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THE NATIONAL GEOGRAPHIC MAGAZINE

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United States Map Supplement in Ten Colors

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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. It has aided and encouraged exploration literally to the ends of the earth, having contributed to expeditions of Rear Admiral Robert E. Peary, discoverer of the North Pole, and Rear Admiral Richard E. Byrd, first man to fly over the North and South Poles.

National Geographic exploration and scientific study made known to the world the natural wonders now preserved as Katmai National Monument and Carlsbad Caverns National Park.

The Society's notable expeditions pushed back the historic horizons of the Southwest to a period nearly eight centuries before Columbus by digging into the vast ruins of Pueblo Bonito, in Mexico. The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest dated work of man in the Americas. This stone is engraved, in Mayan characters, November 4, 291 A. C. (Spinden Correlation). It antedates by 200 years anything else dated in America and reveals a great center of early American culture, previously unknown.

On November 11, 1935, the stratosphere flight of the world's largest balloon, *Explorer II*, sponsored by The Society and the U. S. Army Air Corps, reached a world-record altitude of 72,395 feet. Capts. Albert W. Stevens and Orvil A. Anderson took aloft a ton of scientific instruments and obtained results of extraordinary value.

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The Society and individual members contributed $100,000 to help preserve for the American people the finest of California's sequoias, the Giant Forest in Sequoia National Park.

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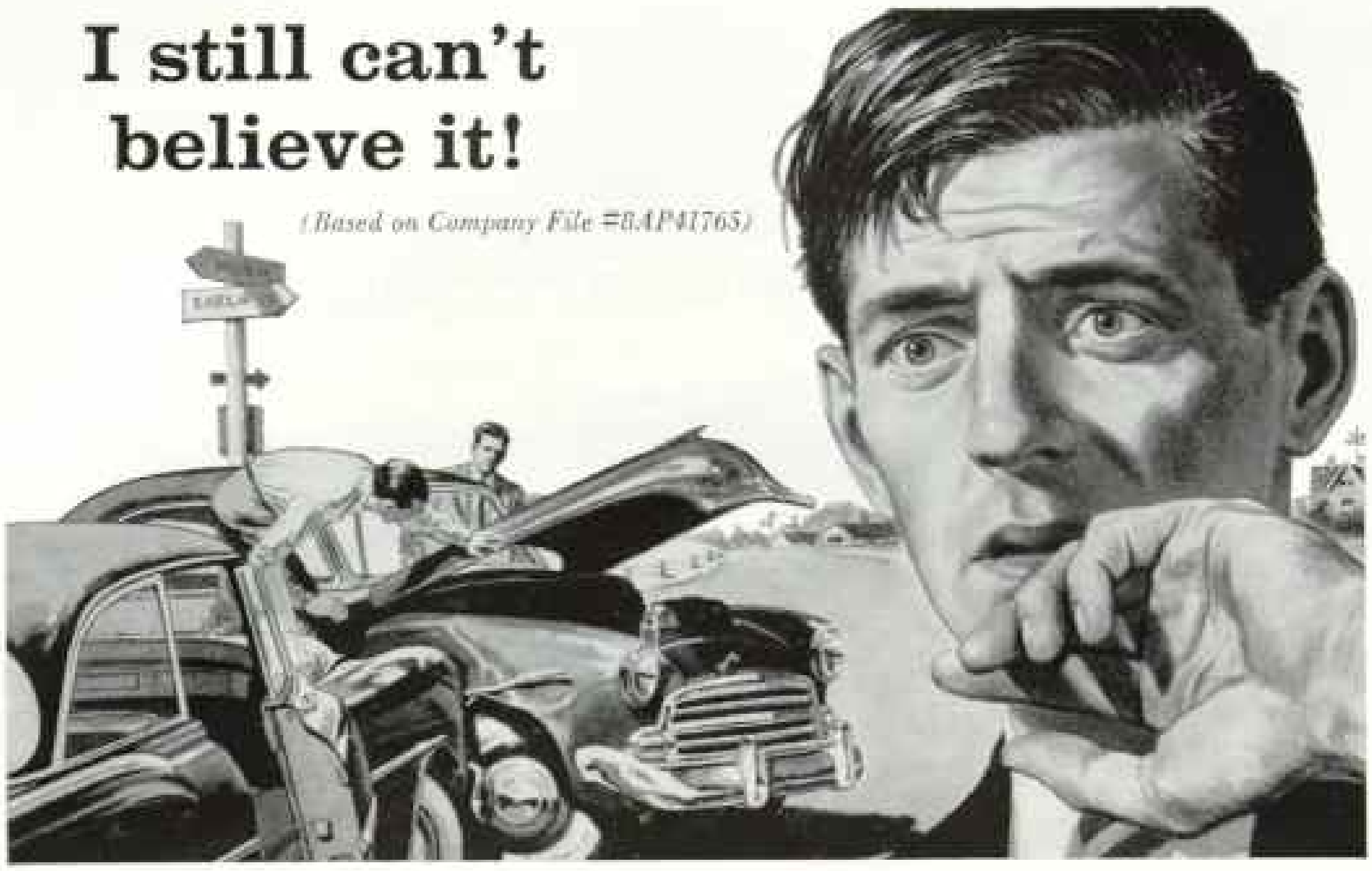

I hadn't been going fast.

When the light changed, I could have stopped easily—if something hadn't suddenly snapped in my brakes. *They wouldn't hold!*

Cars had already started across the intersection. And I hit one of them broadside.

The police arrested me. *Criminal negligence. Failure to observe a traffic signal. Operating a defective vehicle.*

I was held in $10,000 bail. And actually locked up. But the police first let me call my Hartford Agent.

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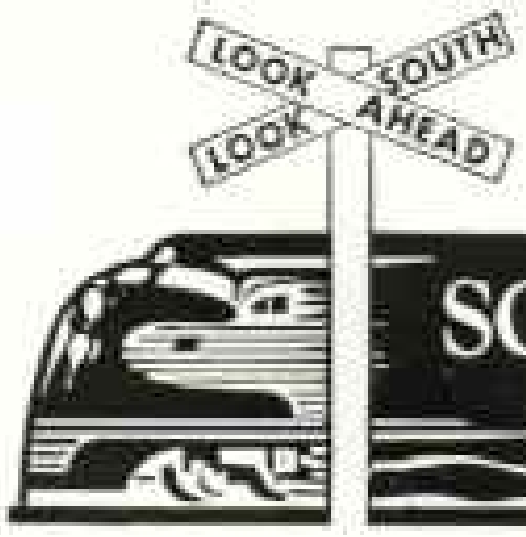

