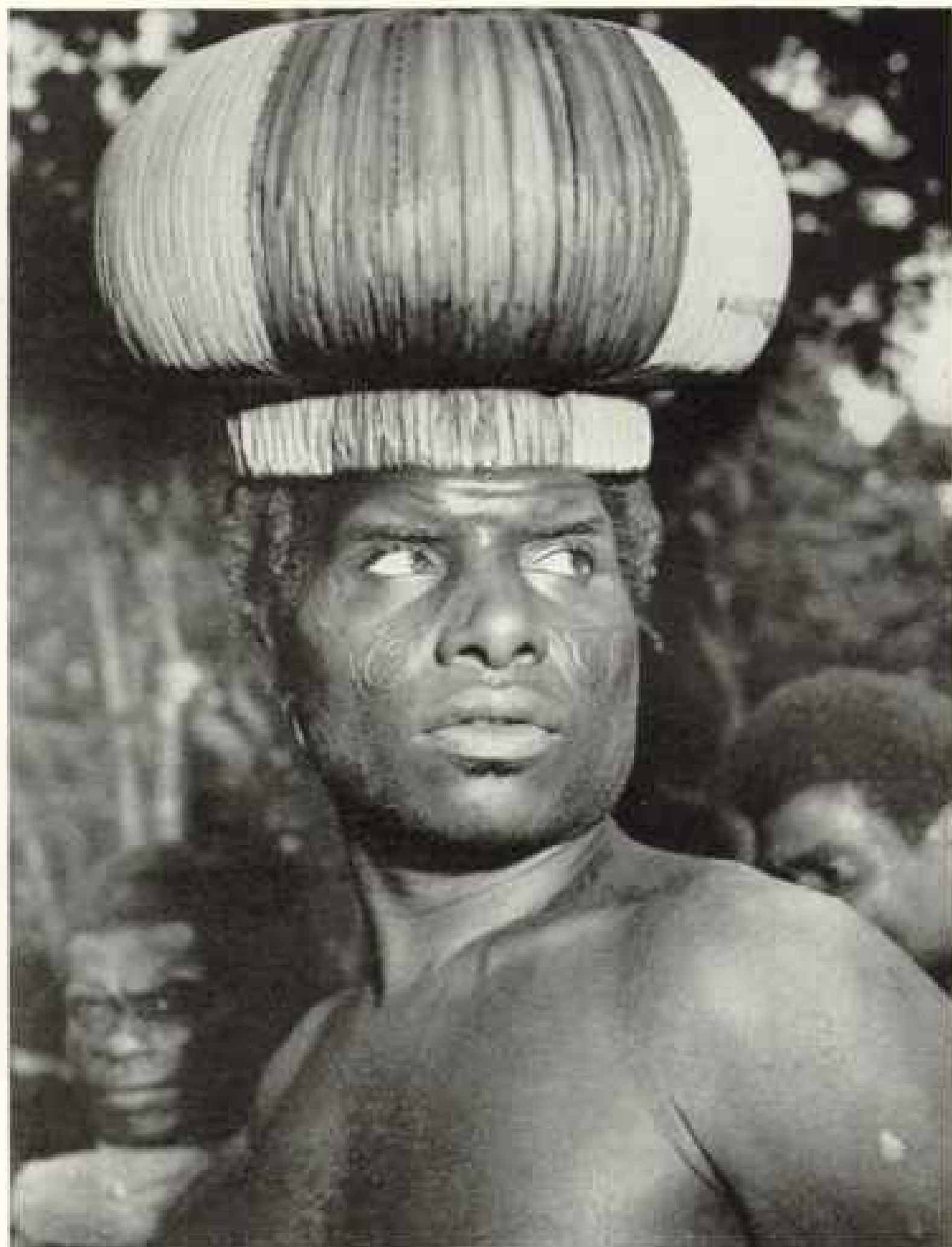
In the wake of each parachute day, our Ibu Chapter of the "Bougainville Carriers and Scouts Federation" increased its membership tenfold. Natives flocked to the outpost to exchange market produce for trinkets dropped from the sky.

They'd come in long, slow processions, moving among the ferns and trees without a sound. But for the wind, the rain, the crickets and frogs of the night, the occasional whistle of a cockatoo, or the dull thud of a falling giant, Bougainville is a land of deep silence.

Men of the tribe always led the pilgrimage, with the oldest and the wisest in front, tapering to tiny boys in the rear. Out of sight, back along the trail, the women followed, keeping a respectful distance from the heads of their households. Backloads of bananas, papayas, taro, squash, breadfruit, and coconuts bowed each from the waist. Perched on his mother's back rode the newest addition to the family, a solemn little owl-eyed mahout, prodding his steed along the path (page 90).

Except for tribal or ceremonial scars adorning breasts and shoulders, the womenfolk wore the only costume of that section, a satiny gown of complacent serenity.

A giant Fijian representative negotiated with these people, impoverished by the enemy's pilfering, for the goods spread upon the ground. With flowing beard, commanding eyes, and gentle voice, this former missionary of twenty-two years' experience in the Solomons bartered with the islanders. He spoke with fluency in eleven languages; few dialects were beyond his ability. He valued each timidly offered bit of produce through the eyes of his



Fierce, Yet Friendly, Bougainville Islanders Served as Carriers

As this boy's hair grows, he lets it pile up inside the red-and-blue headpiece, woven of palm. He wears it until married, and no woman of his tribe may see him with it off. An old nail serves as earring. The three Buka district islanders jumped three feet when the author made this photo flash.

customers, knowing the empty place it left in their frugal fare at home.

Salt, sugar, licorice, tobacco, discarded parachutes—treasures undreamed of—were bought at a fair price and rushed home.

Still sad-eyed, still unspeaking, the dusky little caravans moved back toward the jungle. Some of the islanders were smoking pipes, nearly all wore truly beautiful silks wrapped around their waists as they dissolved into the gloom of the trees.

Ibu Sheds Its Silks, Dons Battle Green

The Fijian stronghold was a changed place the day Colonel Upton arrived from Torokina. Every vivid skirt was thrown aside; blues,



Angry as Hornets Are These Bougainville Islanders, Just Shot Up by Japs

One of their companions was killed as the men peacefully followed a jungle path with no weapons but bows and arrows. Here, in a drizzling mist, the simple tribesmen report to officers at Ibu. The Fijians ambushed the Japs the same afternoon.

reds, and yellows disappeared. The Fijians moved through camp in full battle dress, ready for anything. No longer was Ibu a setting from movieland.

Sifting down from their mountain lairs, the Fijians crept right into the enemy shore positions guarding Numa Numa. After nearly being stepped on by Japanese sentries, they gave detailed descriptions of every weapon and pillbox. Food was scarce—native gardens had been stripped—but emergency rations were keeping the Nips from starving.

The Fijians definitely established the fact that the Japanese could never evacuate their trapped thousands on Bougainville. Their few remaining planes were limited to occasional raids. Their ships had been sunk or driven off by Allied planes.

General headquarters at Torokina, upon receiving these reports, radioed orders to cease all coastal scouting. The assignment of the battalion was finished, but Ibu was not to be

abandoned immediately. To the satisfaction of the Fijians, permission was granted to harass the enemy. That word "harass" brought an epidemic of ambushes which drove the Japs from the hills, back to the beach.

"There will be no more parachute drops for several days," the colonel told me. "If you wish, you may accompany one of our patrols into the bush."

The coconut lands along the coast, the lianas, ferns, mold, and decay of the jungle, even the deep canyons and razor-back ridges of the volcanoes—all were called "the bush."

Setting Ambushes for the Japs

Working south along the Numa Numa trail, we stopped at a gorge of the river. Flanked on either side by bluffs, it was the only ford for miles. Colonel Upton spotted ambushes which could be manned by our patrol should the enemy launch an attack.

The trap below Tokuo was a masterpiece



Drawing a Trail Map with His Foot, a Native Reports to Officers at Ibu

Carefully he explains just where the enemy is camped. The Solomon islander, bent over at right, translates the local dialect into pidgin English, which all the Fijians' officers can speak.

of ambushing. After seeing it, I understood why the Fijians had run up a tally of many scores of Japs for their lone fatality.

Rising from the canyon of the river, the trail stretched over the ridges approaching Takuo. The grade was so steep that even Bero and the other mountain-born Papuans gasped for breath as the colonel combed the slope for ambush sites.

He planted his first Bren gun on a ridge beneath giant trees. The trap's flanks were fern-clad and dropped off into deep crevasses. For nearly fifty yards in front the trail lay narrow and straight.

Cpl. Malakai Mo and his two gunners burrowed into the ferns until only the black snout of the barrel was visible. Nothing in front of the trap betrayed its presence. No spider web was torn, no bit of moss dislodged.

Only a woodpecker could have found the second Bren, forty yards beyond. It protruded from the split trunk of a lightning-struck tree.

The third Bren was dug in so that it could blanket the hilltop or, reversed, it could fire into the center of Tokuo village. With nine "bushmasters" behind those three Brens, the ambush was deadly.

Colonel Upton had no sooner returned to Ibu than the smoldering powder keg of Japanese opposition exploded. The Fijians were engulfed in a maelstrom of Japs who threatened to turn their record of incredible success into one of disaster.

General headquarters reported powerful enemy forces massing around Empress Augusta Bay, thus severing our escape route to Torokina. The Fijians had to evacuate the outpost or face annihilation. The colonel ordered Ibu destroyed. All but the old mission house was left in flames, awaiting the Japs . . . and the jungle.

Below Tokuo the ambushes of Cpl. Malakai Mo and his Bren men were hit by a full Japanese company. For six hours machine guns, grenades, and mortars roared and rocked

through the jungle. The Japs charged the first position and were blown back. When they hit again, it had been abandoned.

With heavy machine guns they pounded the second ambush, then drove in with bayonets. Bren fire scattered them over the ridge. They came again, screaming as they charged. The second position was deserted.

That third ambush repulsed a massed frontal attack. Then the enemy, fearing the Fijian fire more than the jungle, infiltrated around the trail. Their three-sided hanzai charge carried them over the position. It, too, had been abandoned.

Five Against a Hundred

The final Fijian stand around Tokuo was made by five men who stayed in the village. Five men against more than a hundred. Sub-machine gun slugs and grenades poured from the huts, throwing the Japs back into the jungle. Tokuo belonged to the night—and the Fijians. More of the enemy were added to the score. Not a Fijian was hit.

Next day the fury of the Japanese storm mounted to even greater heights around our ambush in Sisivie.

As usual, the rain limited all visibility to a few feet. As usual, the Japs waited until the downpour was at its worst, then slipped through the watery screen to the attack.

Cloaked in ferns from head to waist, faces blackened with charcoal, and leaning quietly against tree trunks, the Fijians became part of the jungle in the half-light and the rain (Plate III). Cool and casual, they placed each shot with terrific speed, but utmost care.

I'll never forget two dramatic scenes that occurred as the Japs swarmed forward in clusters, like specters.

One Fijian soldier was pulling grenade pins with his teeth and hurling the bombs with a mighty shout into Jap faces. His grenades blew Japs and jungle to kingdom come.

A gigantic, six-foot-four mortar man, braced with legs apart and exposed to enemy fire, was slamming bomb after bomb into his gun and firing it from the waist. The shocks twisted his body, but his feet never moved.

Cpl. Malakai Mo stayed always at my side with his Tommy gun. When my grenades were gone, he gave me some of his.

Cpl. Malakai tapped on his Tommy and, catching my eye, pointed to a grenade thrower calmly tying up a hole in his dungarees. Slugs had shot away the seat of his pants!

Those were the Fijians. Gentle but fearless, thinking of a stranger before protecting themselves, standing alone on a hilltop in a foreign land, fighting for their lives.

The police boys led us out by a secret path over the mountains. Half of the garrison poured through this corridor while the other half held the crowding Japs.

Our last action with the enemy was fought at Sisivie. Twenty men held off some 600 Japs in a fierce battle. When the battalion was clear, the rear guard gave a defiant cry, threw everything they had at the enemy, and then turned and sprinted up the ridge.

Not a Fijian remained behind. Again every man came through without a scratch.

During the next five days we marched across a mountainous, jungled, enemy land. It rained continually. Food disappeared completely after the second day. Climbing over Mount Balbi, we found the nights bitterly cold. No fires were permitted for fear of strafing or bombing, but drinking water was plentiful. We either caught rain or chopped stems of wild bamboo, filling our canteens with water from the sections.

Bougainville Allies Hunt Japs with Arrows

In the midst of the stumbling procession some 150 barefoot Bougainville natives plodded. Since they had helped the Fijians as scouts and carriers, they could not be left behind to the mercy of the Japanese. Even women and children, some infants riding pickaback, accompanied the heads of the households.

To hunt birds, fish, cuscus, and Japs, the Bougainville men carried a variety of bows and arrows.* "Antipersonnel" arrows had long, smooth, sharply pointed tips made of a wood tough as mahogany.

After we crossed the divide, the going got worse. Feet and boots cut deep into the trail, laying bare quagmires of slender, sinewy roots. Men went down as though shot when caught in their grip.

Then one morning, bright and clear, we hit the beach.

Planes wheeled out of the southern sky and spotted our haggard, bearded men lined up on the sands. The 1st Fiji Battalion was intact. All but one were present.

Soon landing craft of the Navy plowed across the sea and picked us up (Plate VII).

For sixty days the colonel had guided his men across the largest of the Solomon Islands, through the heart of enemy country. With the loss of only one man he had fulfilled his mission. He had proved that the thousands of Japs on Bougainville, neutralized by our troops at Empress Augusta Bay, can be left to "die on the vine."

* See, "What the Fighting Yanks See," by Wanda Burnett, NATIONAL GEOGRAPHIC, October, 1944.

Fiji Patrol on Bougainville

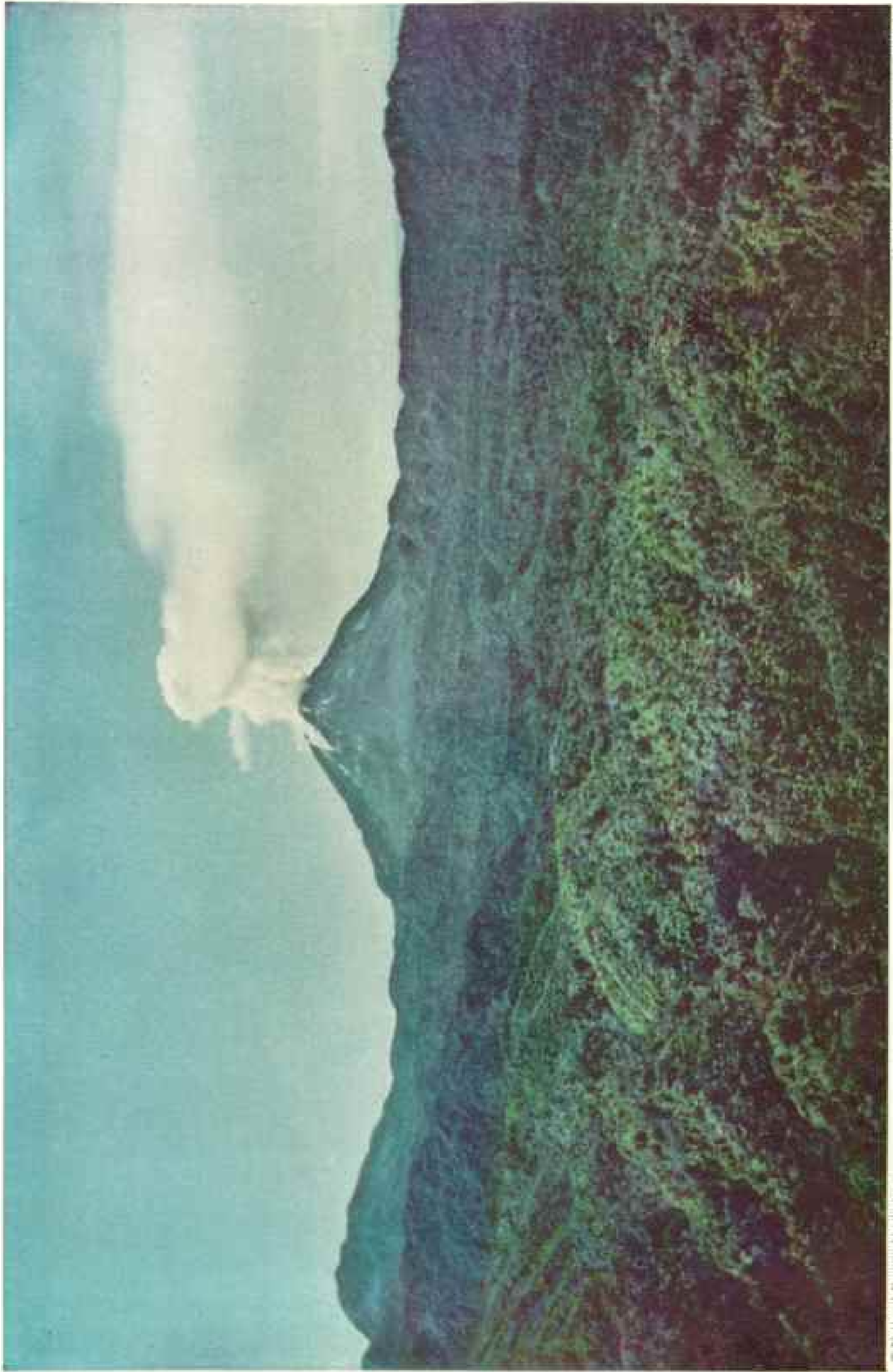


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Photograph by Lt. David Truman, USMC

Para-packs Float Down to Fiji Guerrillas 30 Miles behind Japanese Lines on Bougainville

Fijians loved to wait until the last moment to dodge the 300-pound packs. U. S. Marine Corps flyers made every effort to hit the clearing lest the jungle swallow food and arms forever. From the old mission (rear) New Zealand officers directed operations.

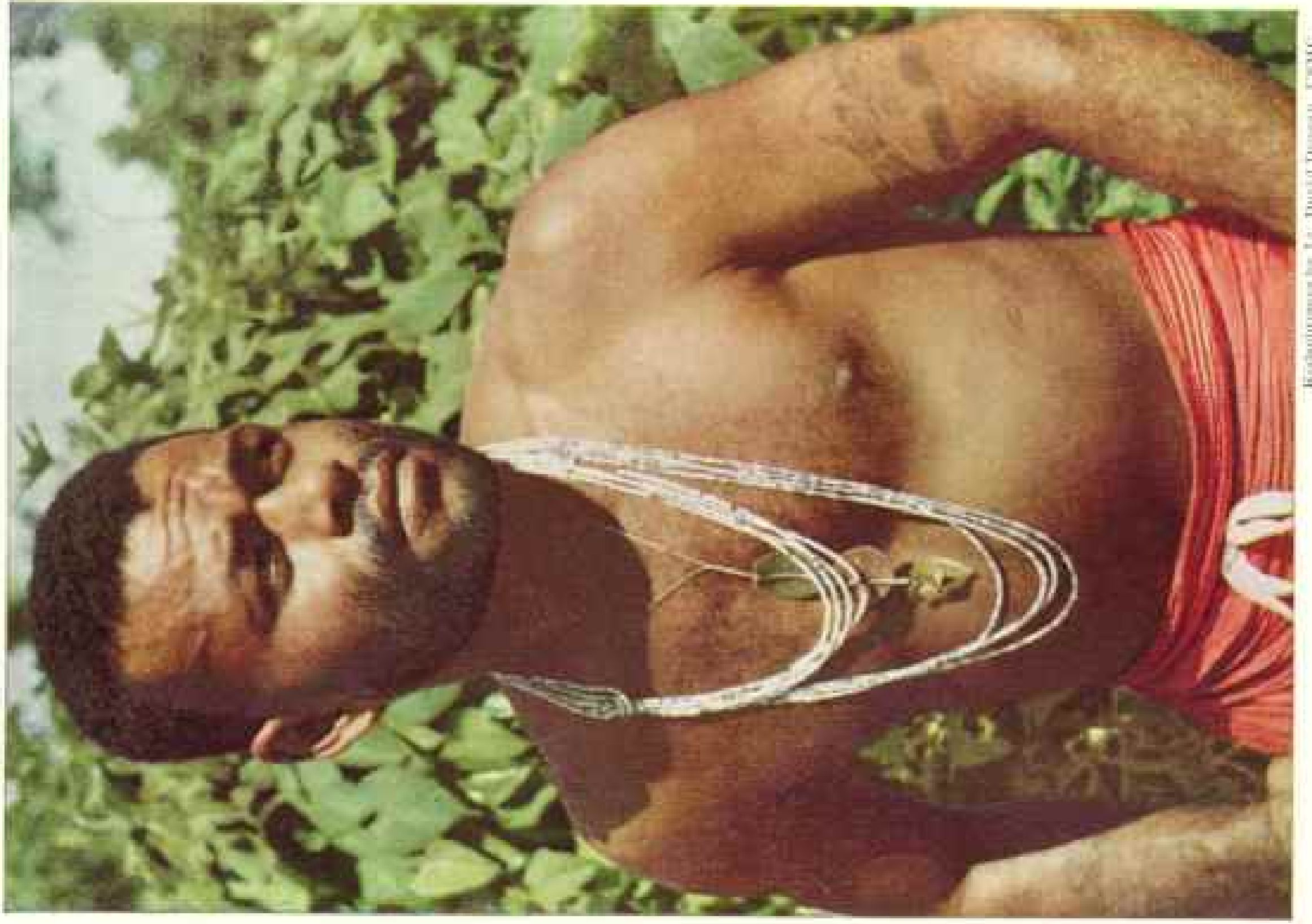


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Collection of Lt. David Dymally, USMC

A White-plumed Monarch of Bougainville Forest, Mount Bagana Is Sighted from a Marine Corps Plane over Enemy Country

Ever crowned with a column of vapor, the volcano became a familiar sight to United States troops who stormed ashore in the Emprise Augusta Bay area on November 1, 1943. On the following Christmas Eve and Day, the Bagana region celebrated with an earthquake.



Photographs by Lt. David Dugan, USMC

Skirt, Tattoo, Beads, and "Dog Tags" Are Camp Raiment



© National Geographic Society

Scowl and Gun Lurk in Ambush—He Killed 50 Japanese



A Battalion Surgeon Treats a Solomon Islander Who Risked a Spy's Death for the Allies
After he had hired out to the enemy, this native was recognized as a scout. Fleeing to the jungle, he wrenched a knee. To headquarters he carried his report. Parachute bags become sandbags at the radio dugout.



© National Geographic Society

Reproduction by Lt. David Truman, USMC

On a Parachute Tablecloth Fiji Mess Boys Slice Squash (Left) and Papaya
In return for parachutes and tobacco, islanders delivered fruits. "Theirs was a real contribution," says the photographer, "the Japs having stolen nearly everything edible."

Fiji Patrol on Bougainville



© National Geographic Society

Photograph by Lt. David Hansen, USMC

A Tangled Maypole Dance Ensues When Fijians Pull Parachutes Out of a Tree

Undamaged silks must be turned in. Straining at the lines, these men show little concern over snags. *Lava-lavas*, or loincloths, can be made from torn silks. Like giant butterflies, unsalvaged yellow parachutes festoon jungle growth. Even in base camp, weapons are worn or kept near by in the grass.



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Silently, Like Indians, They Glide in Single File

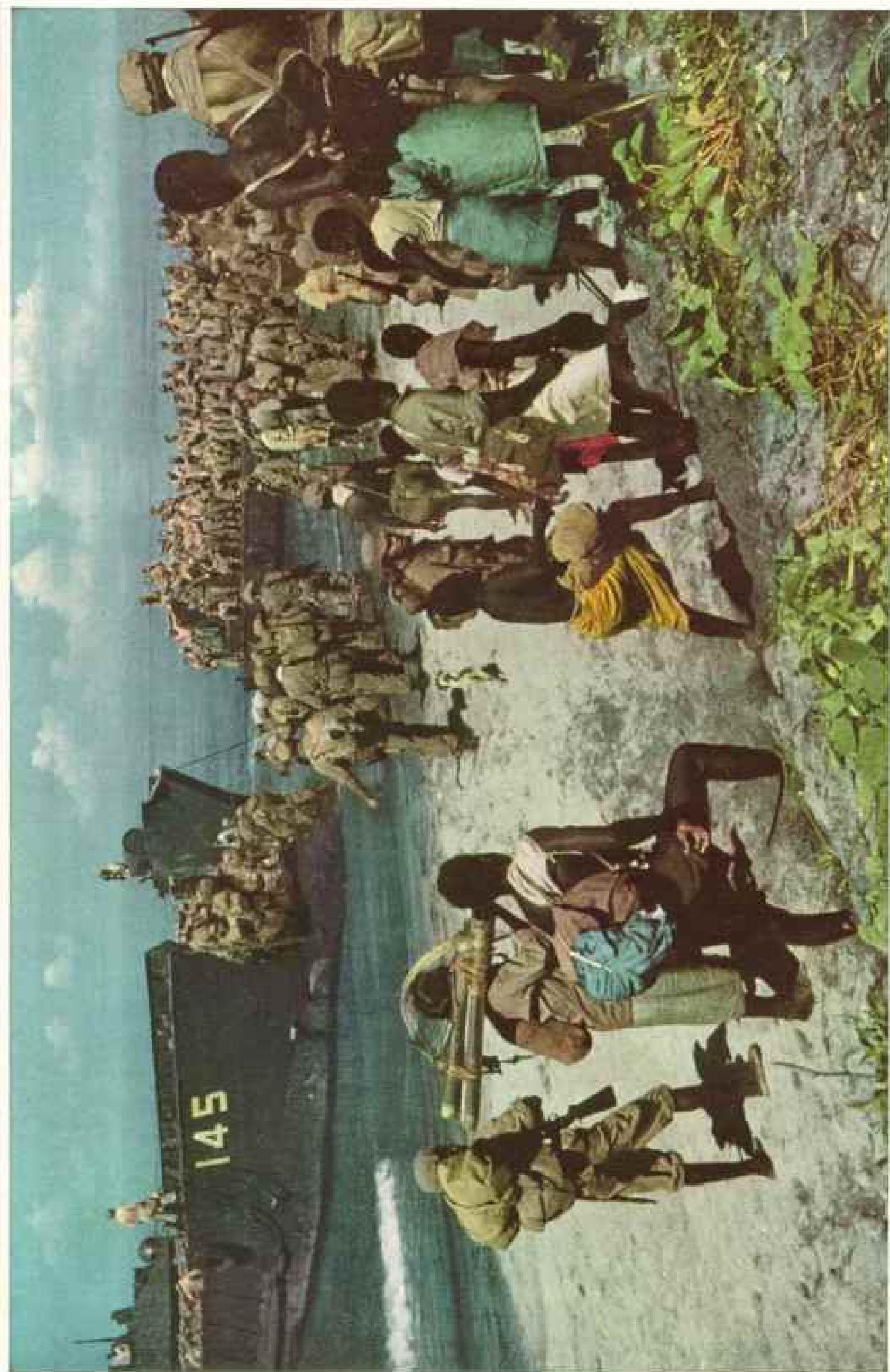
Stealth is their craft. In maneuvers, Fijians invaded other camps by moonlight and chalk-marked various objects—all without a sign of warning. Fluffy skirts, poor camouflage, show this area is safe.



Reproduction by Lt. David Bennett, USMC

In Scarlet Splendor, a Parachute Envelops Green Pants

In jungle camp, any odd costume combination is "regulation." To fit helmets, these Fijians have clipped the long fuzzy hair in which they took pride at home. A bearded New Zealand officer is in shorts (center).

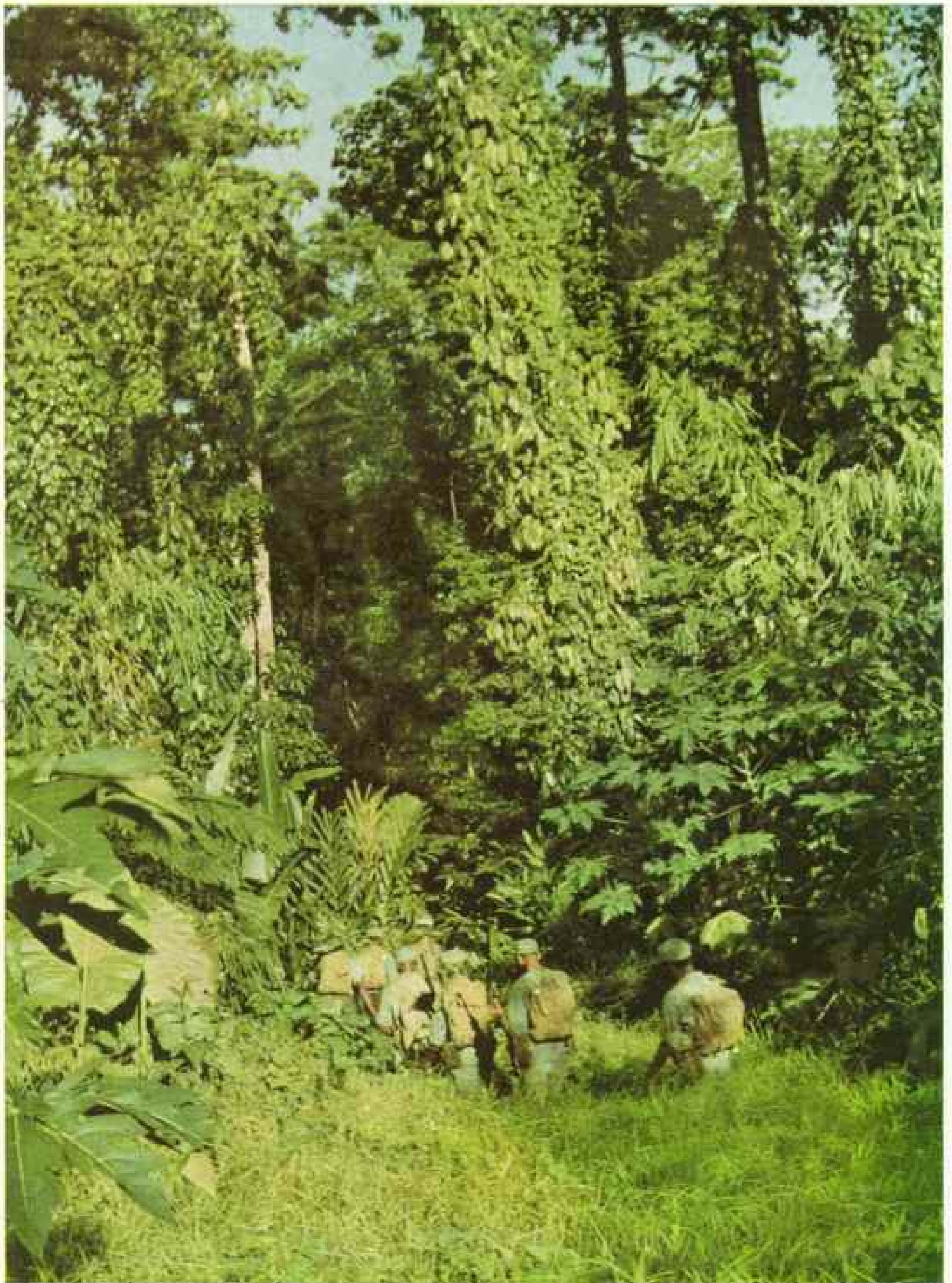


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Excerpted by Lt. David Dwyer, USMC

Ending a 60-day Foray into Enemy Territory, Fijians Board Landing Craft in Empress Augusta Bay for Swift Return to Base

Without losing a man, they killed 175 Japanese in one battle. From mid-island to coast they biked 5½ rainy days without food. With them, despite risk of death, went 150 islanders, including women and children (foreground). Their dog (center) followed the patrol across the island.



© National Geographic Society

Exhibition by Lt. David Duncan, USMC

As Dungle Green Dissolves into Jungle Green, the Fiji Patrol Vanishes

"At this time," writes Lieutenant Duncan, "600 Japs were 500 yards away on a parallel path. The world's finest junglemen, the Fijians did not lose a man in any Jap ambush in the interior." They alone among Bougainville troops avoided rash from poisonous plants. Here the troops begin to camouflage caps with ferns.

Our Global Ocean—Last and Vast Frontier

BY F. BARROWS COLTON

OCEAN, not land, covers nearly three-quarters of our earth.

To a man on Mars, watching the earth rotate through a powerful telescope, this would be obvious.

To a man in Kansas City, Novosibirsk, or Timbuktu, it may be a little hard to believe, since there's dry land all around him.

But dry land actually is in a poor minority. Even the continents are just big islands, jutting up out of the world-wide sea. There is ten times as much water by volume in the ocean as there is land above sea level. Dump all this land evenly into the sea, and water would cover the entire earth, one and one-half miles deep.

The ocean in many ways is the most important thing in the world. It provides water for rain, greatly influences winds and weather, and distributes the sun's heat from the Tropics toward the colder regions. Yet it is still largely a mystery, earth's last frontier, the greatest field for future exploration.

Today, global war has made the ocean even more important. Never before has it played so large a part in any war. Not only are we fighting on, under, and over the ocean, but we're extracting materials for weapons and supplies from its depths, and our Navy is using secrets uncovered by the lusty young science of oceanography.

Sea Water Helps Make Bombers

Bombers flying over the ocean are built partially of lightweight magnesium metal, extracted from sea water. The incendiary bombs they drop also contain magnesium. The gasoline they burn is given its antiknock quality by a compound of bromine, another sea-water product. Most of our petroleum, in fact, was formed at the bottom of the ocean long ago, chiefly from the dead bodies of innumerable tiny sea animals and plants (page 114).

Because many sailors and flyers in this war are forced to take to life rafts, Navy experts have made detailed studies of how winds, currents, and waves affect the drift of rafts.

They've gathered data, too, on the direction in which a raft will drift when it starts at any given point at sea. Thus, if flyers are forced down at a certain latitude and longitude, rescuers will know the most likely place to look for them (page 111).

For these castaways we've even found a way to make sea water drinkable by removing some of the salt with a chemical outfit carried on

life rafts. Drinking untreated sea water is fatal because it contains a higher percentage of salt than the human body can handle. To help get rid of it more water is drawn from the tissues, and the body becomes dehydrated.

The Importance of Seaweed

When Japan entered the war we lost our main source of agar, the dried extract of a special seaweed, which forms a jellylike substance used in scientific laboratories as a medium on which to grow bacteria. Agar is indispensable for such things as testing purity of water, milk, or food, or diagnosing nose, throat, and other diseases. When samples or "cultures" are tested, the "bugs" of many diseases can be recognized from the colonies they form on the agar.

After Pearl Harbor, agar was placed on a restricted list, and we had to set up facilities hurriedly to make it from our own seaweed.

You don't think of fish as making noises, but many do. They grunt, purr, drum, croak, and grind their teeth! Noise of a school of fish can confuse sailors listening with sound detectors for enemy submarines. So scientists have made recordings of fish noises, to teach sailors to distinguish a U-boat's propeller from a croaker's croak (page 107).

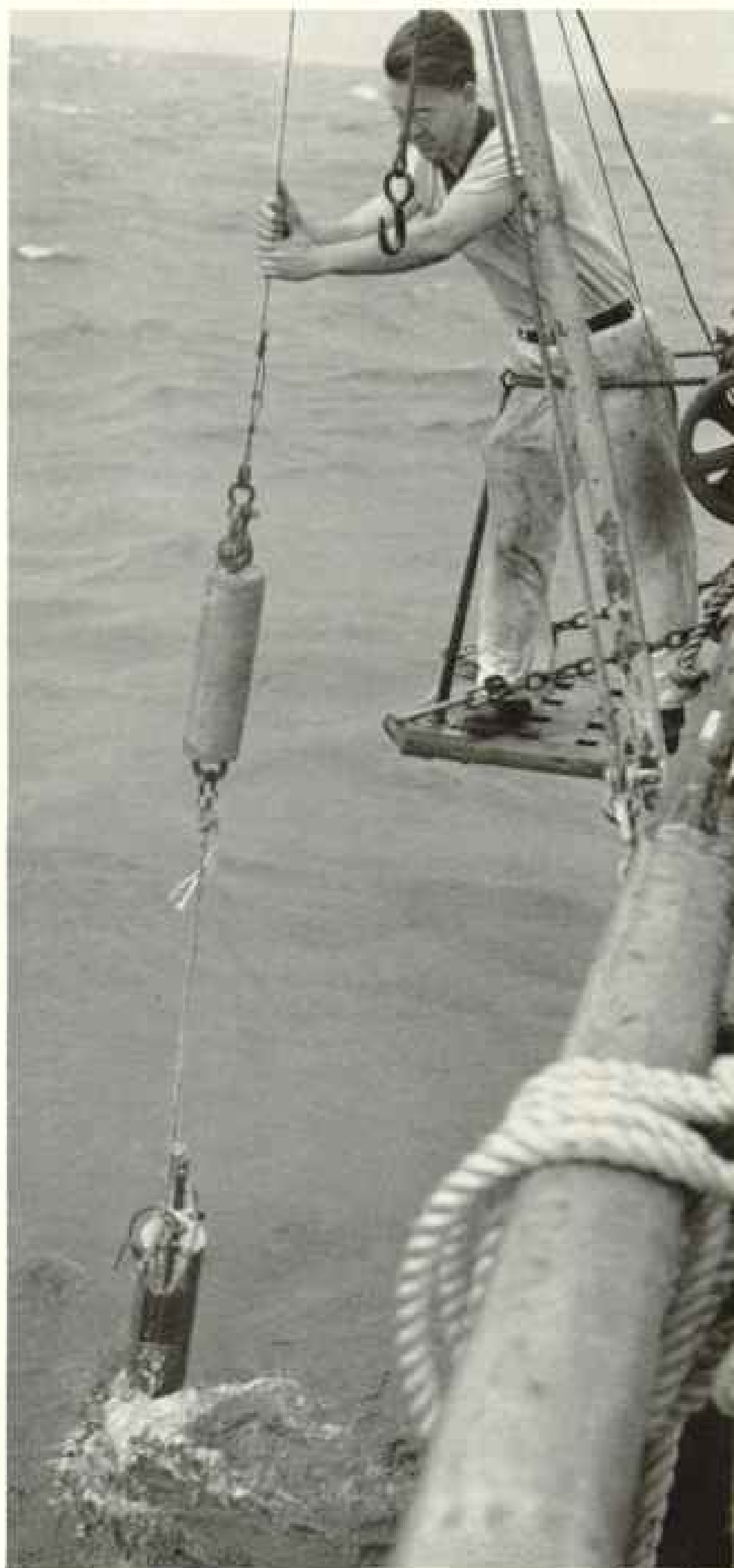
Sound detectors can be used more efficiently, too, if the operator knows the type of bottom below him, and how warm or cold or salty the water is. Such things affect the travel of sound through water. It echoes from a rocky bottom, for example, and tends to be absorbed by a muddy one.

Knowing the location of offshore fishing grounds is important in making surprise raids on enemy coasts. Fishing boats, which might give warning by radio, are more likely to be found where the fish are. A chance encounter with a Japanese fishing boat forced General Jimmy Doolittle to start his 1942 raid on Tokyo earlier than had been planned.

But wars are only pinpricks on the vast body and long history of the ocean. As Byron wrote:

*"Roll on, thou deep and dark blue ocean, roll!
Ten thousand fleets sweep over thee in vain;
Man marks the earth with ruin,—his control
Stops with the shore."*

What lies beyond, down in the great waters? In their depths exists a strange world, which man probably can never see, where gigantic forces are at work, governing earth's destiny. Beneath the sea are hidden secrets of the



Maurice Ewing

Down to Photograph Davy Jones's Locker

A submarine camera for making photographs of the ocean bottom, designed by Dr. Maurice Ewing, is lowered beneath a lead weight from the research ship *Atlantis*. Camera was tested on a cruise sponsored jointly by the National Geographic Society and Woods Hole Oceanographic Institution.

earth's past, and perhaps its future, that geologists would give almost anything to uncover.

Great areas of the undersea world still are entirely unexplored.

Groping and probing blindly in the depths with frail nets and tenuous sounding lines, explorers of the ocean have worked under heavy handicaps.

Often they have been seasick, cold, and wet. They've been bitten and poisoned by fish and jellyfish, and lost expensive instruments when wires or cables broke. They've watched fascinating new species of sea creatures brought up from the deeps, only to see many of them slip out of the nets at the last minute. Down through miles of water they've poked at random with scoops and dredges for small samples of the enormous ocean floor.