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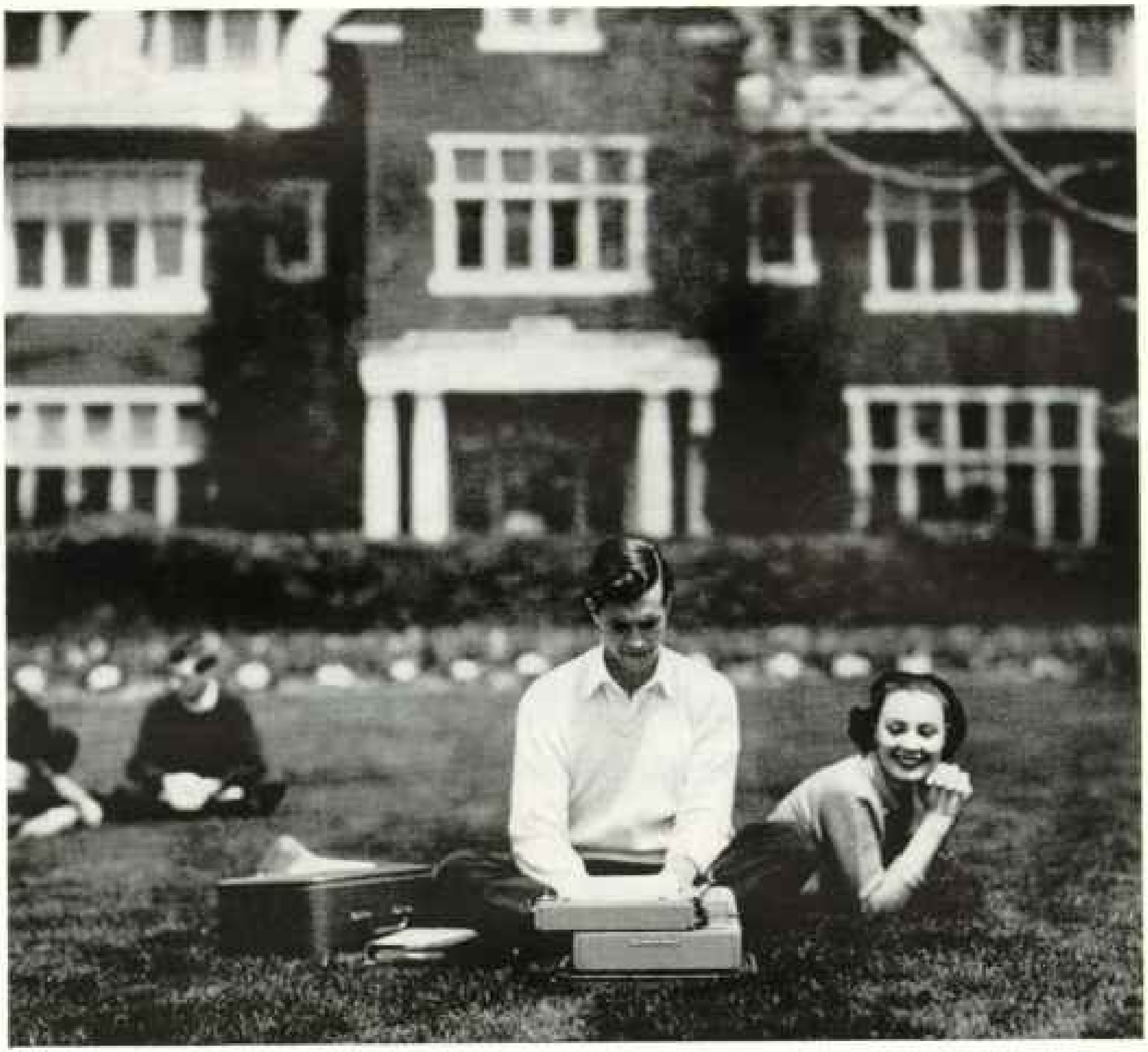

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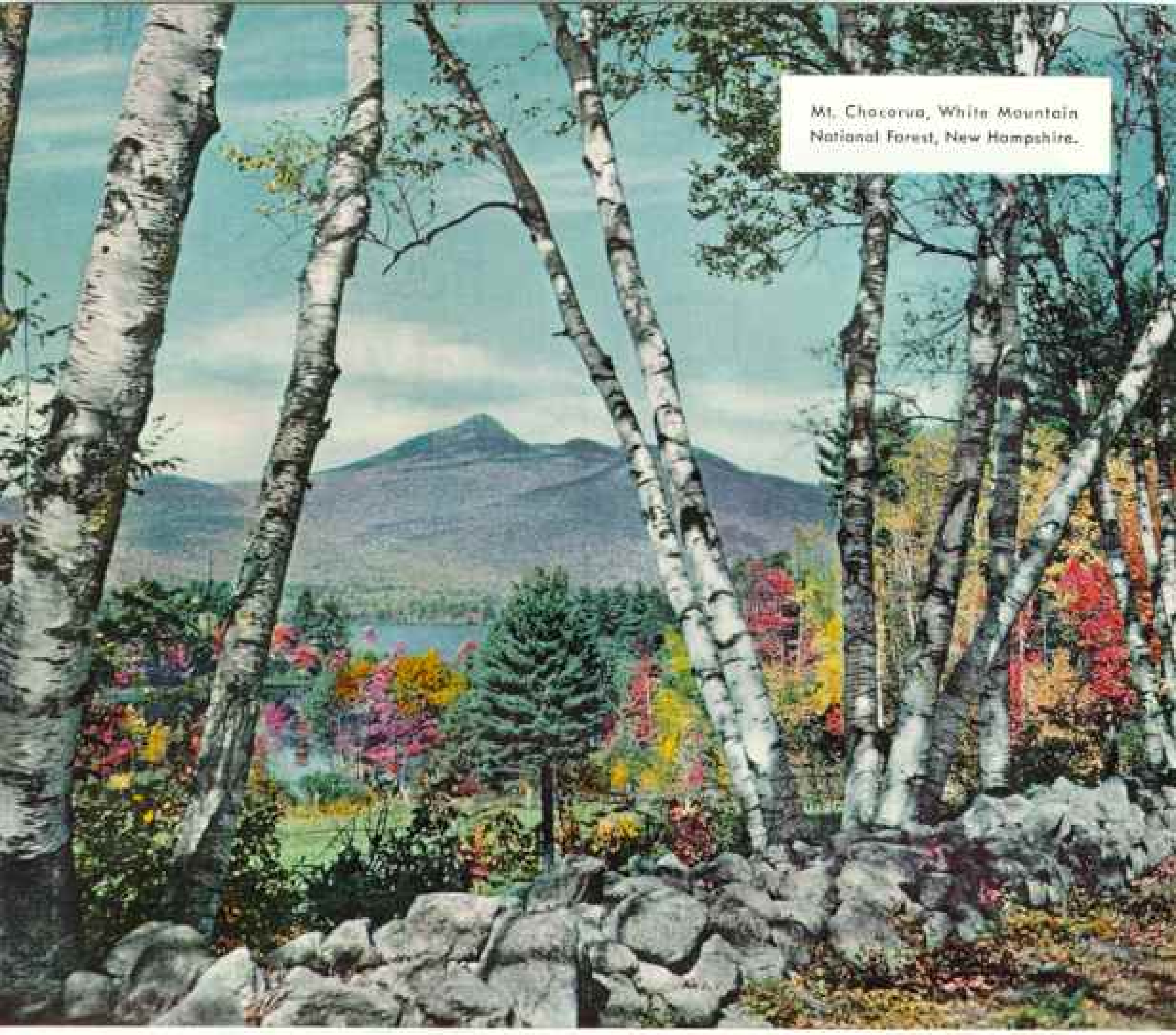