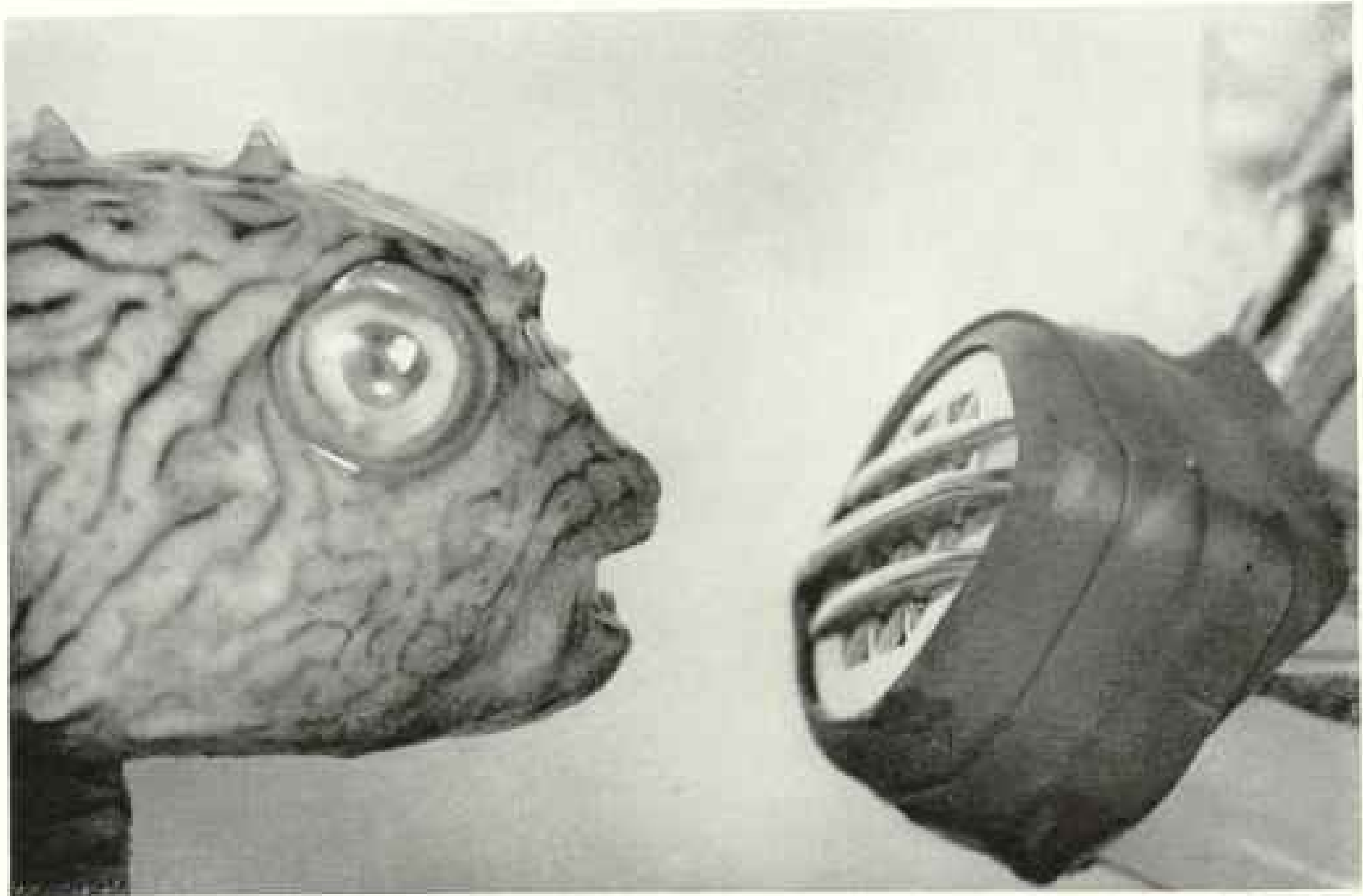
They've tagged several million fish, as people on land band birds, to trace their wanderings and check their growth. One halibut carried a tag 10 years (page 108).

They've hunted whales, as the Prince of Monaco did, to study the fragments of giant squids in their stomachs. Before the days of sonic sounding with its high-speed measurement of depth, they might spend hours paying out and reeling in a sounding line just to plumb the ocean at one deep place.*

From all this we're just beginning to understand the ocean, the mighty sweep of its currents, the cold, slimy ooze or clay on its dark bottom, the strange creatures that swim and drift in its waters, and its temperature and saltiness, which vary from place to place.

Intriguing mysteries still hang over "old ocean's gray and melancholy waste." How do

* See "Charting a World at War," by William H. Nicholas, NATIONAL GEOGRAPHIC MAGAZINE for November, 1944.



LIFE FROM THREE LIGHS

Fish "Talk" Is Recorded to Help Navy Men Distinguish It from U-boat Engines

A burfish comes close to the microphone to record its characteristic noise. Sounds made by many different fish have been placed on records. These are played as part of the training of men who will use submarine-detection devices so that they will not mistake fish noises for the hum of propellers (page 105).

fish find their way through the limitless depths with no landmarks to guide them? Why do many salmon return from the sea to the streams where they were born, to spawn, while eels do just the opposite, and migrate 3,000 miles from European rivers to the warm Sargasso Sea to lay their eggs? What is the "chemical sense" with which blind fish find their food?

Are there stranger creatures living in the sea than man has ever seen? What about the "lost Atlantis"?

Some ocean mysteries may never be solved unless we can get all the water out. The sun could do that by evaporation in 4,000 years, if we could prevent moisture from condensing and returning to the sea as rain.

The Seas Enter Your Daily Life

Whether you live inland or on the shore, the ocean enters your daily life. All the sugar you eat is filtered during manufacture through "diatomaceous earth," a close-packed mass of shells of tiny plants, or diatoms, that lived and died in ancient seas. It's used also in auto-body polish and furnace insulation (page 126). Your artificial pearls and your auto paint get their luster from essence of fish scales.

Baby chicks consume far more cod liver and other vitamin-rich fish oils than human babies. Millions of health-conscious Americans now swallow several tons of vitamin pills, capsules, and other preparations yearly, much of the contents of which comes from fish livers.

Ocean fish are rich in iodine, which helps to keep the thyroid gland functioning properly, preventing goiter. The Japanese, who eat more sea food per capita than any other people, almost never have goiter.

Here are a few ocean facts you may have wondered about:

Highest surface temperature of the sea ever measured was 96 degrees Fahrenheit, in the Persian Gulf.

Light penetrates no more than about 3,000 feet in the open ocean, and much less nearer shore, where the water is not so clear (p. 125).

When Ocean Water Was Fresh

Bright, clear blue is the ocean's true color. This is because the blue rays of sunlight penetrate deeper than other colors. Some of this light is scattered back upward to meet your eye, and appears blue because the other colors have been absorbed by the water. When the ocean appears green or some other color it is



Paul Pryor

Ocean Fish Are Tagged to See Where They Migrate and How Fast They Grow

A scientist from the Chesapeake Biological Laboratory, Solomons Island, Maryland, wires a small celluloid tag to the back of a hardhead. In the notebook he will record the number on the tag, when and where it was attached, and the fish's size and species (page 106). When a tagged fish is caught, the records reveal how far it has traveled and how much it has grown.

because of mud, sediment, or accumulations of small animal or vegetable life.

Look now at the ocean in its tremendous whole.

It contains more than 320 million cubic miles of water. Long ago when the young earth was a red-hot ball of molten rock, all this water hung as a cloud of steam in the air above, many geologists believe. When the earth cooled, the steam condensed and fell as rain to fill the ocean basins.

That ancient, brand-new ocean was all fresh water. Most of the salt and other chemicals in it have been washed down since then from the continents by rivers and rain.

If all the salt in the sea were removed it would make a pile larger than all of Africa above sea level. All the salt we use today, even that from mines and wells, came originally from the sea (page 125).

Saltiest of all seas is the Red Sea, while the shallow, landlocked Baltic, diluted by inflowing river waters, is only one-fourth as salty. Arctic sea water is less salty than tropical because evaporation is less, and melting sea ice dilutes it with fresh water. When sea water freezes, most of the salt is left out

of the ice. As polar explorers know, water from melted sea ice that has survived an Arctic summer is good to drink, because all salt has been leached out of it.

In each cubic mile of ocean, says the Dow Chemical Company, there are 175 million tons of chemicals, mostly in combinations of gold, silver, copper, iron, magnesium, potassium, aluminum, calcium, radium, chlorine, bromine, iodine, and sulphur, potentially worth five billion dollars.* To get one pound of bromine compound used for making gasoline "high-test" or "antiknock," you have to process 2,000 gallons of sea water.

In every ton of sea water there's half a milligram of gold, the Dow chemists estimate.

That makes 830 million tons of gold in all the seas, over 54,000 times what the U. S. Government now has stored in the vaults at Fort Knox, Kentucky, more than 700 pounds for every person on earth, worth \$929 trillion dollars at the current price of \$35 per ounce. (Other estimates of gold in the sea are larger and smaller.)

* See "Metal Sinews of Strength," by Frederick G. Voshough, NATIONAL GEOGRAPHIC MAGAZINE, April, 1942.



Staff Photographer E. Arthur Stewart

Model Shows How Caribbean Islands Rise Steeply from the Ocean Bottom

T. H. Whitcroft, U. S. Navy Hydrographic Office, sculptures relief map of Caribbean Sea area. Vertical scale is exaggerated four times, but horizontal scale and earth's curvature are true. Extending back from foreground is island chain of Puerto Rico, Hispaniola and part of Cuba. Just to right are the Bahamas.

In the Southern Hemisphere, below Africa, South America, and Australia, the ocean forms a continuous belt of water all the way around the earth, making an island of the Antarctic Continent, around which flows a current from west to east. From this globe-girdling ocean extend three main branches, the Atlantic, Pacific, and Indian Oceans, two of them connecting with the ice-covered Arctic Ocean. All are really part of one great global ocean.

Causes of Ocean Currents

Through all this immense sea there is a gigantic and unending slow mixing, stirring, and circulating of water. Without it the ocean could support far less life than it does now.

Cold water, like cold air, is heavier than warm. Near both Poles chilled water sinks downward and moves along the sea bottom back toward the Equator. Warm tropical water on the surface meanwhile moves from the Equator toward both Poles to replace the cold water that has sunk.

Water with a high percentage of salt also tends to sink and replace water that is less salty. Such rising and sinking of water is one cause of ocean currents. The movement is along a gentle slope, not vertical.

Most of the so-called currents are really parts of great eddies or whirls, thousands of miles across, which circle forever in the sea in the direction of the prevailing winds. Major eddies in the North Atlantic and Pacific circle clockwise because of the earth's rotation; those of the South Atlantic and Pacific go counterclockwise.

The great eddies of the North Atlantic and Pacific are given a westward push along their southern edges by the southwestward-blowing trade winds near the Equator, and a northeastward boost on their northern rims by the prevailing winds in those latitudes.* Similar winds push along the eddies of the South Atlantic and Pacific.

The Gulf Stream, flowing northeastward off the east coast of the United States, is really just a part of the main North Atlantic eddy. After crossing the North Atlantic, much of

* Ocean currents are shown on "The World Map," published as a supplement to the NATIONAL GEOGRAPHIC MAGAZINE for December, 1943. Copies of "The World Map," enlarged to 67½ x 43½ inches, may be obtained by writing the National Geographic Society, Washington 6, D. C. Prices, in U. S. and Possessions, \$2 each; Index, 25¢. Outside of U. S. and Possessions, \$2.25; Index, 50¢. All remittances payable in U. S. funds. Postage prepaid.



Hillem Leventik

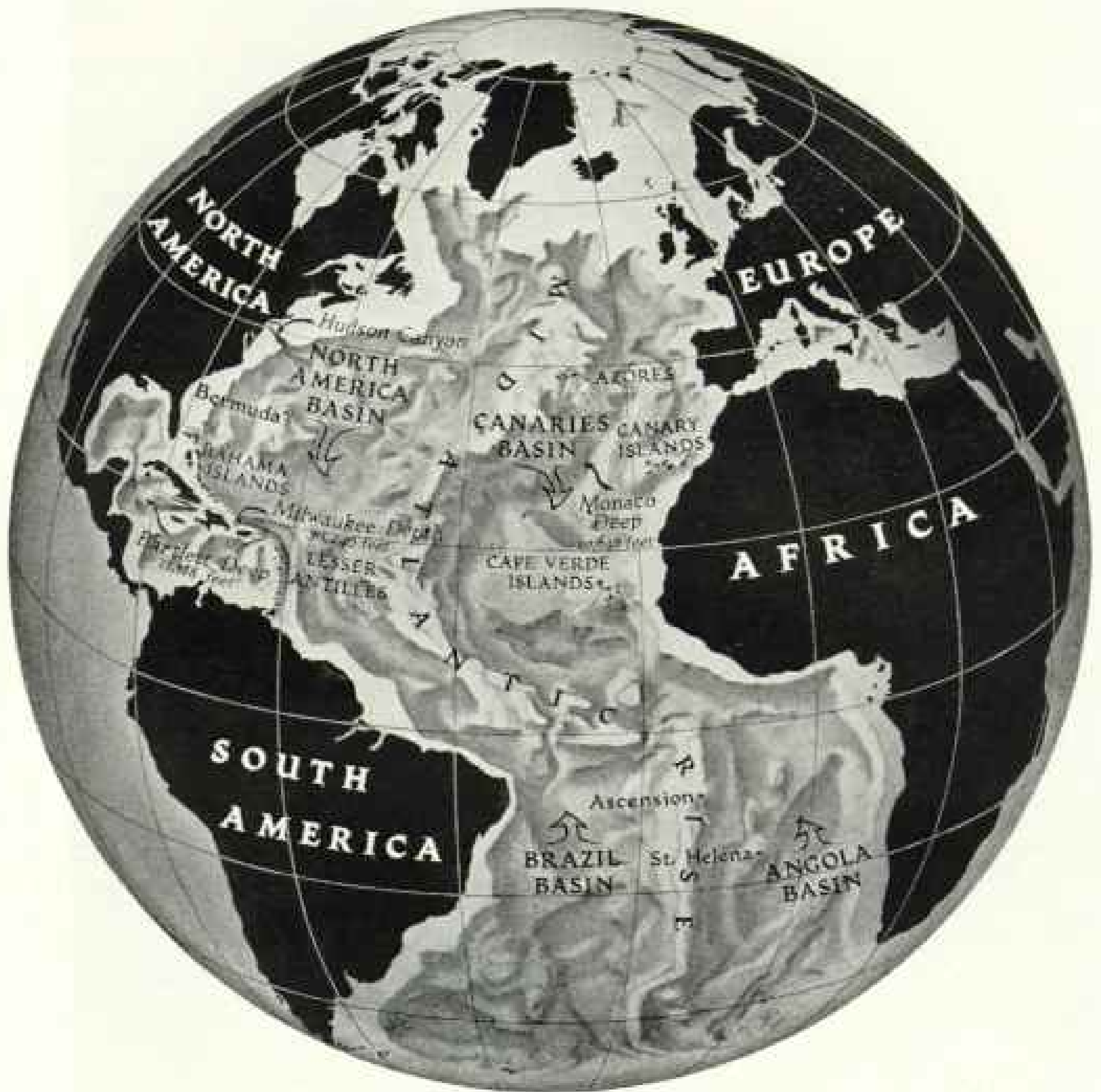
"Old Ocean's Gray and Melancholy Waste," Still Largely Unexplored Beneath the Surface, Covers Nearly Three-quarters of the Earth



U. S. Navy, Official

"Alone, Alone, All, All Alone, Alone on a Wide, Wide Sea." Flyers on a Rubber Raft Adrift in the Vast Pacific

A mere dot on the lonely expanse of water, the raft calls to mind the line in Coleridge's "Rime of the Ancient Mariner." Photograph was made by a Navy plane which rescued the men after a raid on Rabaul, New Britain. Study of ocean currents and how rafts drift is helping the Navy find such castaways (page 105).



Drawn by Irwin Alliman.

If Atlantic Ocean Were Drained, a Huge Submarine Mountain Range Would Appear

This diagram shows approximately how the bottom of the Atlantic would look if water were removed. Vertical scale is greatly exaggerated to bring out heights and depths. Mid-Atlantic Rise, running down through center, is one of the longest mountain systems known on earth. Deeply submerged for the most part, it rises above the surface to form the Azores and Ascension Island. It is flanked by four great depressions, the North America, Canaries, Brazil, and Angola Basins. West of the Canaries is the Monaco Deep, 20,646 feet, and in the Caribbean region are the Bartlett Deep, 27,788 feet, and Milwaukee Depth, 30,246 feet (page 122). Note shallow shelves around edges of the continents.

this Gulf Stream water curves around and flows south again in the Canaries (Southeast Drift) Current of the eastern Atlantic off Europe, then back westward in the North Equatorial Current to its starting point.*

The Gulf Stream flows out of the Gulf of Mexico, but actually it does not "start" anywhere, since it is part of the continuous North Atlantic eddy. Energy of the Gulf Stream comes largely from the trade winds, blowing from east to west near the Equator. They pile

up warm tropical water in the Gulf of Mexico until the sea level there is higher than outside.

This piled-up water has to go somewhere, so it flows out through the Straits of Florida in a tremendous stream, 14 cubic miles per hour,

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Grandest and Most Mighty Terrestrial Phenomenon: The Gulf Stream," by Rear Adm. John Elliott Pillsbury, August, 1917; "Devil-Fishing in the Gulf Stream," by John Oliver La Gorce, June, 1919, and "Interesting Citizens of the Gulf Stream," by Dr. John T. Nichols, January, 1921.

500 times the hourly discharge of the Mississippi River in flood. Off Florida it is joined by the Antilles Current moving up past the West Indies.

Flowing north off the American coast, the Gulf Stream is gradually diverted to the right and off Cape Hatteras it begins to turn eastward. Off the Grand Banks of Newfoundland it meets the cold waters of the Labrador Current flowing down from the Arctic.

The Gulf Stream's "Cold Wall"

Where these currents meet, there's a boundary between warm and cold water, often sharply defined. Once the Coast Guard cutter *Tampa* stood across this so-called "cold wall" and took the temperature of the sea. At her bow it was 54 degrees F., at her stern, 56 degrees F., a difference of 22 degrees in only 200 feet.

From here on, the Gulf Stream breaks up into various branches, called the North Atlantic Drift; it grows cooler and moves more slowly. Some of its water turns off to the south and continues the circle around the North Atlantic eddy. The rest moves on to the British Isles, the Norwegian coast, and eventually reaches the Arctic Ocean.

When the Gulf Stream leaves the Straits of Florida it is about 15 miles wide, from a quarter to a half mile deep, and moving about four miles an hour. It gradually grows wider and deeper, but slows down, and opposite Bermuda is from 30 to 45 miles wide.

Only a little of the Gulf Stream is warm water, contrary to what people used to think. Warm water forms a sort of trough on the surface, only 100 feet deep in the center and less on the sides. The rest of the stream, which extends down to about 2,500 feet, is comparatively cold.

Weather on the United States' east coast is affected very little by the Gulf Stream, and that still would be true even if we diverted it closer inshore. This is because the prevailing winds in winter are mostly offshore and blow the Gulf Stream's warmth away from us.

Most people believe that the warmth of the Gulf Stream is what gives such a mild climate to the British Isles and northern Europe, but scientists nowadays are not so sure. Much of the heat, many think, may be brought by winds blowing over the warm Sargasso Sea, in the center of the North Atlantic eddy.

This Sargasso water would drift farther north when the Gulf Stream flow was weak, and would be pushed back south by a stronger Gulf Stream flow. So, northern Europe's warmest weather really may come when the

Gulf Stream is weak. If verified, this fact may help long-range weather forecasting.

Sargasso's "Fields" of Floating Seaweed

The Sargasso Sea covers an area of two and a half million square miles, about five-sixths the size of continental United States. Scattered all through it are vast quantities of floating seaweed. Legend says that the Sargasso Sea is a graveyard of ships, where hulks of Spanish galleons, proud frigates, and rusting steamers, caught in the weed, slowly decay. There are from five to 20 million tons of weed floating in the Sargasso Sea, but actually it is nowhere thick enough to hinder the progress of any ship.

The floating weed, known as sargassum, or gulfweed, starts its growth on the sea bottom in shallow places around islands, is torn loose by storm waves, and currents eventually bring it to the center of the North Atlantic eddy. There it floats, supported by small gas bladders, and continues to grow without roots, drawing nourishment from the water. The weed multiplies by breaking into fragments that grow separately. Some of the floating plants grow in this way for decades.