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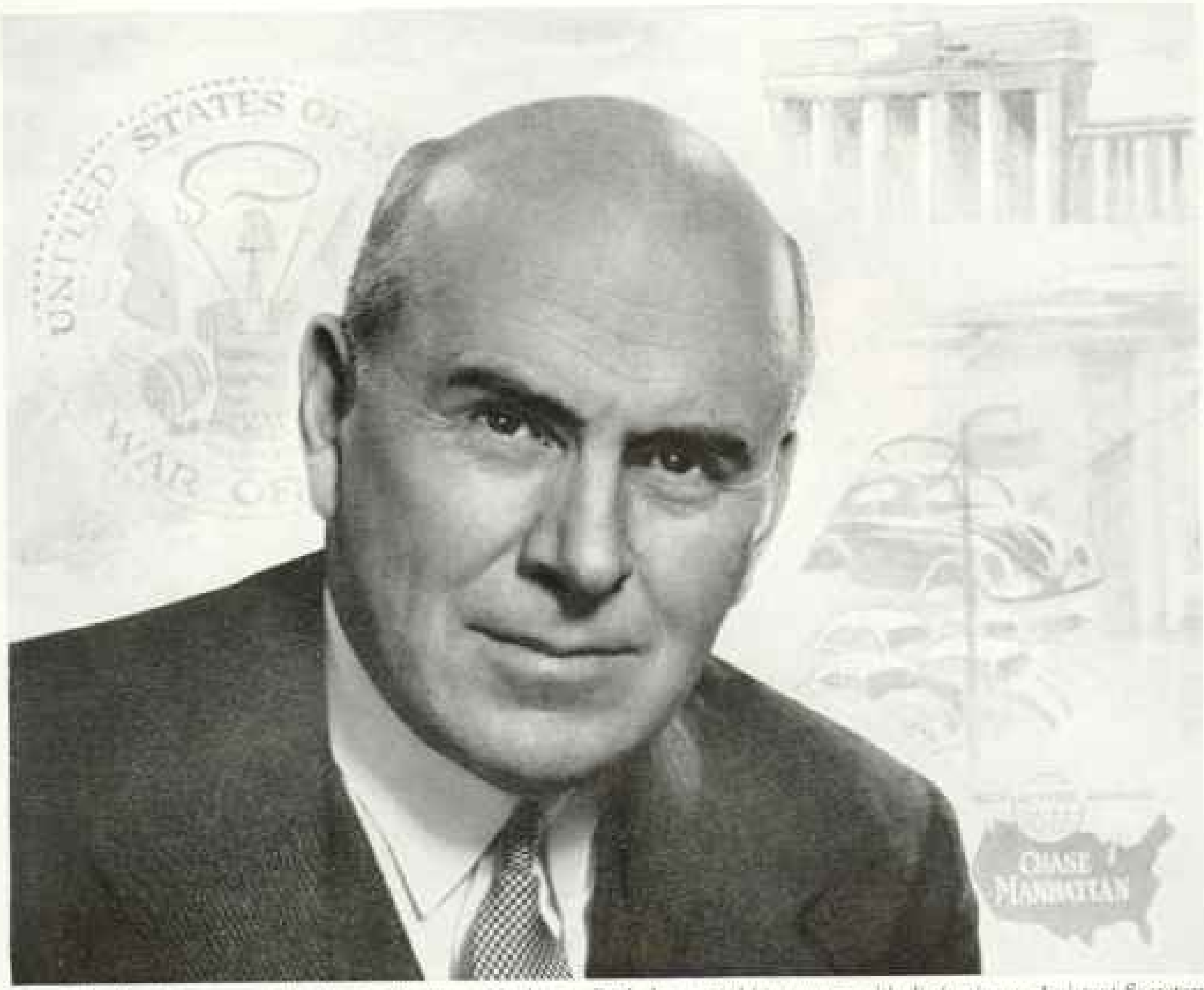

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by JOHN J. McCLOY

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EDMUND BURKE,
18th century British statesman

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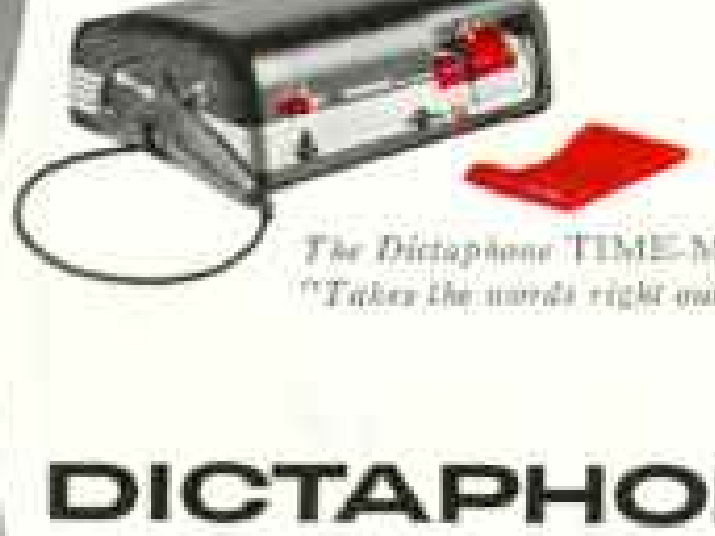

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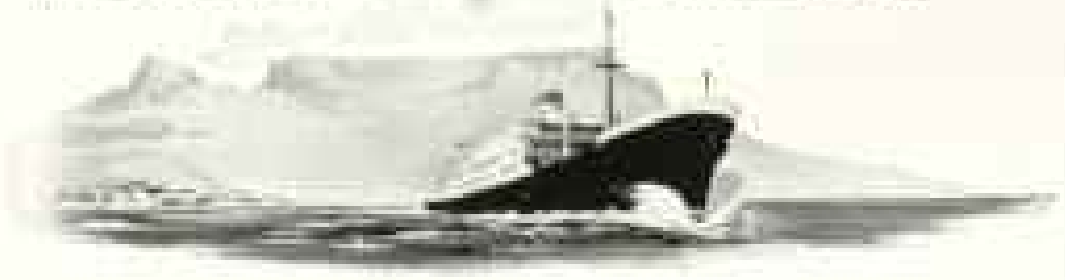

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"Stomach" Ulcer

ACCORDING TO recent conservative estimates, about half a million people in our country today have ulcers of the digestive system in an active form. This includes both ulcers of the *stomach* and ulcers of the *duodenum*—that part of the small intestine into which the stomach empties. There is evidence that this disease is increasing, especially among those from 30 to 50 years of age.

Medical science can now offer greater hope than ever before to those who have this condition. Many cases can be cured completely, and others can be controlled. This

has been made possible largely by increased knowledge of the nature of the disease—particularly of the part that the emotions play in causing ulcers. There has also been great improvement in methods of diagnosis and treatment.

An ulcer is essentially an irritated or inflamed area in the lining of the stomach or duodenum. Although the *exact* cause is unknown, there are several factors which may be responsible for its onset. *Constant* abuse of the stomach through eating hurried, irregular meals—or eating food that is too highly seasoned, or too hot or too cold—may lead to an ulcer. *Prolonged* emotional tension, accompanied by *excessive* secretion of the acid digestive juices formed by the stomach, is also believed to be an important factor in the development of this ailment. As the ulcer develops, pain, an unnatural feeling of hunger, so-called "heartburn" and "indigestion," or other digestive complaints usually occur.

Through improved X-ray techniques and other diagnostic aids, the doctor can almost always determine the size and location of an ulcer. If the condition is detected, he will recommend prompt treatment, as an ulcer may quickly undermine general health by interfering with the body's nutritive processes.

Fortunately, in many cases, ulcers can be treated successfully by appropriate dietary measures. The patient must also readjust his daily life so as to reduce mental and emotional strain. In addition, new drugs are proving helpful. Cases that do not respond to either drug or diet therapy are often benefited by surgery.

As a safeguard against ulcers and other digestive diseases, doctors urge immediate medical attention whenever persistent discomfort occurs in the region of the stomach. With prompt medical care, many persons with ulcers and other digestive disorders recover completely and lead normal, healthy lives.

* * * * *

Since emotional factors are often so important in stomach ulcers and other diseases, Metropolitan has published a new booklet called Emotions and Physical Health. *If you would like a free copy, just clip and mail the coupon below.*

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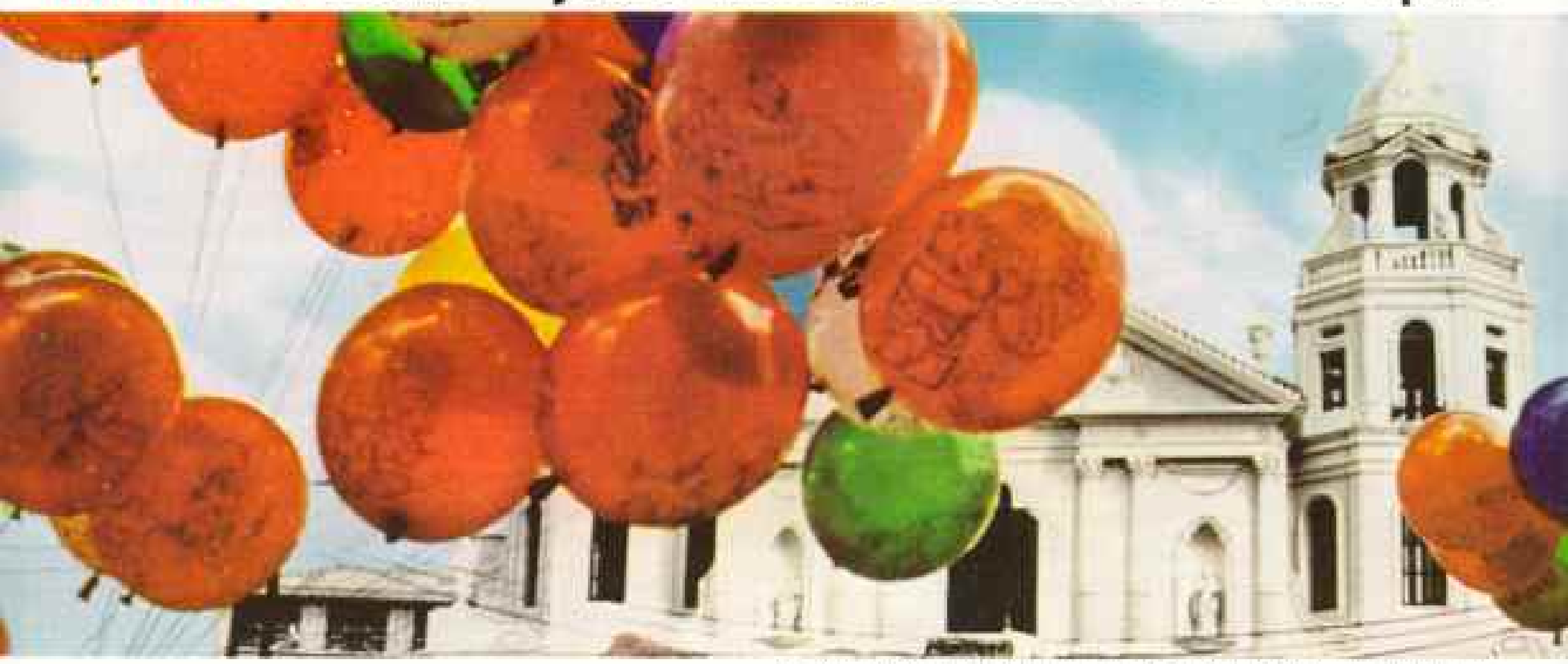

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VOL. CX, No. 3 WASHINGTON SEPTEMBER, 1956

THE NATIONAL GEOGRAPHIC MAGAZINE

Our Green Treasury, the National Forests

Men of the Forest Service Manage a Tenth of the Country's Acres and in the Process Provide 168,500,000 Americans with Water, Lumber, Recreation—and Solitude

BY NATHANIEL T. KENNEY

National Geographic Magazine Staff

With Illustrations by National Geographic Photographer J. Baylor Roberts

WE stood in a grove of young pines so thick we could see scarcely a hundred feet. In the distance a hound bawled on a hot trail. A woodpecker made a tree rattle like a Cuban drum. Something splashed in the sunlit bayou.