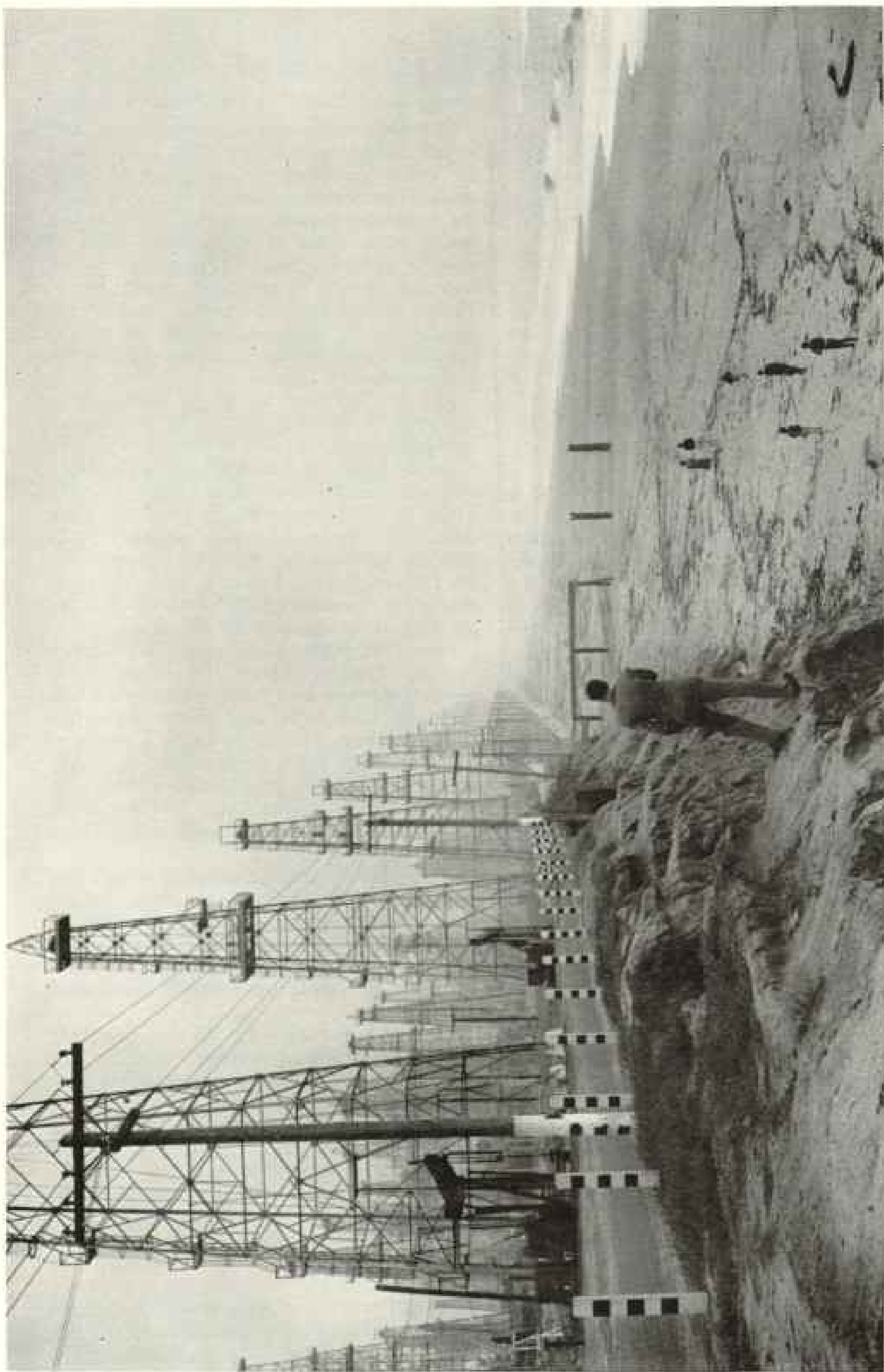
Glass net floats used by Japanese fishermen and wrecked Chinese junks found on the North American west coast helped prove that a current flows from west to east across the North Pacific. This is the Japan Current, or Stream, which later divides into the Kamchatka Current and the Northeast Drift Current, south of the Aleutians. It flows across and around the Pacific as part of the North Pacific eddy.

A piece of floating ice on which were found equipment and documents from the ill-fated ship *Jeannette*, crushed in the ice in 1881 off the New Siberian Islands, took three years to drift through the Arctic Ocean to southwestern Greenland and showed how currents move in that region.

In the South Pacific the Humboldt, or Peru Current, is the most famous, bringing cold water from the Antarctic up along the west coast of South America.

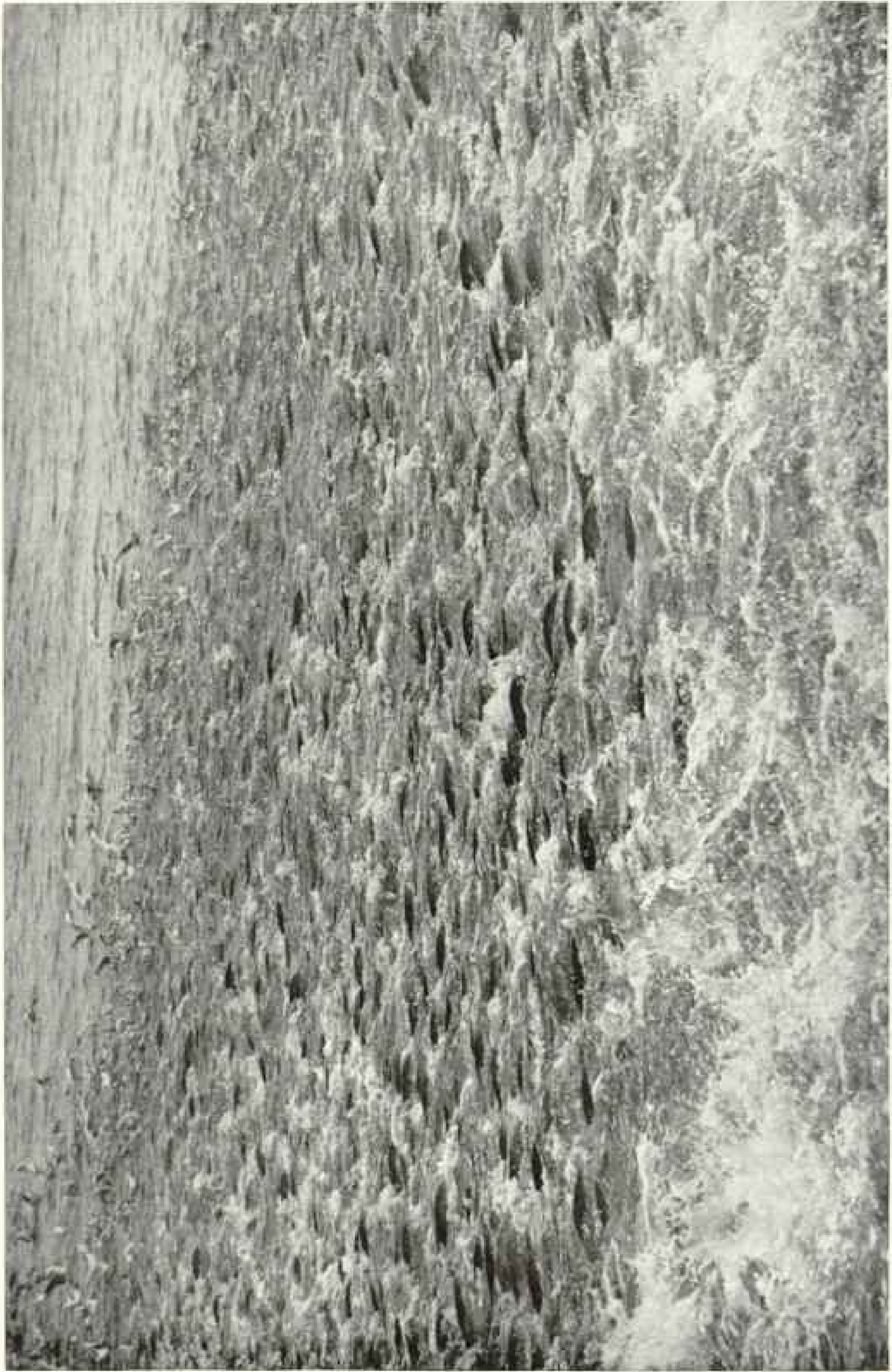
Bottles used to trace currents are weighted with sand so they will not project above water, for otherwise their course is influenced by the wind as well as by the current. The U. S. Navy Hydrographic Office issues official "bottle papers" on which a mariner marks the date and position where he threw the bottle overboard.

On the paper is a printed request in eight languages, including Esperanto, asking the finder to record the time and place of recovery and forward it to authorities. Bottles



Prof. Photographer H. Aubrey Stewart

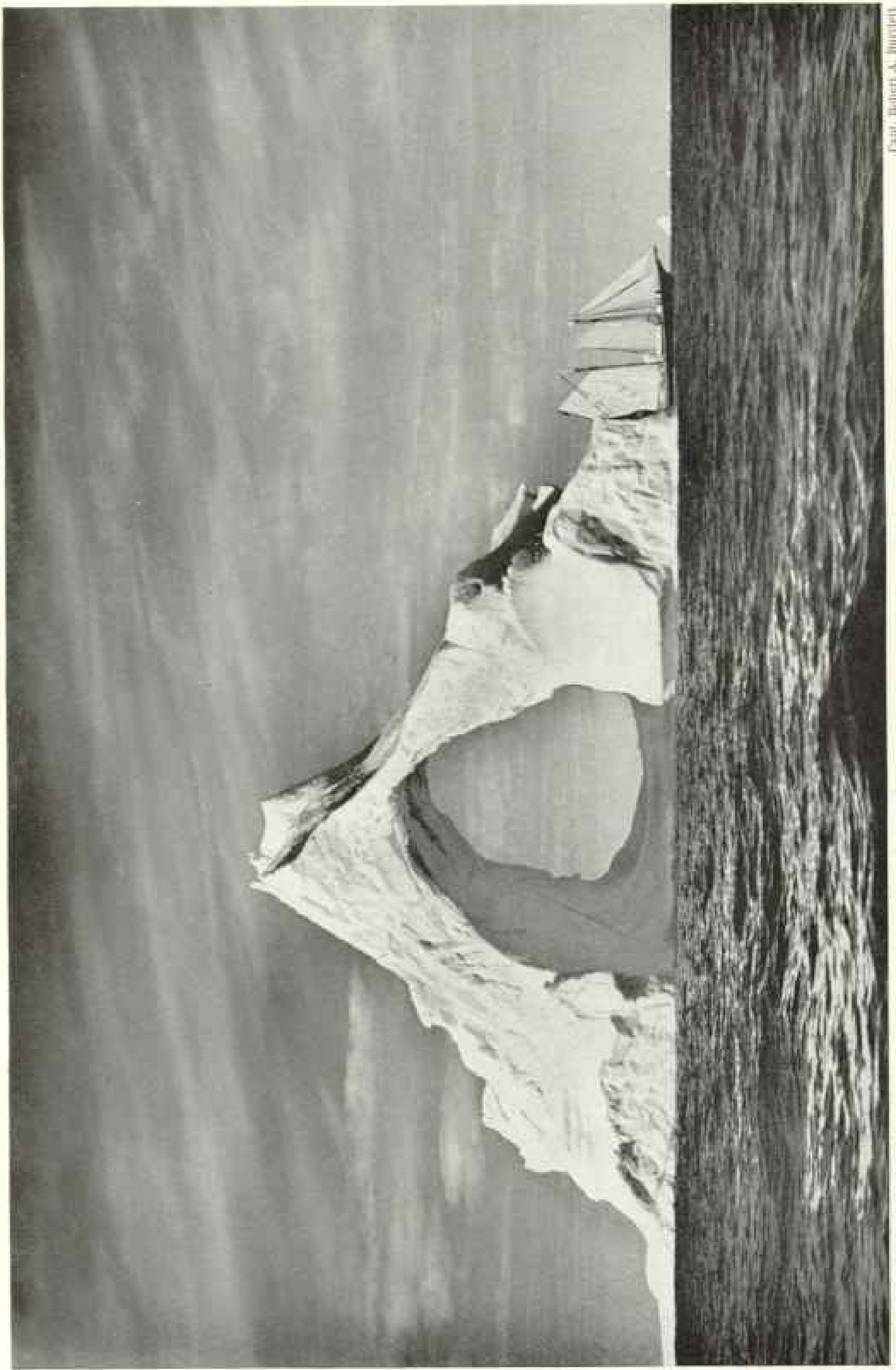
New Oil Is Believed Forming Slowly under California Ocean Waters Even as Old Oil Laid Down in Ancient Seas Is Pumped Out
Derricks on Huntington Beach, near Long Beach, extract petroleum from wells drilled out, under the sea. Most of our petroleum was formed from countless dead bodies of tiny sea animals and plants gradually deposited on the bottoms of prehistoric oceans (page 123). The process continues today.



Keystone View Company

Swimming Closely Packed in New Zealand Waters, a Teeming School of Fish Attracts Flocks of Sea Gulls

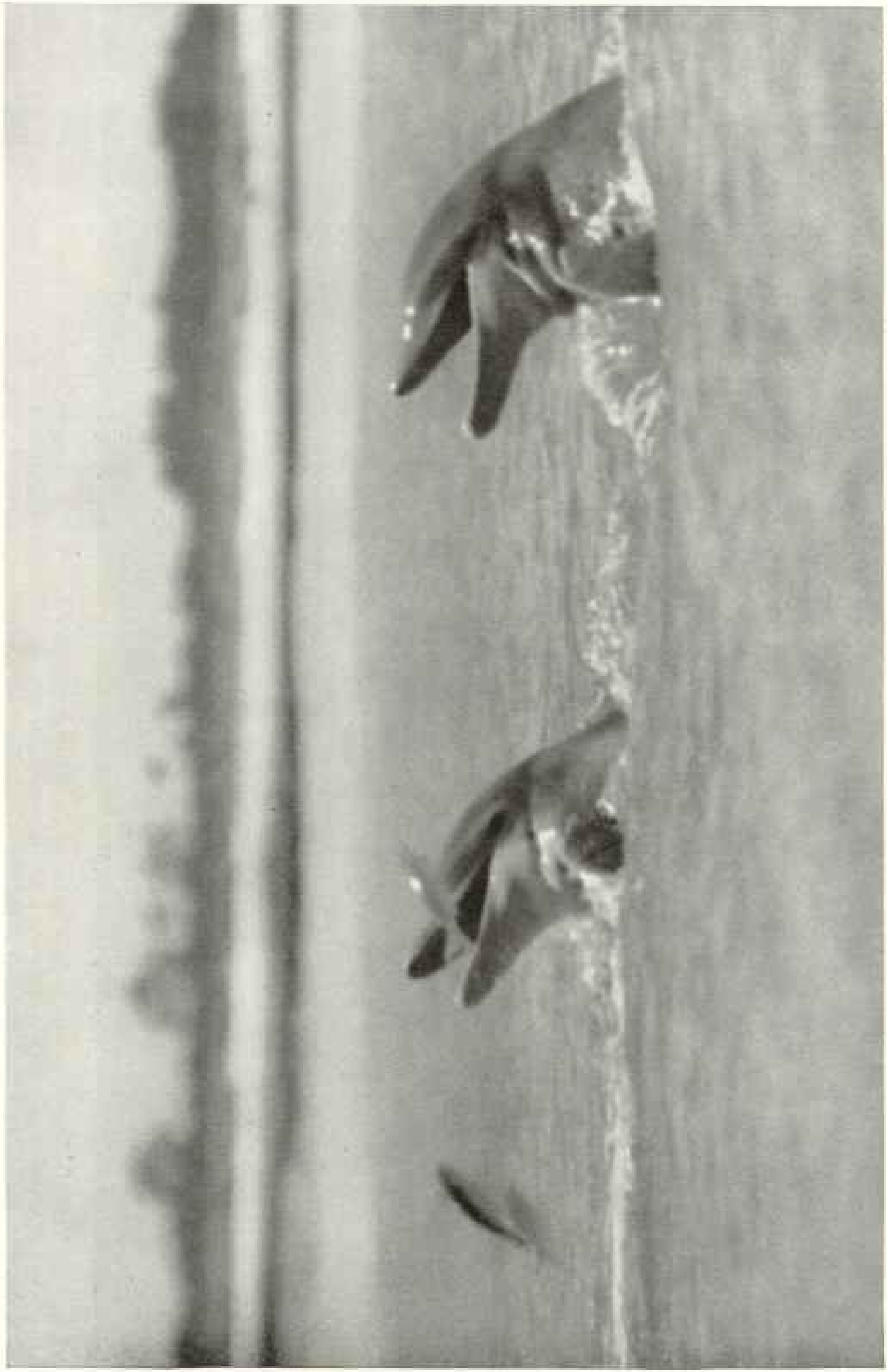
These are known locally as *Achamoi*, related to the mappers. Life in the sea is prolific but precarious. In 1881 an influx of cold water off the Atlantic coast of the United States killed myriads of tilefish, whose floating bodies covered an estimated 7,000 square miles of ocean.



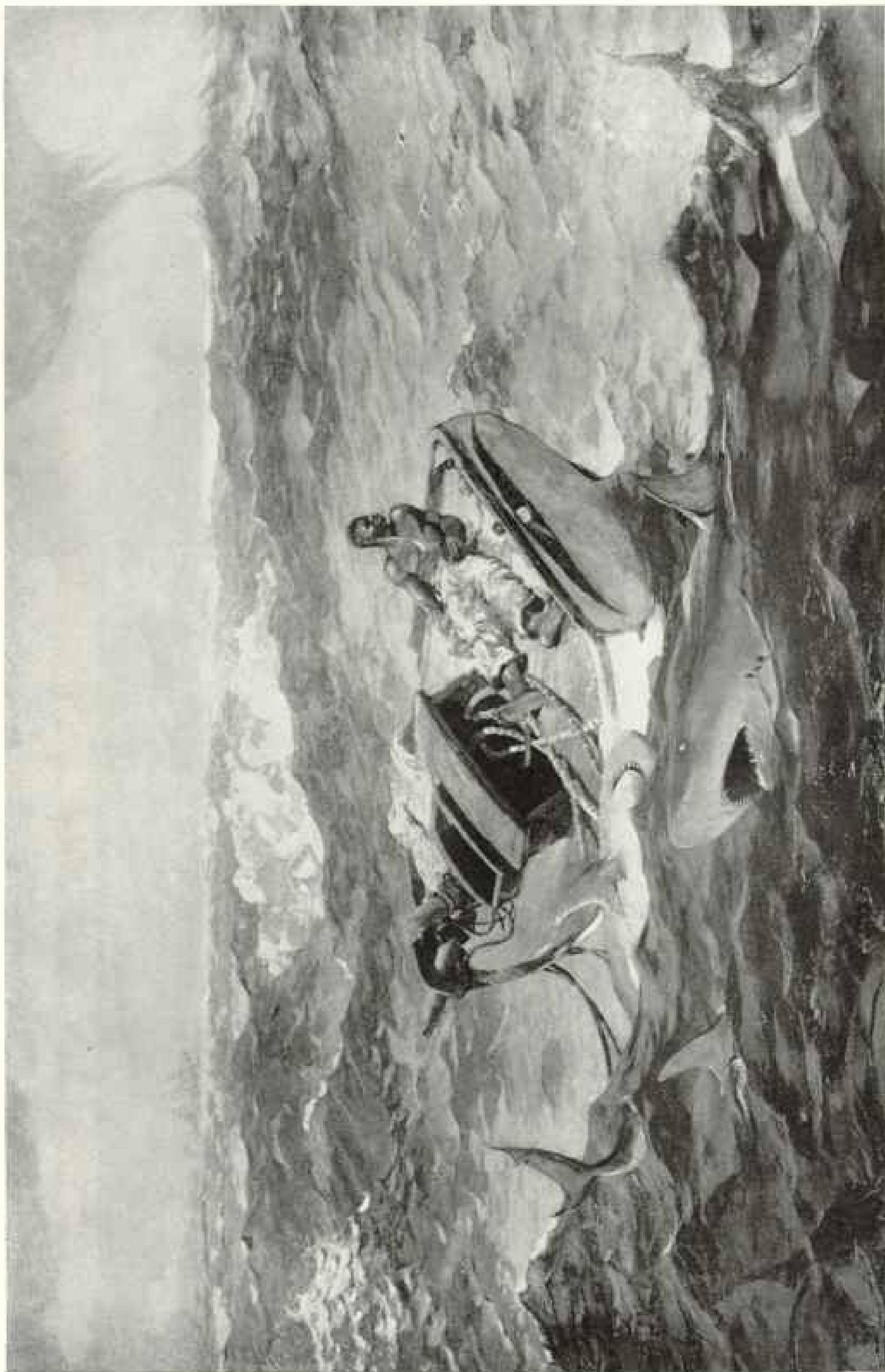
Capt. Robert A. Bartlett

Beauty and Terror of the Deep Are Combined in a Giant Iceberg Resembling the Rainbow Natural Bridge

This great floating arch of ice, photographed near Upernivik, Greenland, suggests the famous rock formation in Utah. Its base is estimated to cover some three acres. (Gravel carried out to sea in prehistoric times has been found in ocean-bottom deposits (page 123).)



Bottlenose Dolphins Seem to Laugh with Glee as They Snap Up Mullet Leaping Out of the Water near St. Augustine, Florida
Dolphins are air-breathing mammals, not fish. They pursue the mullet in shallow water near shore and dexterously catch the frantic prey as it jumps into the air. Dolphins and porpoises belong to the same family as whales, which also are mammals.



Metropolitan Museum of Art

Terrible Loneliness and Grim Cruelty of the Sea Are Depicted in Winslow Homer's Painting, "The Gulf Stream"

Contrasting sharply with the background of beauty in water and sky, a Neutró castaway drifts helpless and alone in his dismantled sloop, followed by hungry sharks. Hopelessness of his plight is emphasized by the ship passing in the distance too far away to see him. A waterspout swirls over the sea in the background.



Latvian from Berlin Railway

"Dat Ole Davil, Sea" Slams a Mountainous Wave Clear Across the Deck of a Tanker Laboring through an Atlantic Gale

Although ships take heavy punishment from storm waves, reports of the heights of waves often are exaggerated. When a ship is riding down the back of one wave at a steep angle, the face of the next one ahead looks twice its actual height. A 60-mile wind raises waves about 30 feet in height from trough to crest (page 120).



N. Y. Herald Tribune

A Freak of Nature Marked This Fish with the "Japanese Flag"

The 15-pound flounder, caught off Cape May, New Jersey, is one of the flatfishes famous for their "migrating eye." When very young, they swim upright and have an eye on each side of the head. But they soon begin to swim on one side, and the eye on the downward side migrates around to the upper. Here the bottom of the fish is shown; both eyes are on the other side.

have drifted up to 15,000 miles, taking as long as six years.

The Workings of a Wave

Winds not only drive ocean currents, but they kick up waves. Did you ever wonder how waves work? As you watch them racing toward shore, the water itself seems to be moving, but only the wave *form* really moves.

Each particle of water in a wave travels in a circular path like a wheel, forward on the top of each wave, downward on the back of it, backward in the trough and up again on the face of the next wave. It always stays within that circular path. Toss a cork into wave-

swept water, and you will see it follow that same movement.

How high are the biggest waves? In a "whole gale" of 60 miles per hour waves reach about 30 feet in height. Reports of "mountainous seas" are only estimates. When a small ship is in the trough between waves, the oncoming crest of a 30-foot wave looks much higher than that. Also, when a ship is riding down the back slope of one wave, the next one looks twice as high as it actually is.

A wave breaking across a ship, however, will sometimes throw water over points 60 feet above the water line (page 119).

All through the great ocean, and down to its very bottom, the mighty surge of the tides is felt. The moon exerts a gravitational pull on the earth, and the ocean, being fluid, flows in response to the pull (page 122). It's easier to understand the tides if you think of the earth as entirely covered by water. Here is what would happen if that were true:

On the side of the earth toward the moon, the water would be drawn around the curve of the globe toward a point under the moon and piled up there in a slight bulge. On the earth's opposite side, the water also would pile up, because the moon "pulls the earth away from the water" a little, and more water would flow there to compensate. High tide would be where the two bulges of water were.

As the earth turned, different places would come under the bulges, and in this way high tide would move from place to place. Between the high-tide bulges, where the water has been drawn away a little, would be low tides. No one particle of water, of course, moves far in the tides.

This is a highly simplified picture of how the tides would operate if the ocean covered the whole earth. Actual flow of the tides is made so complicated by the interference of the continents that it is too involved and technical to explain here.

Because the moon revolves around the earth once in every 24 hours and 50 minutes, the tide at any one place comes 50 minutes later each day on the average.

The sun also causes tides, but not so much as the moon, because it is so much farther away from the earth that its gravitational pull is less. When the sun and moon are in line, either on the same side of the earth or on opposite sides, their combined pulls cause the greatest tides, known as the "spring" tides; from the Anglo-Saxon word *springan*, to bound, or leap. At such times, high tides are highest and low tides lowest.

When the sun and moon are at right angles to each other, in the moon's first and third quarters, the tide rises and falls the least, and this is called "neap" tide, believed to be from the Anglo-Saxon *neþ*, meaning scanty.

Tidal Waves and Mythical Shoals

"Tidal waves," so called, are not caused by tides. They are created by storm winds pushing water up on the shore, or by submarine earthquakes and volcanic eruptions. Many a nonexistent shoal and reef was marked erroneously on old charts because of an earthquake or eruption under the sea. Vibrations traveling up through the water would strike the bottom of a ship with a severe shock, as though she had struck something.

But despite the disturbances of waves and tides, the sea is theoretically level when at rest, and all measurements of height on land start from "sea level," which is not supposed to vary. This sea level is only a "mean" or average, however, for sea level really *does* vary.

Winds may pile up water several feet higher in one place than another. Where atmospheric pressure is high, the weight of air presses down on the ocean and displaces the water, so that it piles up as much as a foot higher in some other location where pressure is less. When an air mass of high pressure moves over the Gulf of Mexico it causes enough displacement of water to speed up the outward flow of the Gulf Stream.

Under the middle of the Atlantic Ocean, from Iceland almost to Antarctica, runs a practically continuous submarine ridge, averaging about a mile under the surface (p. 112).

In the Pacific a submarine ridge runs from Central America to Antarctica, averaging about a mile and a half under water. Still

another, really a series of short ridges, including many islands above the surface, extends from Japan to the Antarctic. Another submerged mountain chain extends from India to Antarctica.

Was that middle Atlantic ridge formerly above water, perhaps the site of the Atlantis which, according to Plato's story, sank nearly 12,000 years ago? It may once have been above water, but scientists doubt that it sank any time within recorded history, or in the cataclysmic fashion that Plato describes, "with great earthquakes and inundations, in a single day and one fatal night." Most geologists see no foundation for the Atlantis legend.

Islands Sink, and Reappear

But islands do sink, and even reappear, as did the volcanic isle of Bogoslof in the Aleutians. And there's the tantalizing mystery of Los Jardines in the western Pacific.

In the early 1500's Spanish explorers reported two islands between latitudes 21° and 22° North and in longitude 153° East, which they named Los Buenos Jardines. About 250 years later the islands were reported again near 21° 40' North and 151° 35' East (900 miles west of Wake Island).

In 1933 the U. S. S. *Ramapo* explored the locality with her sonic depth finder. She found no islands, but, almost on the spot where they were supposed to have been, her soundings revealed a submarine mountain comparable in size to Mount Hood, Oregon, over a mile beneath the surface.

Was this a coincidence? Did Los Jardines sink? Or did the earlier explorers err in their navigation and really see Marcus Island, 200 miles northeastward, or one of the Marianas, over 400 miles to the southwest?*

Along the continental slopes, where many soundings have been taken, the bottom of the sea is as hilly and uneven as the surface of the land. Farther out, where the ocean attains an average depth of about two miles, the bottom is believed to be mostly flat or slightly rolling, unchanged for countless thousands of years (page 109).

But we really know little about the oceanic abyss.

Even today, in the open ocean off steamer routes, soundings average far less than one in 100 square miles. Imagine trying to form an accurate picture of the topography of the United States by measuring the height of one point at random in each county, and taking

* See "Map of Southeast Asia and Pacific Islands, from the Indies and the Philippines to the Solomons," supplement to the NATIONAL GEOGRAPHIC MAGAZINE, October, 1944.



Mount Evering

How the Moon Makes the Tides Ebb and Flow Is Recorded at Seaside Stations

All over the world a close check is kept on how the tides are running, as an aid to ships entering and leaving harbors. This tide gauge at St. George, Bermuda, has a float inside the vertical pipe, protected from the pounding of the waves. Tidal rise and fall are recorded in galvanized-iron shelter above.

a handful of earth or rock from equally scattered locations! Yet we've had to base our knowledge of the deeper parts of the ocean bottom on far more meager information.

Greatest Known Ocean Depths

Greatest known depth in the ocean is 35,400 feet (6.7 miles), in the Mindanao Deep off the Philippines. Mount Everest, world's highest mountain, would be more than a mile under water if submerged there.

Other great deeps are: Bartlett Deep, south of Cuba, 22,788 feet (4.3 miles); Wharton Deep, just south of Java, 22,968 feet (4.4 miles); Richards Deep, off Chile, 25,050 feet (4.7 miles); Milwaukee Depth, north of Hispaniola, 30,246 feet (5.7 miles); Nero Deep, southeast of Guam, 31,614 feet (6 miles); and Ramapo Deep, off Japan, 34,626 feet (6.6 miles).

Conditions down on the hidden ocean bottom are hard to imagine. There live creatures

which never in all their lives are as warm as a cake of ice. Because salt water freezes at a lower temperature than fresh, water in the ocean depths stays liquid even where its temperature is below 32° F., the freezing point of fresh water. Sea-bottom mud dredged up in the Tropics by the British scientific ship *Challenger* was so cold that the officers chilled their champagne in it.

Everything that sinks in the sea sinks all the way to the bottom, contrary to the old belief that ships, dead bodies, and other things "find their level" at various depths and remain suspended there. Despite the great pressures, up to six or seven tons to the square inch, nearly 1,000 times that on the ocean surface, any solid object, or anything into which water can penetrate, such as the body of an animal, is not greatly changed by sinking to the bottom. But closed glass thermometer tubes, even when protected by metal cases, have been crushed to powder.

Small, delicate creatures swim and crawl without discomfort on the bottom under these great pressures because the pressure of fluids within their bodies balances that on the outside. But when deep-sea fish are brought up to the surface in warm regions, the increased heat causes expansion of the gases in their body liquids, and this may bulge their entrails out through their mouths and even explode their bodies.

Sediments and oozes gradually have been spread over the ocean bottom, deposited through uncounted eons of time. Near shore, off the mouths of large rivers, they accumulate at the rate of several yards per year, while out in the open ocean less than half an inch is deposited in 1,000 years.

Red clay and globigerina ooze cover the largest proportion of the ocean floor, the latter named for the tiny sea animal of whose limy shells it is chiefly composed. Diatom ooze, composed of the flinty-hard silica shells of microscopic ocean plants, each smaller than a grain of sand, forms great belts around the Antarctic and across the North Pacific.

Radium Dates Deep Ocean History

Hidden in the sediments, especially in the deeper parts of the sea, are large amounts of radium and other radioactive substances.

Radium continuously gives off heat, and so represents an enormous store of energy, which may have influenced the earth's past history. Radium also disintegrates at a regular rate of speed (it diminishes by half every 1,600 years), a fact which accurately measures the age of the stratum in which it is found.

Knowing how much material remains from the disintegration of the radium, and how long it took to accumulate, you can tell how long ago the process of disintegration began. That is the time when the sediment was deposited. It's like an hourglass, through which sand runs at the rate of one ounce per minute. If there are 20 ounces of sand in the bottom, you know it began to run through 20 minutes ago.

Seeking to learn more about ocean sediments, one scientist invented a deep-sea "cannon" which is lowered to the sea bottom on a cable and fires a hollow metal tube down into the ooze. Others have driven tubes down into the ooze with heavy weights. Hauled to the surface, the tubes bring up "cores" of bottom material ten or more feet long.

Such cores represent cross sections of the bottom covering thousands of years of slow accumulation of sediments. Ten feet of sediment from the deeper parts of the ocean may tell as much about the earth's past as 10,000 feet of deposits on land.

In the cores, at various levels, were found particles of magnetized minerals. Like tiny compass needles frozen in place while pointing in the direction of the earth's magnetic force as it was at that place and time, they show how the earth's magnetic field has varied through past ages.

Layers of volcanic ash, and of sand and pebbles carried out to sea by floating ice, found in cores from the bottom of the North Atlantic, tell of ancient volcanic eruptions and ice ages. In the cores, too, at various levels, are fossil remains of small sea animals, exactly like some which live today in warmer waters and others in colder seas. They reveal how the climate must have fluctuated in that region, and that surface water in that part of the Atlantic once was warmer than now.

In the dim past, too, on the ocean bottom, began the process that formed much of the oil that lubricates our modern machine world. Materials that may produce future oil supplies are forming under the sea today, off California, Chile, Peru, and in the Gulf of Guinea, though experts disagree as to whether the process is fast enough to keep up with our huge consumption of petroleum (page 114). Study of the process may help us find new oil fields.

Where Petroleum Production Begins

The process that eventually produces petroleum begins in depressions in the ocean bottom, where there is little circulation of water.

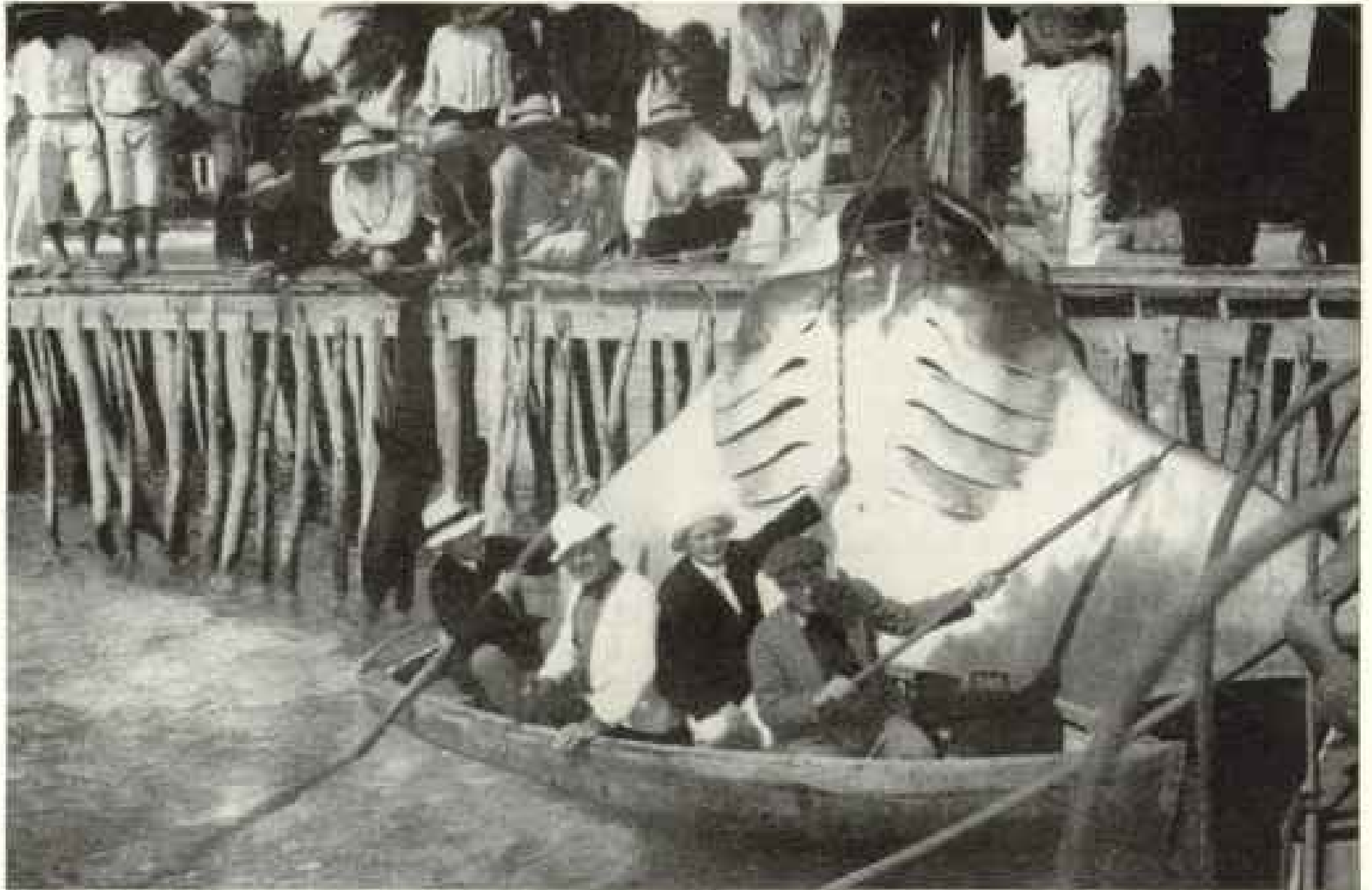
There the countless dead bodies of the plankton—small sea plants and animals—collect, and are preserved in sediments. Gradually then, by a means still not fully understood, they turn into petroleum in anywhere from 100,000 to 10,000,000 years.

Flashing continuously all through the dark depths of the sea are countless lights, produced by the luminescent, or phosphorescent organs of sea animals.

What is luminescence? (Scientists prefer this word to phosphorescence, for there's no phosphorus in the process.) It is cold light, produced with almost no heat, like that of fireflies. A chemical reaction takes place in the creature's body, in which proteins unite with oxygen and form light. Nature in some cases even provides filters of different colors, red, yellow, green, and blue.

Luminous fish use their lights to attract prey or the opposite sex, to frighten enemies, and to see while hunting food.* There are even luminous fish diseases.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, articles on deep-sea fish by William Beebe, in the issues for June, 1931, January and December, 1932, and December, 1934.



Carl G. Fisher

This Devilfish, or Giant Ray, When Harpooned Towed Six Men in a 25-foot Motorboat Several Miles

Captured in the Gulf Stream near Bimini, the monster weighed more than 3,000 pounds. The span of its swimming "wings," or pectoral fins, measured 22 feet from tip to tip, its length from head to tail, 17 feet. Hornlike head fins, from whence comes its non-technical name, sweep small fishes into its yard-wide mouth. Vents in the belly are gill openings. The prize was mounted for scientific study.

Below where sunlight penetrates are found blind fish which have lost the use of their eyes, but farther down, near bottom, where it's just as dark, you again find fish with eyes, often large ones. Some of the large-eyed creatures have lights of their own, but some do not. Do the luminous animals give enough light for the others to see by in the perpetual night of the sea bottom? Nobody knows.

"You can dip a net in the sea today and be almost certain of catching some new animal previously unknown to science, even though thousands of species of sea creatures already are known," Prof. Columbus Iselin, director of Woods Hole Oceanographic Institution, in Massachusetts, told me.

Sea Creatures of Fantastic Forms

Life in the sea takes on amazing and fantastic forms. Some creatures in the middle depths have small gas-filled bladders to keep them from sinking below the level where Nature intended them to live. But if they swim too high up, where pressure is less, the gas in the bladders expands and they literally "fall upward," carried relentlessly to the surface by this suddenly increased buoyancy.

One fish, captured in December, 1938, in the waters off East London, South Africa, is a genuine "living fossil" thought to have been extinct for over 50 million years until found alive in today's ocean.

What about sea serpents? Finding of the "living fossil," dating back to the Mesozoic Age, reopened that question.

"The discovery makes it at least possible that there may be other primitive creatures, believed long since extinct, lurking unsuspected in the depths of the ocean. It is more than likely that there is a real 'sea serpent,'" says Dr. J. L. B. Smith of Rhodes University College, South Africa, first to describe the living fossil.

But most scientists are conservative.

"No fisherman or whaler ever told me he had seen a sea serpent," said Dr. Henry B. Bigelow, veteran oceanographer and zoologist of Harvard University. "Several of the supposed 'sea serpents' that have been stranded have proved to be basking sharks."