"Was that a 'gator?" I asked Ranger A. P. Mustian, Jr., of the United States Forest Service.

He gave me an apologetic look. "I'm sorry," he said. "I didn't hear it. I was listening to the music a forester loves best. Notice it?"

Above me the wind was passing by, and suddenly I became aware of the music too. It was the song of the wind in the trees.

Hurried Men Squandered an Inheritance

I was to hear that wind song in the trees again and again as I traveled 10,000 miles through the national forests of the United States. I heard it thundering in the crowns of baby redwoods in California. I heard it sighing in the red pine plantations of the Great Lakes country, and I heard it rustling the leaves of young oaks in western North Carolina.

It is something of a wonder I ever heard the wind song at all. My ancestors and yours, for more than two centuries, slashed and burned our forests as if they were inexhaustible. History, of course, records their excuse—they were in a hurry to build a great nation, and the forests helped them build it. But history also adds a sobering footnote—entire civilizations have disappeared because they failed to conserve their renewable natural resources of trees, grasses, and soils.

Wind in Young Trees Sings of New Ways

The wind song in new trees, then, is one of the most significant sounds in the United States today. It sings, I think, of a changing from old, wasteful pioneer ways. It means that many of us Americans, despite a bit of backsliding here and there, have accepted the ecological facts of life and are ready to practice conservation of our natural resources.

I do not believe we could have said this 25 years ago. Only now, in mid-20th century, have we decided we had better start taking care of that precious topsoil which makes life possible for us.

Many devoted individuals and dedicated organizations helped us reach our happy choice. Among the foremost was the Forest Service. For one thing, this half-century-old branch of the Department of Agriculture pioneered in the conservation business. For another, it works in a vast arena where results can be readily, clearly appraised: it administers 181,000,000 varied acres divided into 149 national

← Men Strip Vegetation to Starve a Blaze

In an average year 175,000 fires ravage more than 10 million acres of woodland and range in the United States.

California's winter rains were light in 1954-55. By midsummer the forests were dangerously dry. In one 18-day period 436 fires broke out.

More than 1,300 workers, including National Guard men and Indians flown in from New Mexico by the Forest Service, battled this blaze in Sequoia National Forest (pages 308-309). Flames swept 17,000 acres and threatened the General Grant Grove of sequoias.

→Motorized scooter, modern version of the old mule pack train, hauls supplies to the lookout tower atop Picuris Peak in Carson National Forest, New Mexico.

← Lookouts Keep Vigil for Fire, Red Enemy of the Forests

The United States' 181 million acres of national forest provide wood, water, forage for livestock, a home for wildlife, and recreation for a nation.

In windowed towers like this, U. S. Forest Service lookouts guard the country's woodland wealth. J. D. Siefforth (left), a Portland, Oregon, schoolteacher, mans Flat Top Lookout during his summer leave. In Washington's Gifford Pinchot National Forest he talks with forester Neil Suttell. Glass panes frame Mount Adams.

forests in 38 States, Alaska, and Puerto Rico.

Most important, it has had from its very beginning a policy which appeals to the best qualities in the national character.

"In the administration of the forest reserves," wrote Secretary of Agriculture James Wilson in 1905 to Gifford Pinchot, first Forest Service head, "it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people and not for the temporary benefit of individuals or companies.

"... where conflicting interests must be reconciled, the question will always be decided from the standpoint of the greatest good of the greatest number in the long run."

"I don't know where you could find a more inspiring directive," Richard E. McArdle, present chief of the Service, told me at his Washington, D. C., headquarters before I began my journey.

"Translating it into action, we evolved two major guiding principles. One is 'sustained yield' and the other is 'multiple use.' Technical phrases, yes, but they mean a lot.

"When we say sustained yield, we mean simply that we manage the forests with 'forever' in mind. We don't take out resources without providing for the future. Put it another way: we preserve the capital and use the interest.

Watershed Use Gets Priority

"As for multiple use, we feel there are five possible major uses for forest land. Here they are: Watersheds. Timber. Recreation. Grazing. A habitat for wildlife.

"Whenever there is a conflict, watershed invariably gets priority. This Nation badly needs more usable water and fewer destructive floods. Forested watersheds do more than anything else to meet those needs.

"Otherwise, all uses get the test of the 'greatest good of the greatest number.' Sometimes we get all five uses out of one tract of forest land, sometimes only one.

"Now, best of luck to you, and I'll see you when you get back to Washington."

I began the story of my travels with Ranger Mustian's district on the Kisatchie National Forest in Louisiana not because it was my first stop—it wasn't—but because it is predominantly timber-producing forest, and most people seem to think of a forest primarily in terms of trees to be cut for lumber, or for paper products.

"I can grow longleaf pines here as well as or better than any other place in the world," said Mustian. "Everywhere in Louisiana and the rest of the South the wood-using industries are crying for raw material. Seems like new plants are arriving every day.

"So, I grow trees primarily. Yes, I have a few deer and some picnic groves and cattle permits, but I generally favor timber production over other uses."

As he talked, I contrasted this management with something I saw on the Pisgah National Forest in western North Carolina. Ranger Ted Seely and I drove through his district on a day of rain and mist. The green Forest Service jeep growled angrily at the steep grades and writhing turns.

Deer Keep Forest Neat as a Park

Our noisy passing sent deer bounding across the road. It seemed to me I could see their white tails waving for an uncommonly long distance; in my experience most deer had always melted quickly into the woods. I said something about it to Ted.

"You bet you can see them," he replied. "We've got so many they keep all the underbrush eaten out. I can't even plant a pine seedling around here unless I spray on a 'gunk' that keeps hungry deer from eating it.

"You've guessed it by now: a good part of my district is a game management area, run in cooperation with the North Carolina Wildlife Resources Commission. Here, wildlife gets high priority."

Timber in Louisiana, deer in North Carolina—and then, in Tucson, Arizona, one Sunday was warm and pleasant.

"Come on, Dad," said my daughters Barbara and Joan. "Let's go picnic in Sabino Canyon."

Handy to town, Sabino proved to be a

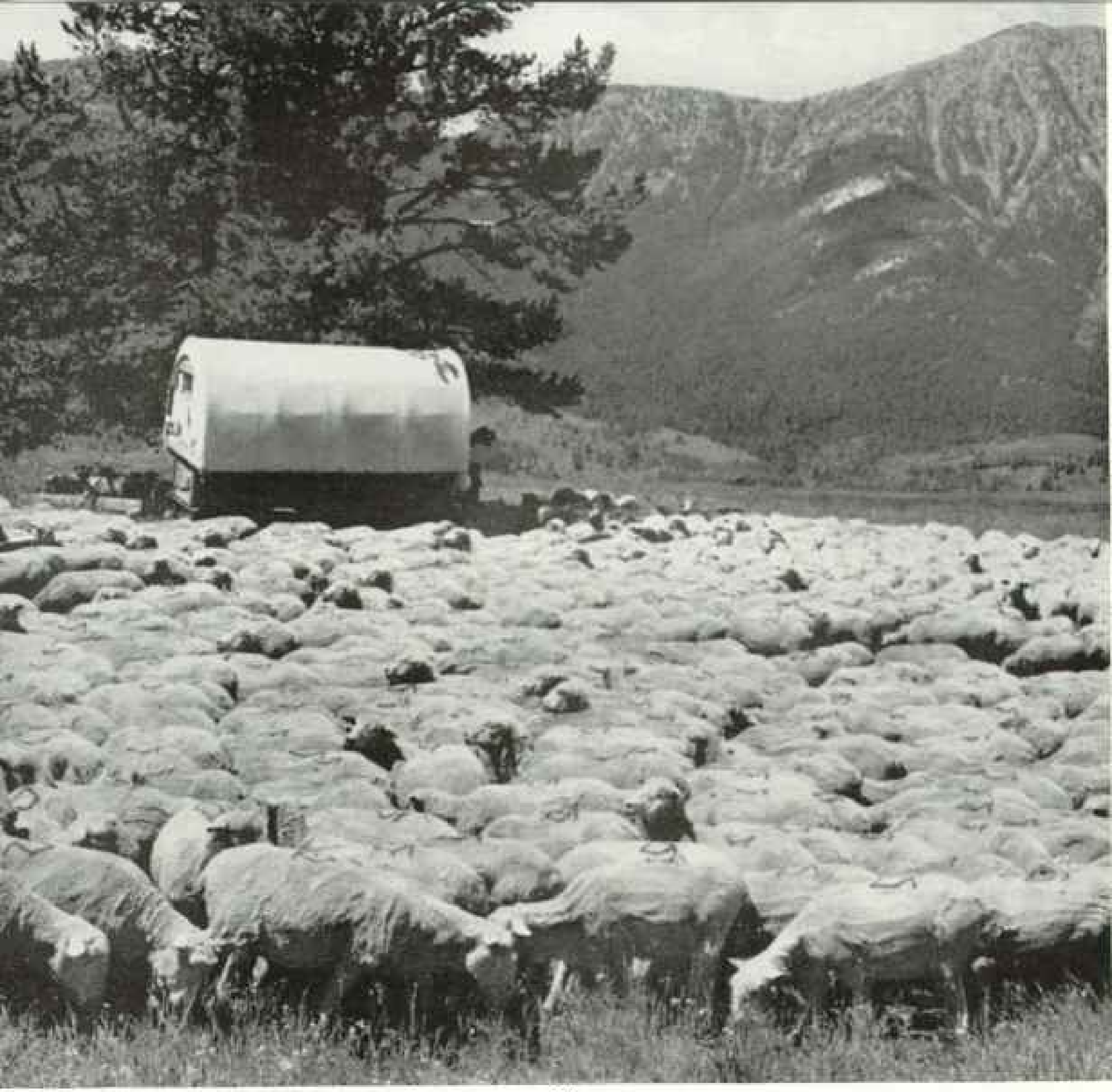
Page 291

Tree Breeder Pollinates Conelets in the Crown of a Ponderosa Pine →

Scientists at the Forest Service's Institute of Forest Genetics near Placerville, California, cross-pollinate species of pine, hoping to produce healthier, faster growing trees.

Each tree may be climbed eight times or more during a single breeding experiment. Technicians protect the female flowers with plastic-windowed bags, squirting in pollen with hypodermic syringes.

Seeds extracted from mature cones (inset) are planted in nursery beds for field trials of newly developed hybrids.



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Shorn Sheep Crop a Mountain Meadow in Beaverhead National Forest, Montana

Replacing vanished open range, national forest grasslands provide summer forage for thousands of ranchers. These sheep are freshly dye marked to establish ownership. Their herder watches from horseback.

spectacular slash through arid hills on the Coronado National Forest. Saguaro cactus raised grotesque arms to the sky. Long-tailed road runners scuttled through the mesquite.

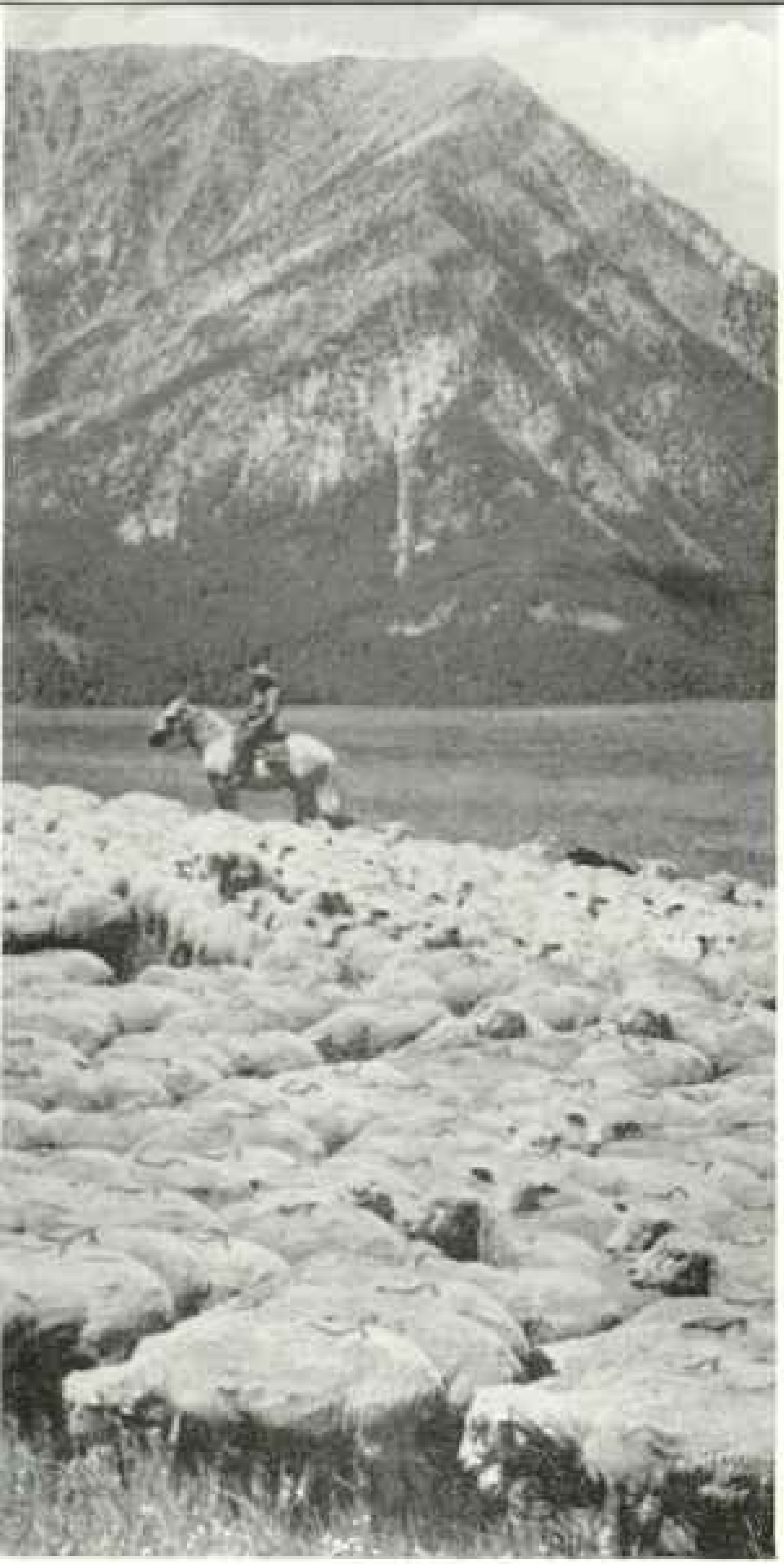
Did we get to picnic? No. A few thousand other folk had had the same idea, and, even though we managed to inch our way through a monumental traffic jam, we found every foot of picnic grove occupied.