The basking shark grows to a length of 45 feet and spends much time lying on the surface with its back visible above water. Someone occasionally may see a giant squid on



Harford Times, Conning

Salt from the Waters of the Gulf of Aden Goes to Season the Food of Africa

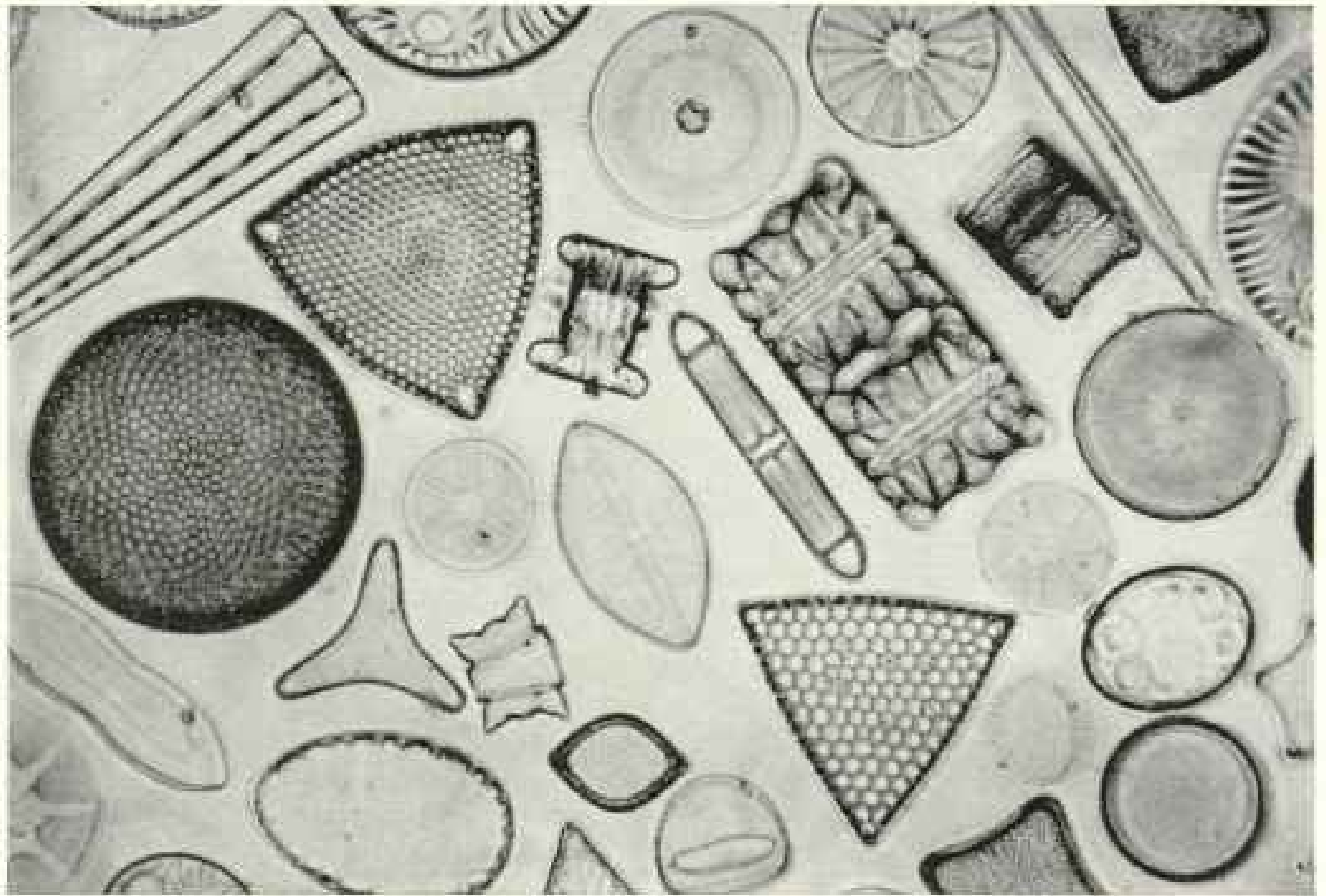
Barges are loaded with salt by a continuous conveyor at Aden, in southwest Arabia, for export. The salt is obtained by evaporating sea water. Salt has been a staple commodity of trade since earliest times. Each 1,000 pounds of sea water contains on the average 27 pounds of salt dissolved in it (page 108).



Roy Walker, Minter

Sunlight Filtering Down into a Submarine Coral Forest Gives a Ghostly Effect

Brightly colored fishes dart in and out. Light bright enough for taking such photographs penetrates only a short distance into the ocean depths. Below 3,000 feet there is Stygian darkness.



Magnified 225 diameters.

W. Fyfe's Mural

Diatoms, Which Form the Floating "Pastures" of the Sea, Assume Jewellike Forms

Too small to be seen with the unaided eye, diatoms are tiny plants which live and grow near the ocean's surface and furnish the food of fish larvae and microscopic sea animals (pages 123, 127, 128). Here organic parts have been removed and only the "skeletons" of the plants, composed of silica absorbed from the sea water, remain. So numerous are the tiny floating plants in the sea that their total weight has been estimated to be more than that of all vegetation on land.

the surface, or several dolphins or porpoises swimming and leaping one behind the other so that they look like the continuous coils of some serpentlike animal.

Even tide rips have been mistaken for sea serpents. But a book has been written to prove there *is* a sea serpent; it describes many reports of a huge-bodied, long-necked creature, somewhat resembling the supposedly extinct plesiosaurus.

Most nightmarish of known sea monsters is the giant squid, whose body may be up to 20 feet long, with eyes as big as dinner plates. It may measure 55 feet over-all, including its tentacles. It is the largest animal without a backbone.*

Much of the Ocean Is "Desert"

Are there still bigger squid, true monsters of the deep? Perhaps, for there are giants among other fish. Cod, for example, average about 10 pounds in weight, but the largest on record weighed over 200 pounds. Teeth of extinct sharks five inches in length have been dredged up from the sea bottom. Their owners may have been 100 feet long.

Life exists all through the ocean, yet it is not teeming with fish everywhere as many people believe. Most of the ocean, in fact, is almost a desert, where living things are sparse and have a hard struggle to survive.

Only in some shallow waters on the continental shelves and in some of the great ocean currents, where food is plentiful, do fish swarm by the millions and billions, providing easy food for man. One year on Georges Bank alone, scientists estimated there were 300 to 350 million haddock of marketable size, more than two and a half times the inhabitants of continental United States.

But though life in the sea is lavish, death also lurks everywhere (pages 115, 117). One female codfish lays about 4 million eggs a year, yet only a very few live long. We know this must be so, for the population of cod does not increase. Perhaps it's just as well. If all the little cod lived to maturity and kept on reproducing, the oceans eventually would be jammed full of cod!

* See "Marauders of the Sea," by Roy Waldo Miner, NATIONAL GEOGRAPHIC MAGAZINE, August, 1935.



William Beebe

Would-be Explorers of the Ocean Depths Were Lampooned in This Old Caricature

"Going Down in a Diving Machine," drawn by the famous English artist, George Cruikshank, pokes fun at early efforts to explore under sea. Diving bells have been used successfully in underwater engineering. The bottom is open and water is kept from rising inside by air pressure.

Age of many fish, incidentally, can be told from rings on their scales or in their ear bones, like the annual growth rings of trees. Some halibut live to be 25 or 30 years old.

Nearly all life in the ocean depends on the plankton. That is the name for the countless billions of extremely small plants and animals living and drifting in the sea.* They are so small and sometimes so thick that German scientists once estimated there were 6,336,000 individuals in one quart of water from the bay at Kiel. Eggs and larvae of fish, crabs, oysters, and other creatures also form part of the plankton.

The vegetable plankton, or phytoplankton, called diatoms when they have silica shells, make up vast floating "pastures" in the sea, so rich that occasionally the innumerable tiny plants color the ocean green, red, or brown for miles. Red plankton give the Red Sea its name (page 126).

The sea pastures exist only in a narrow layer on and just below the surface, for sea plants, like land plants, must have sunlight to grow, and sunlight penetrates strongly enough for this purpose only a short distance down into the sea.

Great masses of vegetable plankton some-

times are washed up on beaches. Once, in the State of Washington, such a mass was continuous for 20 miles, four to six inches deep, and must have weighed thousands of tons. Altogether, the vegetable plankton probably weigh more than all the vegetation on land.

Plankton Graze on Sea Pastures

Grazing on the sea pastures are the animal plankton, or zooplankton, mostly copepods, little shrimplike creatures, many so small you can see them only with a microscope. One copepod may eat 120,000 diatoms.

Bigger fish and even some whales eat the plankton—both animal and vegetable. Over 60,000 copepods have been found in one herring's stomach! Still bigger fish in turn eat the little fish, and so on up the chain, just as cattle eat grass and men eat cattle.

So numerous are the animal plankton that scientists once estimated there were 80 to 100 billion copepods per square mile in the west Baltic Sea, and that in the 16 square miles of one fishery district there were enough copepods to feed 534 million herring.

* See "Living Jewels of the Sea," by William Crowder, NATIONAL GEOGRAPHIC MAGAZINE for September, 1927.

Scientists at Yale University told me they had made and eaten plankton soup. "It wasn't bad," they said, "but rather fishy and full of grit from the microscopic little shells which many plankton have, like too much sand in your spinach. Some of those shells are of silica, extracted from sea water and hard as glass. They probably wouldn't be good for anyone to eat in large quantities."

"Plankton is rich in food value," Dr. George L. Clarke told me at the Woods Hole Oceanographic Institution. "A sample of animal plankton that we caught contained 59 percent protein, 20 percent carbohydrates, 7 percent fat when dried."

"But to live on plankton, a man would have to gather so much, and the supply is so uncertain that, all in all, it's better to let the fish eat the plankton and then we eat the fish!"

Ocean pastures, like those on land, must be kept fertile, and most of the fertilizer comes from the water below a depth of about one mile. When anything dies in the ocean it sinks. Most of what is not eaten by other creatures is dissolved in the water on the way down, or is devoured by bacteria on the bottom. Through this process the deep water grows rich in phosphates, nitrates, and other chemicals. This fertilizer is brought to the surface by upwelling currents, or by the stirring action of waves.

Some nutriment, too, is washed down to the sea by rivers. Rotted vegetation, transported by streams in the interior of North America and carried down the mighty Mackenzie River to the Arctic Ocean, is borne eastward and then south by the Labrador Current to the Grand Banks off Newfoundland. There it nourishes vegetable plankton which are eaten by animal plankton, which are eaten by mackerel or cod, which perhaps next Friday you in turn will eat.

"Fertilizer of the Sea"

Thus the "fertilizer of the sea" is the key to all its life. Only where it is brought up from the ocean depths or washed down by rivers can the sea pastures flourish, and only there can large numbers of fish exist.

Sea fertilizer is most plentiful in cool and shallow northern waters, where winds and storms "plow the sea," bringing up a constant supply from below the surface. Therefore most of the world's great commercial fisheries are in limited areas where such conditions prevail, as off the coasts of New England, California and Canada, in the North Sea and the Baltic, around Norway, and in the seas off Iceland and northern Japan.

But even in the rich areas where plankton

thrives, life is precarious. Many sea creatures, both plants and animals, are delicately adjusted to living in water of a certain small range of temperature or salinity. A slight shift in ocean currents, bringing water that is saltier, warmer, or colder, may mean death to billions. Countless fish eggs, laid in warm water, may be swept off to colder seas and die before they have a chance to hatch.

"How much more food could we get from the sea if we fished it to the limit? Could we feed the entire human race from the ocean?" I asked experts.

"We could get perhaps twice as much sea food as now, with proper management and use of fish now thrown away," was the answer. "You couldn't come anywhere near feeding the world with ocean fish, however. There aren't enough fish, and the fish supply is limited by the amount of food the ocean produces."

Changes in the supply of fish depend mostly on how many young fish live to grow up each year. With huge trawl nets dragged along the bottom many fishermen scoop up all sizes and kinds of fish, large and small, wanted and unwanted. Some species are feared to be declining because so many young fish are caught that fewer and fewer of them grow up each year to lay eggs.

Government scientists urge that trawl nets be used with meshes large enough for the young fish to escape, and that small fish not be allowed to be sold.

Such control of the fish supply is probably the nearest we can come to "farming" the sea, for you can't fence in a school of fish as you can a herd of cows. Nor can we fertilize the sea as we could a field, to raise more plankton and hence more fish.

Rich Harvest of Seaweed

But we're already "farming" the sea in another way which offers greater promise. Off the coasts of Maine and California enormous masses of seaweed stalks up to 100 feet long are being harvested, from which we extract algin salts for use in camouflage paints, waterproofing, and coating for electric wiring.

Will the world's expanding population force us eventually to use all possible food from the ocean, as once was predicted by a League of Nations committee? Will more dry land areas disappear gradually under the sea, like the Hudson Canyon and the regions now covered by the North Sea and English Channel? Will some of the ocean's secrets remain forever hidden beneath the great waters?

In the words of Ecclesiastes: "That which is far off, and exceeding deep, who can find it out?"

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ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded fifty-six years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 a. c. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 13, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

The National Geographic Society-U. S. Navy Expedition camped on desert Canton Island in mid-Pacific and successfully photographed and observed the solar eclipse of 1937. The Society has taken part in many projects to increase knowledge of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted \$25,000, and in addition \$75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

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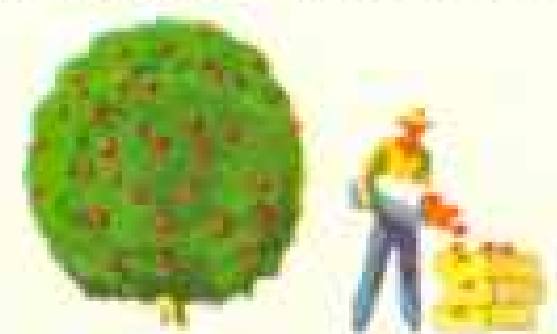


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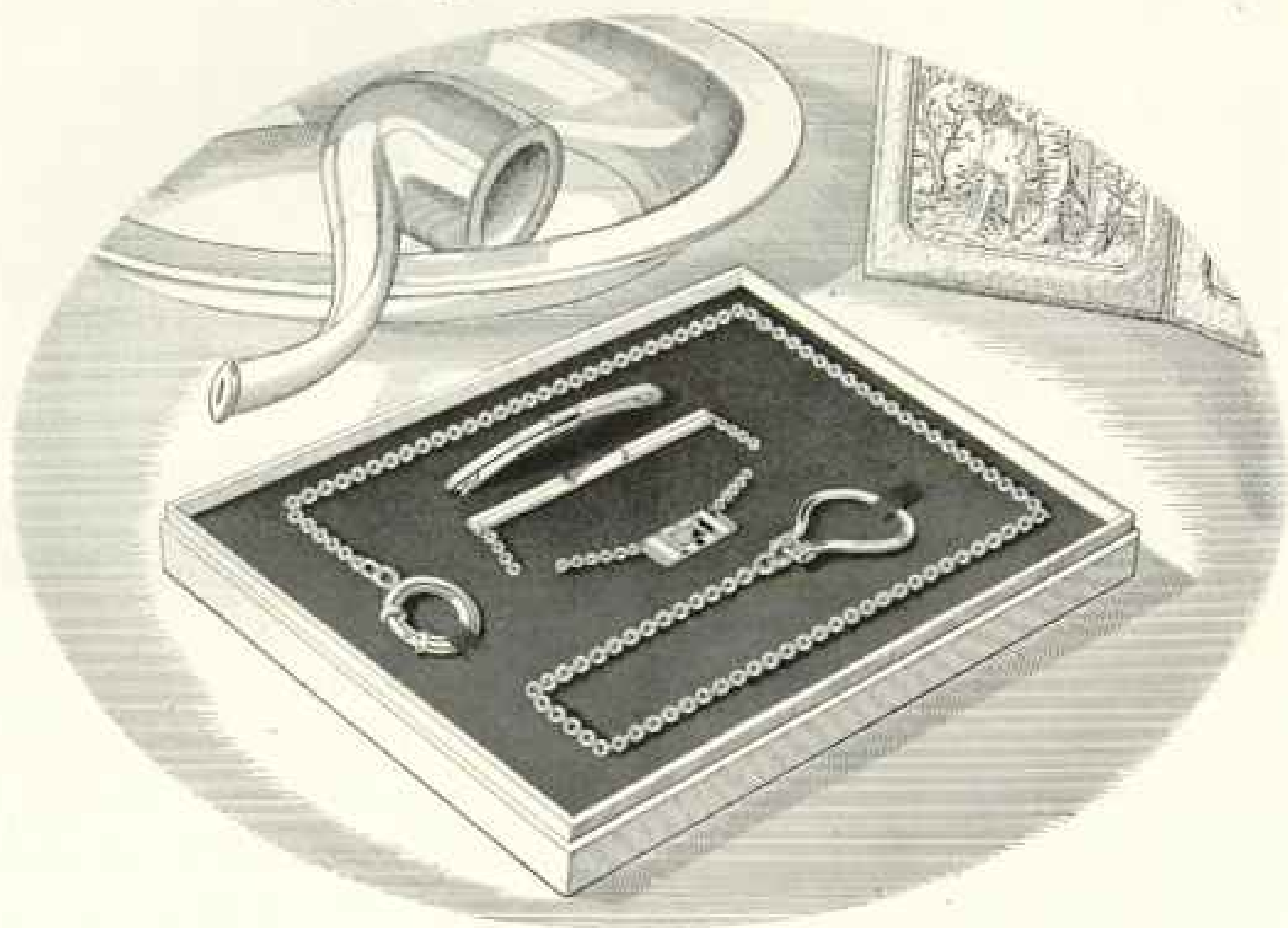
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 CHICAGO 40, ILLINOIS



SHIPS..vital in War..vital in Peace

To the winning of the war, GRACE LINE has contributed its entire modern fleet, its officers, its crews, its management organization.

With Victory, the responsibilities of GRACE LINE will be far from finished. For out of this war must come an enduring peace, and our "SANTA" liners and freighters will have their share of the task which the American Merchant Marine must perform in the creation and maintenance of a peaceful world structure.

GRACE LINE will soon again be devoting its whole-hearted energies to developing trade, travel and understanding between the nations, through swifter, more efficient and more economical transportation service.



GRACE LINE

TO MANHATTAN SQUARE OR ROCKEFELLER CENTER, NEW YORK; WASHINGTON, D. C.; PITTSBURGH; CHICAGO; DETROIT; NEW ORLEANS; HOUSTON, TEXAS; SAN FRANCISCO; LOS ANGELES; SEATTLE; PORTLAND, ORE.



For You—The World's Clearest
Most Beautiful Radio Tone in Your
COMING NEW ZENITH
RADIONIC *FM* RADIO

Zenith's Specialization in
"RADIONICS EXCLUSIVELY"

will bring you Genuine FM at its finest in
radios and radio-phonographs!

GENUINE ZENITH Radionic FM is an utterly different kind of radio. It will bring into your home a tone unlike anything you've ever heard before.

It will open up to your ears an entirely new range of richness, and fullness, and color... entirely free from static noise at all times... so thrillingly real that you'll swear the performers in the studio or on records are right in the room with you!

FM's development is an important part of RADIONICS, the vast new science in which many discoveries are so sensational they cannot yet be disclosed to the public.

Zenith, world's leading specialists in "RADIONICS EXCLUSIVELY," will bring you *genuine* FM, not an imitation. And it will be *Zenith Radionic FM*, born of the world's longest, broadest, most intensive experience in the field of HIGH FREQUENCY!

You see, Zenith pioneered this field. Zenith has been developing Short Wave, FM and Television since their very birth!

Among the world's first and finest FM stations, for example, is the transmitter created and operated by Zenith in Chicago. And Zenith has never scattered its energies over unrelated fields such as refrigerators, washing machines, cooking ranges, vacuum cleaners. They have specialists of their own. *Zenith concentrates* its leadership in engineering and precision manufacture on "RADIONICS — AND ONLY RADIONICS!"

This is the big reason why you will enjoy the world's clearest, most beautiful radio tone in the coming new *Zenith Radionic FM* Radios and Radio-Phonographs... the reason they will combine advanced engineering and precision quality at low cost, as never combined before!

The day radios are again available for your home, it will pay you to be smart — to put *your* money on a winner. Keep your eye on Zenith for genuine FM at its finest — and see Zenith first!

Available now for America's hard-of-hearing — the famous new Zenith Radionic Hearing Aid. Only \$40 complete, at authorized Zenith Hearing Aid dispensers.

COPYRIGHT 1944, ZENITH RADIO CORP., CHICAGO, ILL.

Keep Your Eye on **ZENITH** for the Best in Radio!
LONG DISTANCE RADIO
RADIONIC PRODUCTS EXCLUSIVELY—
WORLD'S LEADING MANUFACTURER
RADIO · FM · TELEVISION · RADAR · SHORT WAVE · RADIO-
PHONOGRAPHS · HEARING AIDS

EYES ON TOMORROW

On drawing board and blueprint, in research laboratory and on testing machine you will find the shape of things-to-come in railroading.

We know the American public expects great things—new, modern trains; daring designs; exciting and novel innovations; new power; new speed; new riding qualities; new comforts

and luxuries; new services and ideas in travel, in shipping . . . in a word, transportation values beyond anything known or experienced before.