I met no ranger here—I imagine he had long since taken cover, exhausted by the questions and problems of this mass of humanity—but I did not need a ranger to tell me that Sabino's primary use was recreation.

Grazing as a forest use is of major importance in the West (above and opposite). From Winston E. (Curly) Steuerwald of the Forest Service regional staff at Missoula, Montana, I learned that national forest grazing permits provide a vital link in the year-long grazing operation for the smaller ranchers of the West—and some big ones, too.

"These national forest lands furnish green forage in the summer, when other good range is limited," said Curly. "You realize, of course, that a great deal of what we call 'forest' includes intermingled grasslands and areas with scattered trees, some no bigger than a piñon pine."

We were driving through the Bitterroot Val-



ley as we talked. On either side harsh mountains raised hoary peaks as though to pierce the fluffy clouds. The Lolo National Forest's trees stood thick on the slopes, dwindling to gnarled, wind-tortured dwarfs at timber line. On the valley floor small ranches lined the highway. White-faced Herefords jammed feed lots.

"In a month or two, when the snow is gone," Curly went on, "you'll not see as many cows down here. They'll be up on the lush grass on the Lolo."

Perhaps the most spectacular example of a community's dependence upon the national forest for watershed protection occurs in California. Should one single forest—the Inyo in the Sierra Nevada—be lost for any reason, the huge, mushrooming city of Los Angeles would face a serious problem.

The rainfall on the south coastal plain of California averages only 10 to 15 inches a year, not much more than you'd find in the desert. In point of fact, the lush citrus groves and fabulous farms of southern California exist only because of irrigation.

Half a century ago Los Angeles decided that it had better look beyond the plain for water. Eventually it reached more than 300

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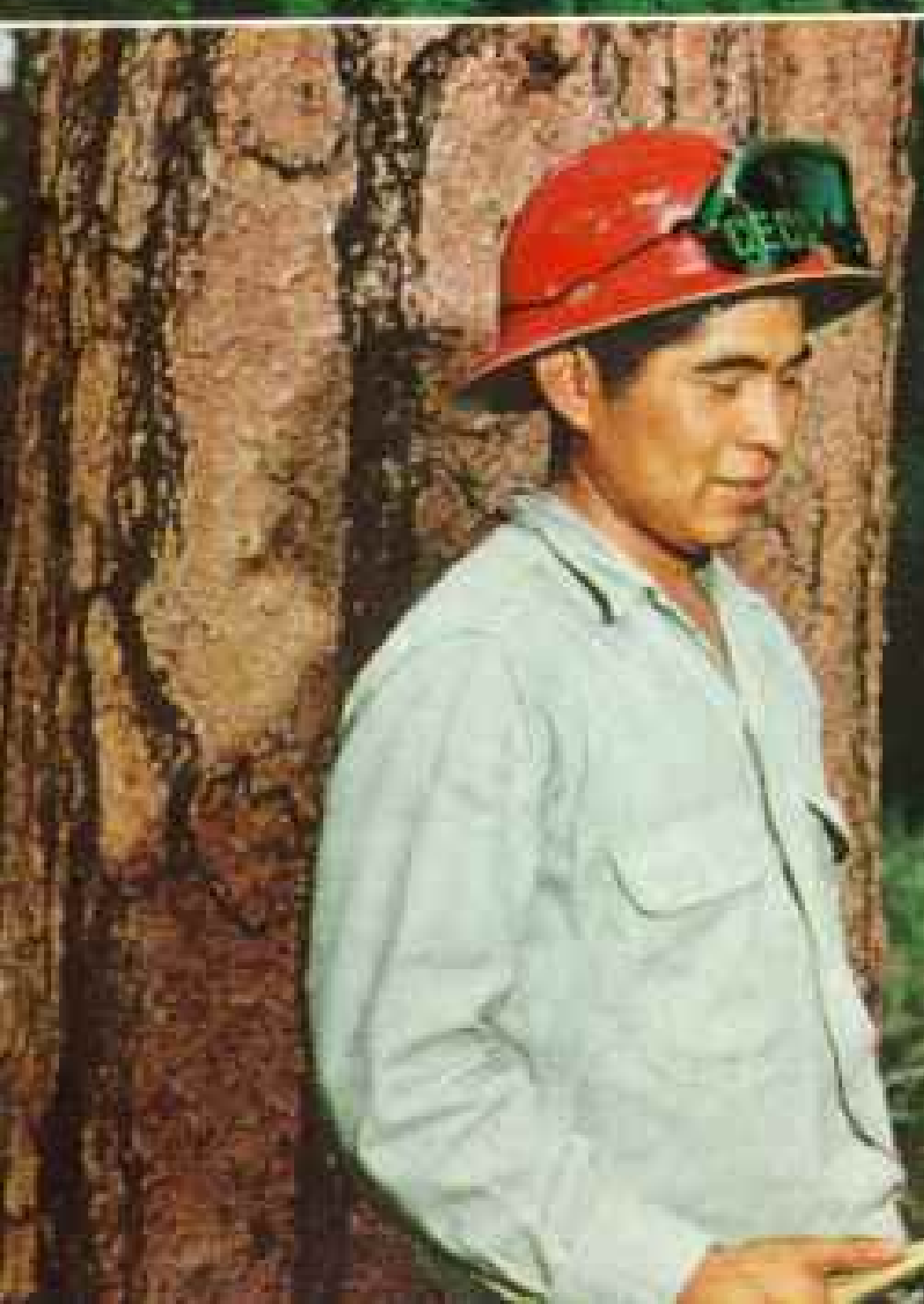
Cattle Move into the High Woods

The Forest Service's 1956 grazing permits for cattle, horses, and sheep will enrich the National Treasury by about $3,000,000.