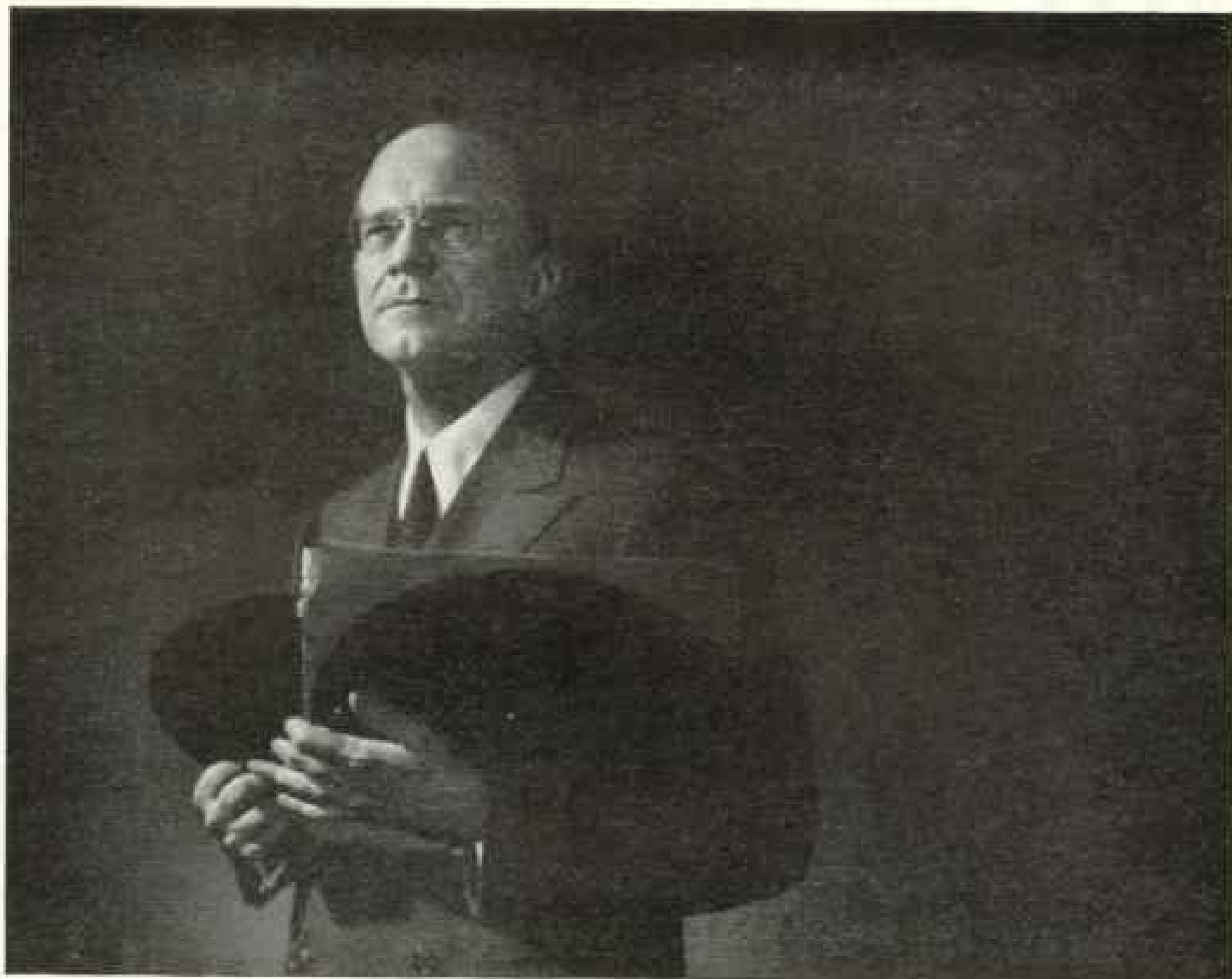
In its planning, the Pennsylvania Railroad has these things in mind—for it is a tradition of this railroad to look ahead, and apply its research to finding new ways to serve the traveling and shipping public better!

★ 49,917 entered the Armed Forces ✪ 453 have given their lives for their Country
BUY UNITED STATES WAR BONDS AND STAMPS

PENNSYLVANIA
RAILROAD

Serving the Nation





I stood...my arms filled with records no longer needed

By Deems Taylor

Here was a battered souvenir that dated back to the earliest days of disk recording. Another record had recently been re-made from one of the old cylinders . . . the original itself worn almost through the wax in many places. Others I chose because the compositions were notoriously hard to reproduce. Even the Meissner, I thought, will be lucky to get anything worth while out of *these* five . . .

And now I stood . . . my arms filled with records no longer needed. For the first few bars of the very first record had proved the truth of all those amazing things I had heard about Meissner reproduction. And, record by record, the evidence mounted. It was the most convincing tonal demonstration I had ever heard.

☆ ☆ ☆

Deems Taylor, distinguished composer, critic, and author, had just been listening to the only Meissner radio-phonograph in existence—the final laboratory model perfected just before war turned all of Meissner's skill and knowledge to

the manufacture of vital war supplies.

Luxurious counterparts of the Meissner, however, will bring postwar riches to all the lovers of artistic perfection who have long been irritated by the "missing elements" in much of today's recorded music. And you will join in welcoming such Meissner advantages as an Automatic Record Changer that provides two hours or more of music without your touching a record; plus Frequency Modulation, Super Shortwave and a connoisseur's choice of distinguished cabinets.

For tomorrow -
A NEW WORLD OF SOUND AT YOUR FINGER TIPS



MEISSNER
MANUFACTURING COMPANY • MT. CARMEL, ILL.
ADVANCED ELECTRONIC RESEARCH AND MANUFACTURE





"Falling Leaves" painted by Rudolf Wetteng

Home

In your mind's eye, this may be the spot that's yours, the place you return to, sanctuary and birth-place of dreams, where all is as you want it, be it ever so humble.

Perhaps among the things that make it distinctively yours, is the memory of the pleasant flavor, the welcome fragrance, of a Kaywoodie Pipe.

Many men have found the Kaywoodie flavor so satisfactory that they've made this their permanent choice among pipes.

Many Kaywoodies go direct to our fighting men — please be patient if your dealer temporarily can't supply you. Illustrated here is Meerschaum-Lined Kaywoodie "Square" Shape, No. 11C — \$12.50.

Kaywoodie Pipes are tempered with fine curing-agents, so that they deliver the mildest, coolest, most delicious smoke you ever enjoyed. They are cut from the real pre-war briar brought from the Mediterranean, from which the finest pipes have been made for 100 years.

It is a natural product. Like home, it grows slowly. You can't speed it up. We will keep right on making Kaywoodies of it, cutting them deftly and seasoning them well, so your Kaywoodie will always be your good companion and steadfast friend.





SQUEEZ-GRIP — *For Carbon Dioxide* *Meets Navy Standards*

Most people think of fire extinguishing equipment in the terms of fire departments, hose, water and chemicals. But to the modern-thinking executive it is the extinguishing equipment that will put out a fire the quickest and with the least damage to materials, property and production. The SQUEEZ-GRIP valve originated by C-O-TWO, meets specifications of the Navy Bureau of Ships. It is the most modern release for carbon dioxide portable extinguishers. Even an inexperienced person can operate the SQUEEZ-GRIP. No handwheel to turn; no need to set the extinguisher down. Nothing to do but squeeze the control lever over the carrying handle; aim the discharge horn at the fire; it is extinguished in split seconds—without damage to materials or equipment. SQUEEZ-GRIP Saves Time, Saves Gas, Saves Lives.

*C-O-TWO manufactures a complete line of Portables,
Hose units and Smoke Detecting systems.*



C-O-TWO FIRE EQUIPMENT COMPANY

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NEW JERSEY

Sole and Service in the Principal Cities of United States and Canada

AFFILIATED WITH FYZESS MANUFACTURING COMPANY



BUY WAR BONDS AND STAMPS

Miss Muffet knew her vitamins

REMEMBER? She was eating "curds and whey." That's cheese, of course.

Miss M. may have been timid about spiders, but she was a smart girl when it came to diet—for cheese is one of the world's very finest foods.

Like the milk from which it's made, cheese is especially rich in protein, calcium, phosphorus. In fact, on the average, a pound of cheese contains about as much of all these elements as three quarts of milk. Both cheese and milk are good sources of vitamins A and G.

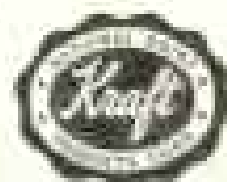
America has eaten much more cheese in recent years. That has helped the health of the nation and broadened the dairy farmer's market. And a good part of these gains can be credited to the research of National Dairy's Kraft Division.

Here, new cheeses have been produced and old ones improved . . . the pasteurization of cheese perfected . . . the purity and flavor of cheese protected by better packaging . . . hundreds of new cheese dishes created.

Besides these developments in cheese, many improvements in other dairy products have

come from the National Dairy Laboratories. Some have helped to meet pressing problems of military supply—and others are ready for the peaceful post-war years.

Dedicated to the wider use and better understanding of dairy products as human food . . . as a base for the development of new products and materials . . . as a source of health and enduring progress on the farms and in the towns and cities of America.



**NATIONAL DAIRY
PRODUCTS CORPORATION**
AND AFFILIATED COMPANIES



ON EVERY INVASION FRONT—wherever our boys land, WHEARY moisture-proof chests, filled with finest surgical instruments and precious medical supplies, float to the beach, ready to give immediate help to any casualties. It is this "on the spot" treatment of our wounded that has helped cut war fatalities to an all-time record low. The needs of our armed forces for such war equipment have been great and WHEARY production has been taxed to the utmost. We hope the day is not far distant when more of our facilities can be devoted to making civilian luggage reflecting WHEARY craftsmanship, quality and efficiency. WHEARY, INCORPORATED, Racine, Wisconsin.



Patriot, President —and penman!

General Washington, in dark days, led his country toward light. This peerless patriot was also a potent penman—wrote fiats and commands, ledgers, memorable memoranda, with quills of geese.

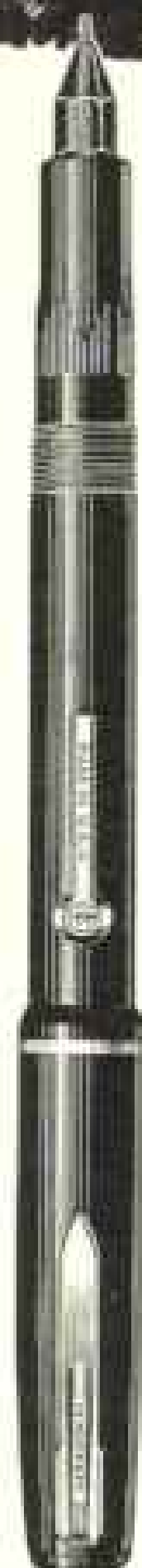
TODAY, the pen behind the sword is Inkograph—chosen by many generals, and hundreds of thousands of men in service. Easy flowing, precision-built, pointed to fit pressure of any hand, light yet durable, it is as dependable in the field as in the office and home.

If your dealer is out of stock, please keep trying!

Sorry, no mail orders; only dealers can supply you.

*Use any pen to sign up for more
WAR BONDS!*

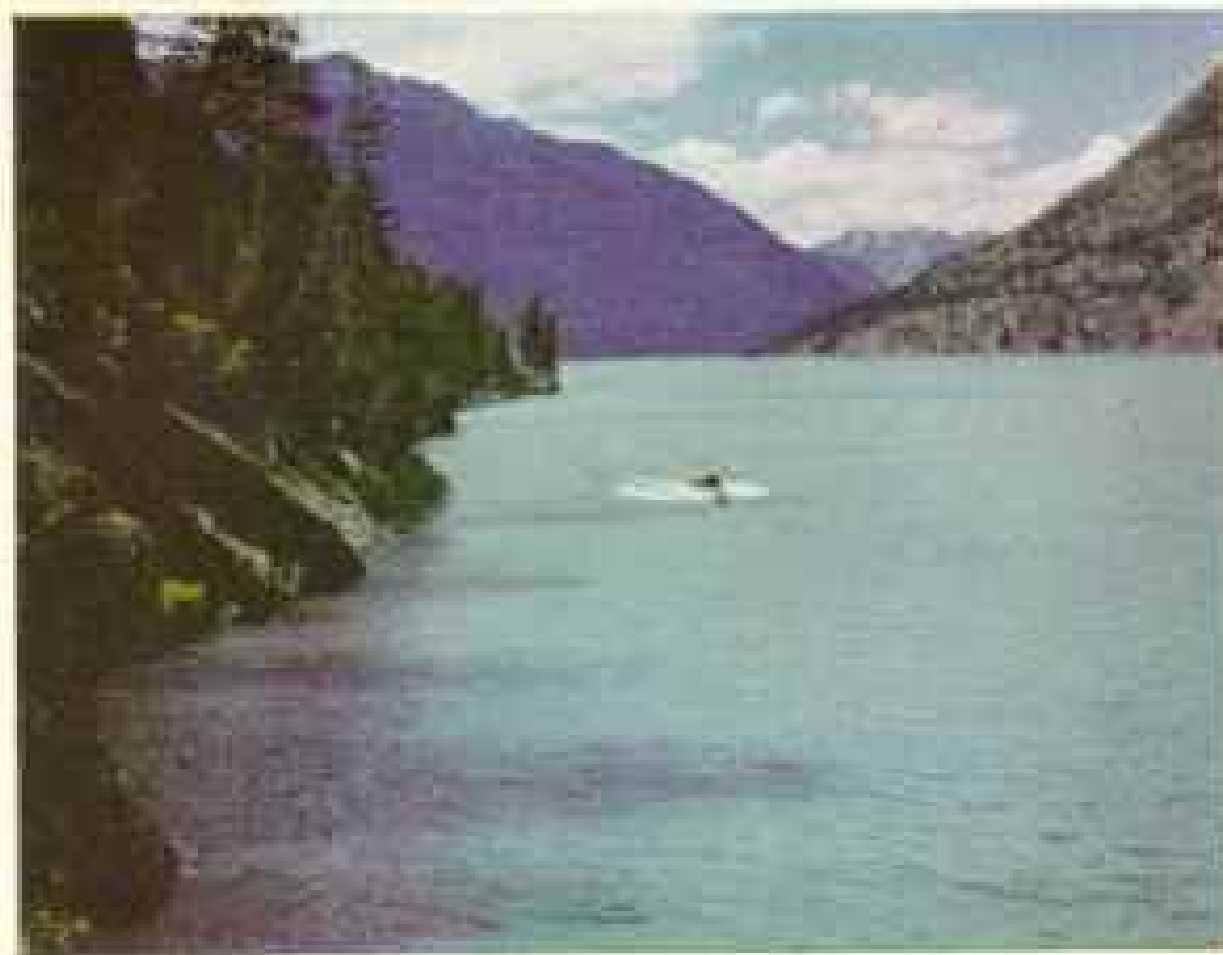
INK-O-GRAPH²
Inkograph Co., Inc., 200 Hudson St., N.Y. C. 13



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Lake Chelan in the Eastern Cascades, a 55-mile expanse of freshwater beauty



Surf at Ruby Beach on Olympic Peninsula, near snow-capped peaks and green carpeted forests



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**"FILL'ER UP!
we're headed for
WASHINGTON
STATE"**

● When the last victorious gun is fired, you're going to want and need a vacation...and you'll deserve it. Until then, don't plan to travel, but it isn't a bit too soon to start *thinking* about it now, and Washington State really gives you a new delightful vacation to think, plan and dream about! Washington State—America's Evergreen Playground, offers every imaginable vacation thrill! Whatever you seek in relaxation and fun, you'll find it made to your order in Washington State.

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State Capitol, Olympia, Washington

Please send me free "Victory Vacation" folder with illustrated booklet of Washington State.

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Address _____

Ann Sheridan gets as much
pleasure from her

Motorola Radio



... as you'll get from her
performance in WARNER BROS'.
happiness hit
"The DOUGHGIRLS"

Many of America's stars of stage, radio and screen enjoy the brilliant performance of Motorola Radio. These are experts who know good performance when they hear it.

On battle fronts throughout the world, Motorola Military Radio has performed brilliantly. The famous "Handie Talkie," an exclusive development of Motorola Radio Engineers, is affectionately called the "fight-

ingest radio" in the army. These same engineers, pioneers in electronics before the war and through it, will have exciting new developments in F-M and A-M radio for your Home and Car.

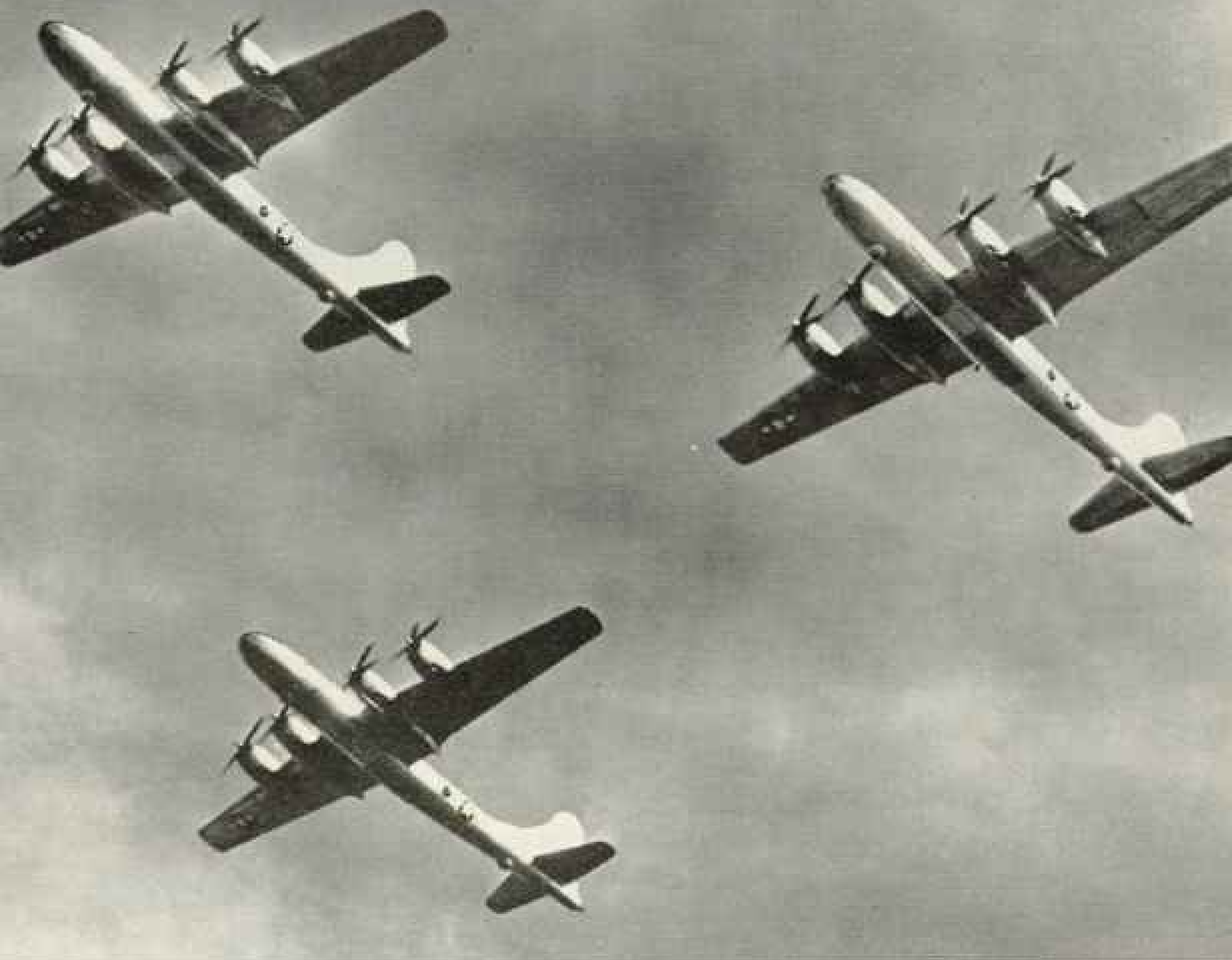
You have a right to expect improved radio performance in your Post War set and you can depend on Motorola to deliver it soon after Victory in Europe!

GALVIN MANUFACTURING CORPORATION • CHICAGO 31
"HANDIE TALKIE" ANOTHER MOTOROLA FIRST!



 **Motorola**  **Radio**
FOR HOME & CAR

F-M & A-M HOME RADIO • AUTO RADIO • AUTOMATIC PHONOGRAPHS • TELEVISION • F-M POLICE RADIO • RADAR • MILITARY RADIO



Only the beginning

All the Free World has thrilled to the news of Boeing B-29 raids on Japan. They were just the beginning. More Superfortresses are on the way . . . many, many more!

Back of the B-29 is one of the most gigantic manufacturing programs ever placed behind any weapon of war. And Boeing brings to the task the same manufacturing philosophy that shattered all airplane production records in the output of Boeing Flying Fortresses.

The Boeing Superfortress is being built largely by people who never worked on production lines before; drug clerks and housewives,

farmers and truck drivers, school girls and grandfathers.

But such things, of course, don't "just happen." The efficient use of previously unskilled people is a by-product of good production planning and organizing.

At Boeing this planning starts with the original conception of a new design and encompasses all functions of its production. It is a *basic consideration* which results in simplifying the manufacture of a complex product and, as in the case of the Superfortress, permits it to be produced in quantity by previously unskilled people.

Plans developed by Boeing now guide the entire over-all production program in dozens of other co-operating plants including those of Bell and Martin, which are also turning out completed Boeing B-29's. This program was patterned after the co-operative plan under which Douglas and Lockheed have built and will continue to build Boeing B-17's.

Once the war is over, Boeing methods of research, design, engineering and manufacture will be turned to peacetime products. And they will insure that any product "Built by Boeing" is bound to be good.



More than a Great name in motion picture equipment

...A WORLD-WIDE SERVICE

EVERYWHERE and at all times—even in these hectic days—owners of Victor 16mm Motion Picture Equipment have found that the name "Victor" means even more than the best in construction and performance. Wherever Victor equipment is used, Victor and Victor distributors and dealers have kept available dependable service facilities and Victor parts. With thousands of Victor cameras and projectors going to the armed forces, Victor has even maintained a free factory training school for soldier and sailor service men so that Victor Equipment in far off corners of the world may always be ready for duty. And in the post-war years, Victor owners—schools, institutions, industries, business and private homes—are assured that the Victor Service Organization, staffed by highly trained men, will always be available.



Put your projector to work for the Sixth War Loan—contact your local War Bond Committee.

Victor Animatograph Corporation

Home Office and Factory: Davenport, Iowa

New York (18) 330 W. 42d St. • Chicago (1) 188 W. Randolph

Here the *Sun* works overtime ...for you!



In spite of the war, Tucson's warm, dry, invigorating climate is still the healthiest in all America. Nowhere else in the U. S. can you match this rare combination of climate and moderate altitude (2400').

For free booklet and information write our 25-year, non-profit Tucson Sunshine Climate Club, 4004-D Rialto, Tucson, Arizona.

P.S. Confirmed reservations for living accommodations are imperative!

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Your place in the sun is TUCSON



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Free on request

Complete 120 page Seed Catalog with 16 pages in color...featuring many new, high quality Seeds, Bulbs and Plants introduced by us for the first time this year.

SAWCO-JAPY MILKY DISEASE SPORE DUST
Kills Japanese Beetles

Manufactured for us by J. J. Parker under Pat. No. 2,394,319 issued by the Dept. of Agriculture.

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1 lb., Sufficient for 4000 sq. ft., \$7.50
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FM Radio by General Electric—*you* hear the tones in all their "natural color" and beauty.

JEANETTE MacDONALD, lovely star of radio, screen, concert and opera, singing the famous "Waltz Song" from "Roses and Rain."

Conventional Radio—lacks color and richness. Something is missing.



FM radio alone brings you Jeanette MacDonald in natural color

Her glamorous roles are legion! . . . Her songs are shining jewels! . . . And tomorrow you'll hear her joyous voice with a true-to-life *realism* surpassing anything you've ever known in radio!

This will be lovely Jeanette MacDonald on General Electric FM . . . the radio with glorious "natural color" tone! FM (Frequency Modulation) will be far finer than today's conventional radio. For conventional radio is limited to less than half the complete range of musical tones . . . it is radio only in "black-and-white".

Listen to General Electric FM, however, and you hear *all* the beauty of music and voice. Because FM retains the delicate lacework of vital overtones

—virtually free from static or station interference.

This is General Electric FM . . . the most revolutionary radio development in years!

General Electric is the only manufacturer to build FM complete, from station equipment to the radio for your home. This unmatched experience in Frequency Modulation is your assurance that the coming General Electric FM will embody all that's best in radio.

FREE: A fascinating booklet, "YOUR COMING RADIO." 28 pages profusely illustrated in full color. Preview the revolutionary new General Electric Radio and Television sets. For your free copy, mail a postcard request to Electronics Department, General Electric, Schenectady, New York.



GENERAL ELECTRIC

179-01

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A PRODUCT OF G-E ELECTRONIC RESEARCH

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ARGUS EYES FOR VICTORY



ARGUS C1



ARGUS MODEL 8



MIRACULOUS OPTICAL INSTRUMENT



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Please send me free information about Jacksonville
 as a resort community as a home city

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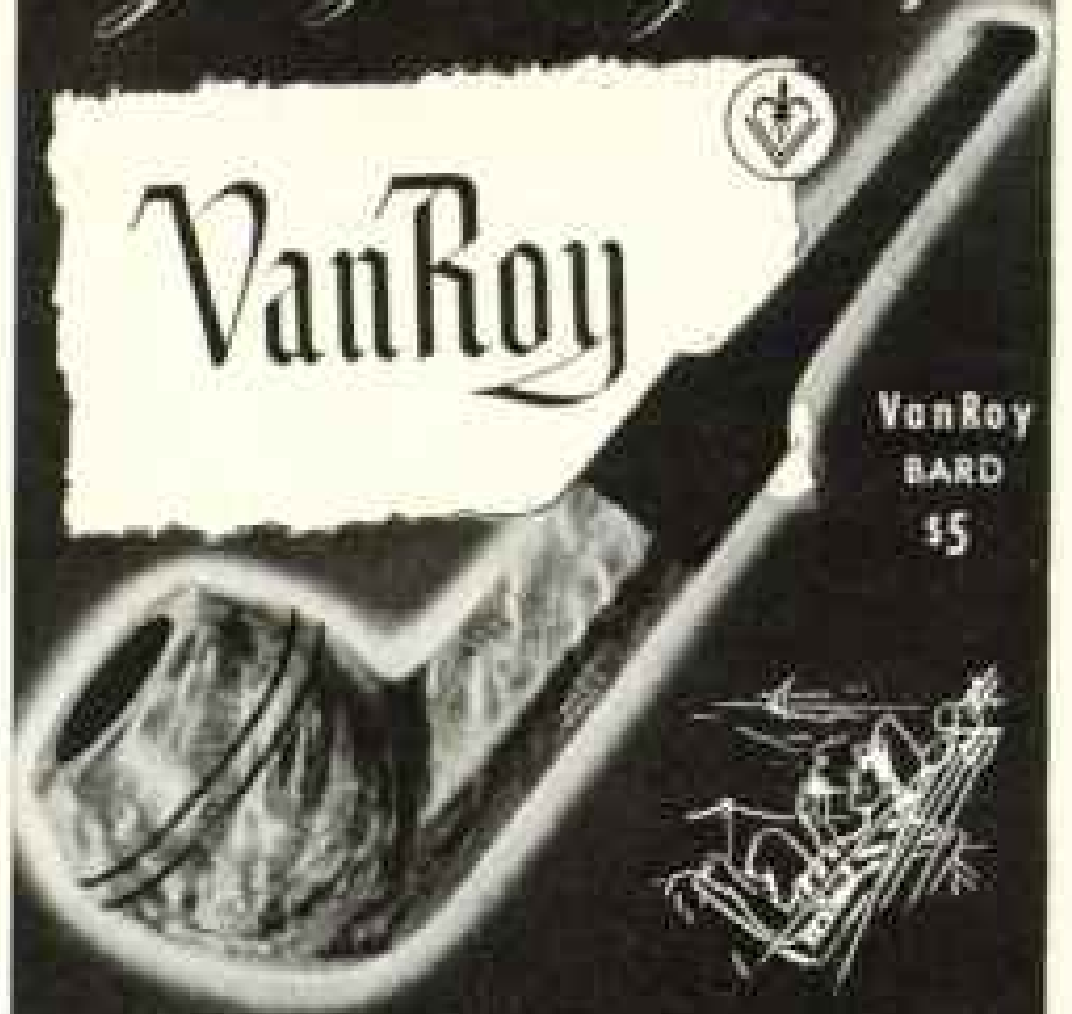
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For those who can afford, and seek out, the finest . . . VanRoy is that rarity among pipes and men—the perfect mate for every mood.

VanRoy Pipe Family

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VAN ROY COMPANY, INC., EMPIRE STATE BLDG., NEW YORK 1

Laugh at a cold—and PNEUMONIA may laugh at you!



LOTS OF people think "it's just a little cold." But that little cold can use up a lot of your body's resistance against disease.

People who are already weakened by colds make easier targets for such serious diseases as pneumonia, in-

fluenza, sinusitis, ear infections, tonsillitis, or bronchitis.

If you take the simple precautions below, chances are good that you won't be one of the thousands of victims of pneumonia this winter—or one of the countless victims of other frequent complications of respiratory infections.



1. When a cold strikes... go to bed if possible. At least stay indoors and rest all you can. It may help to take a hot bath, or soak your feet in hot water, and drink a hot lemonade before retiring. Be sure to avoid chilling.



2. You must go to work? Remember that you may inflict your cold on others. If you really must, then wear warm, protective clothing. Avoid drafts and sudden chilling. Keep your sneezes and coughs covered up.



3. Drink large quantities of milk, fruit juice, and plain water. Take a laxative if needed.



4. Treat that sore throat to a gargle. For a homemade gargle, add a teaspoonful of salt or bicarbonate of soda to a glass of warm water.

If your cold seems more severe than usual, or if it starts with aching, chilliness, and fever, call the doctor without delay. Pneumonia may be indicated.

Most forms of pneumonia and certain other respiratory infections are often successfully treated with sulfa drugs—particularly if diagnosed early. Remember, sulfa drugs should be taken only when prescribed by a doctor.

But, an ounce of prevention is still worth a pound of cure. Do your best to avoid colds. Watching your diet will help. Get plenty of vitamins, fruits, and leafy vegetables. Eat better breakfasts. Don't skimp on your sleep. Dress warmly and avoid chilling. Get regular exercise—some of it outdoors. And keep away from sniffers.

Metropolitan will gladly send you its free booklet, 15N, entitled, "Respiratory Diseases."

1948, 1947—METROPOLITAN LIFE INSURANCE CO.

Metropolitan Life Insurance Company

(A MUTUAL COMPANY)

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The deer whose hoofs are too sharp

THE VIRGINIA or White tail Deer (*Odocoileus virginianus*) has as wide a range as any game animal in the United States.

Well protected by game laws, he is far more numerous in many areas today than he was in the unsettled forests of two hundred years ago.

During most of the year, he gets along very well. But the deer that lives in the north, where winters are severe, faces grave danger during winter months.

The heavy snows make food scarce and travel difficult for him. His small, sharp hoofs, which helped to carry him away from danger during the summer, are now too sharp. His slim legs sink deep into the snow with every step.

Instinct, however, provides deer with a way to obtain their food under these adverse conditions. They band together in winter, ordinarily choosing a well-protected spot where food is likely to be most abundant.

There they make a "yard," packing down the snow over a small area. From the yard, well-beaten paths are made to various feeding places so the deer may go foraging and return easily.

But, marvelous as are the ways in which instinct guides animals to protect themselves against disaster, they are seldom infallible. As winter drags on, and food near by is eaten up,

the trails grow longer and longer.

Then if, as often happens in February, a bad storm covers the trails, many deer may die of starvation.

Although man, by the use of his intellect, has managed to work out far better measures for his safety than instinct has provided for the deer, he cannot guarantee himself against unexpected mishaps.

He has, however, worked out an infallible way to protect himself from the financial consequences of a mishap once it has occurred. He does this through insurance.

If a fire should damage your property or an accident land you in the hospital, you can depend upon insurance to cover the inevitable expenses which follow.

Since one never knows when a mishap may occur, and since the resulting expenses can be considerable, it is important to play safe and never allow yourself to be without adequate insurance protection. Your local Travelers man can advise you about your protection needs.

MORAL: Insure in The Travelers. All forms of insurance and surety bonds. The Travelers Insurance Company, The Travelers Indemnity Company, The Travelers Fire Insurance Company, Hartford, Connecticut.

Exactly right for Saturday night

SPAM* 'N' BEANS



SPAM* 'N' BEANS

Half buried Spam slices in baked beans, browned and piping hot - a crisp, new flavor wedded to an old favorite. Adds vitamins, too - Spam is pure pork - rich in B₁ and B₂



HORMEL

GOOD FOODS

COLD OR HOT... **SPAM** HITS THE SPOT!

* Spam is a registered trade mark. It identifies a meat product packed only in 12 ounce tins and made exclusively by Geo. A. Hormel & Co., Austin, Minn.

His two best girls
at their best... **in Color!**



Kodacolor snapshot,
reduced in size.



2X Minicolor Print,
from a miniature
Kodachrome transparency.
Reduced in size.



Send your serviceman

Kodacolor Snapshots.. Minicolor Prints

There's nothing he'll treasure more than pictures from home—pictures at their vivid, lifelike best—in Color.

With Kodacolor Film, anyone—in bright sunlight—can take beautiful *Kodacolor Snapshots* with an ordinary Kodak or Brownie. From the negatives, the Kodak Company makes Kodacolor Prints—full-color snapshot prints on paper... Kodacolor Film, like all film, is scarce;

but there's a little to be had. Ask your Kodak dealer.

Or send beautiful *Minicolor Prints*, made from your Kodak Bantam or 35-mm. Kodachrome Film transparencies. Minicolor Prints, full-color photographic enlargements, reproduce all the natural beauty of your original transparencies. Three sizes. Order through your Kodak dealer... Eastman Kodak Co., Rochester, N.Y.

THE MARCH OF COLOR

IN 1928 Kodak brought out a film for making home movies in full color.

IN 1935 Kodak introduced full-color Kodachrome Film—making color movies available to every American home.

IN 1936 Kodachrome "still pictures," shot with a Kodak Bantam or 35-mm. camera, became the joy of tens of thousands.

IN 1938 Kodachrome sheet film led to full-color

photographs as magazine and newspaper illustrations.

IN 1941 Kodak introduced Minicolor Prints from miniature Kodachrome Film transparencies—the first direct full-color photographic prints.

IN 1942 Kodacolor Film fulfilled the dream of generations—color snapshots, full-color prints made from color negatives in an ordinary roll-film camera.

Kodak Research

HAS MADE COLOR PHOTOGRAPHY
A PART OF EVERYONE'S LIFE



FAMED FOR *Accuracy*

DISTINGUISHED FOR *Beauty*

Since 1791 Girard-Perregaux has enjoyed a world-wide reputation for making fine watches . . . beautifully styled . . . traditionally accurate.

Today, when correct time is so vital, your choice of a Girard-Perregaux assures you of a timepiece with a distinguished heritage.

Girard-Perregaux watches are featured by selected jewelers . . . priced from Forty Dollars. To know more about fine watches write for Free booklet G-8 "The Flight of Time".

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THE AUTOMATIC ELECTRIC
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Operates from Light Circuit

Safe—dependable. Moderate price—inexpensive to operate. Easily installed in new or old homes. Operates from light circuit.

The Home-LIFT is designed by experts who have been building commercial passenger elevators for years. Send for descriptive literature.

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NEBRASKA

Land of rich soil, of thriving towns, of livable homes that offer cheerful hospitality... land of deep winter snows and warm summer suns, Nebraska is typical of the midwestern section of *Your America*.

The state is one of the nation's leading stock raising areas. It is famous for dairy products. Corn, grain, hay and sugar beets grow in abundance. Industrial activity has rapidly developed.

Nebraska is justly proud of its sound economic condition, its "pay-as-you-go" policy. Its citizens are straight-thinking people who cling to the fundamental belief that the best way to achieve a comfortable living is to work for it.

Nebraska's largest city, Omaha, is the headquarters of the Union Pacific Railroad, the "strategic middle route" uniting the state with the East and the Pacific Coast.

Nebraska and Union Pacific have one common goal; to speed victory and keep open the doors of opportunity so that courage, hard work, initiative and enterprise may reap their just reward.

• Listen to "YOUR AMERICA"
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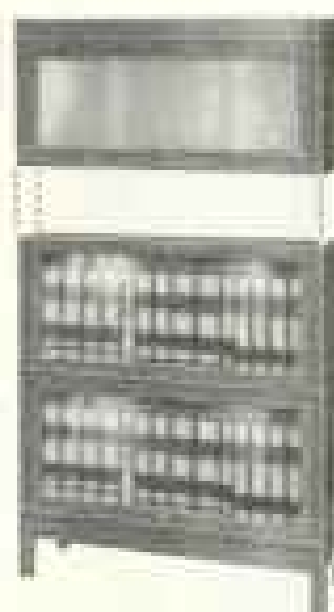
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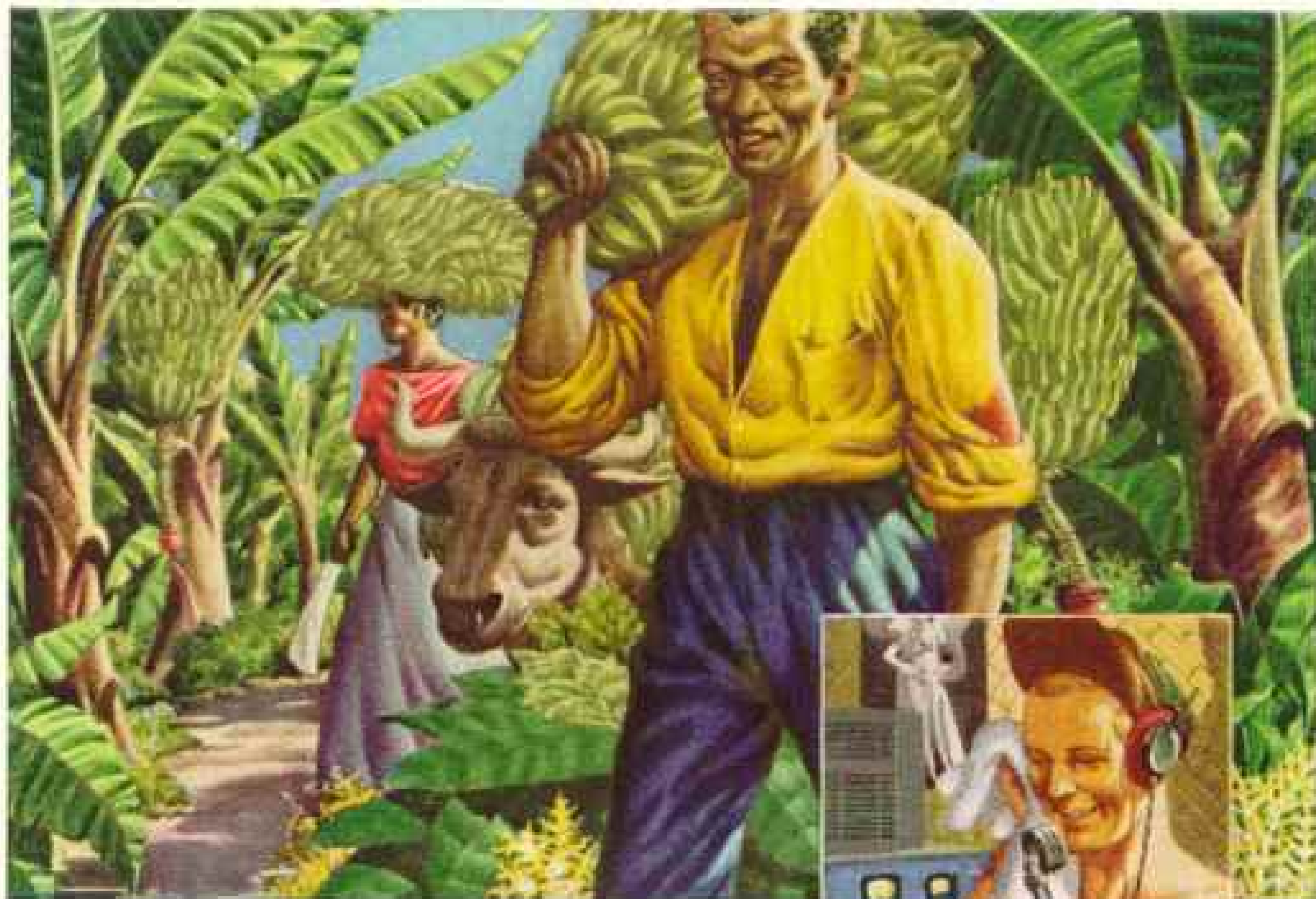
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