These Herefords wintered on a valley ranch; here in spring they head for green forage in Payette National Forest, Idaho.

Lowell J. Farmer, U. S. Forest Service



← At Home in the Woods: A Minneapolis Family Camps in Superior National Forest

The United States' 149 national forests range from the cypress swamps and yellow pine groves of the South to the alpine meadows and spruce woods of the Rockies; from the hardwoods of the Appalachians to the towering Douglas firs of the Pacific coast.

An estimated 59 million visitors—an all-time record—will picnic, swim, camp, fish, hunt, and ski this year in these forest playgrounds.

For rugged vacationers, the Forest Service maintains 14 million acres of wilderness.

Except for official use, planes may not land in or fly below 4,000 feet over the roadless areas of Minnesota's Superior National Forest.

Canoes took Mr. and Mrs. Eli Steffy and their three youngsters to this secluded glade, one of their campsites on a 19-day trip.

← Hopi Indians Prune Pine Trees of a Colorado Plateau

Page 294: A tenth of the Nation's lumber comes from national forests. Although the Forest Service does no commercial logging, it sells standing timber to private mills.

Foresters make a survey to determine which trees should be cut, then advertise the timber for sale to the highest bidder. Harvest never exceeds growth.

Pruning and thinning done by Cecil Johnet (left) and Hopi crew leader Homer Koylyumptewa help to improve growth in this ponderosa pine forest. Cutting of lower branches from young trees ensures more knot-free lumber.

Pine Cones Come in Many Sizes →

Shore pine's thimble-sized cone is dwarfed by the fruit of the sugar pine (upper) and the Coulter pine. These youngsters compare specimens at the Institute of Forest Genetics (page 291).

miles north into the Sierra, building an aqueduct system that cost a good $90,000,000.

This Los Angeles-Owens Valley Aqueduct bores through mountains, descends hills, and even flows through the blazing Mojave Desert to bring the city more than half of its domestic, industrial, and irrigation water—and nearly every drop comes off the Inyo National Forest on the east Sierra slopes.

A portion of the Los Angeles supply comes by another aqueduct from the Colorado River. Here again national forests play a vital role; 23 of them in five States guard the Colorado River watershed.

How does a forest protect a watershed? I learned the basic facts at the Forest Service's Coweeta Hydrologic Laboratory nestled in the Appalachians in western North Carolina near the Georgia boundary (page 300).

Dropped leaves, needles, dead limbs and plants, even the fallen bodies of trees help form topsoil. This precious material the trees bind with their roots, so that neither wind nor water can dislodge it.

Water can soak down through topsoil instead of running off on the surface. Some goes deep underground to form the reservoir —the water table—we tap when we dig a well; some bubbles away to streams and rivers.

Water under such natural control does not tear the soil from its lodgings or fill rivers with silt. But Edward A. Johnson, Coweeta's youthful director, took me into his hills to see what happens when somebody tampers with a watershed's guardian forest.

"We've done some terrible things to these lovely hills in the name of science," said Ed. He stopped the jeep.

"Here, for example, is what is left of a typical steep mountain farm. We had a local farmer come in to clear the trees and put in his crops. One summer storm washed 76 tons of topsoil down into the catchment basin on the stream. We weighed every pound of it.

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An Avalanche Set by Shellfire Charges Harmlessly down a Utah Ski Slope

Utah National Guard men, at the request of the Forest Service, fired a 105-millimeter howitzer at this mountainside above Alta. When the slide stops, the run will be safe again. The breakaway point, or fracture line, shows clearly near the mountaintop.

"They told me this thing was traveling 100 miles an hour," said National Geographic photographer Campbell. "Seconds after I made the picture, I was engulfed in a swirling cloud. Later I saw chunks of snow the size of a desk scattered for a quarter mile around the valley."

William Campbell III, National Geographic Staff

↑ Plane Broadcasts Pine Seed Across Louisiana Grasslands

Southern foresters, eager to restore cut-over stands of valuable pine, aid nature by artificial seeding. Here in Kisatchie National Forest a Forest Service chartered plane scatters 12,000 longleaf pine seeds to the acre. Ten to 30 percent of the seeds will produce established plants.

←Birds and rodents have long harassed restocking efforts by gobbling up sown seed. New repellents help to check the thievery. Seeds treated with one non-poisonous chemical have yielded 4,500 seedlings to the acre, as against 195 with untreated seed.

Shown in a laboratory experiment, this mourning dove (rear) and red-winged blackbird display scant interest in seeds painted unnatural colors and sprayed with repellent.

and there it is, overflowing that big bin.

"After seven years the corn crop wasn't worth the trouble of planting; previous crops had taken just about all the nutrients in the meager woods soil. Our farmer friend picked up and moved.

"We proved here you shouldn't farm unsuitably steep slopes."

I saw other Coweeta watersheds that had been overgrazed, carelessly logged, or otherwise deliberately maltreated. In varying degree, the result was the same: too little stream flow in dry weather; floods, erosion, and silting in wet; erratic or unproductive wells.

"From Coweeta and similar outdoor laboratories elsewhere in the country, we've learned there are basic principles for the management of all watersheds, whatever the varying local problems," Ed concluded.

"You must keep the watersheds in cover. Whatever is best suited to individual soil, climate, and degree of slope is the best cover as a rule. For most steep watersheds in this country the prime cover is forest."

Good forestry can improve upon nature. A classic example is furnished by an experiment on part of a watershed serving Denver, Colorado. Originally it was heavily forested with lodgepole pine. But too much snow caught in the dense trees, evaporated, and never reached the ground to melt. The Forest Service thinned the lodgepole, and now the watershed produces more water.

Eroded Hills Invite Flash Floods

Only when rain or snowfall is abnormal does a healthy watershed produce floods; far more often, it prevents them. The Angeles National Forest, which covers the San Gabriel Mountains and their foothills, undoubtedly keeps whole sections of the sprawling city of Los Angeles from inundation by mud and water during the rainy season in winter.

Stands of pine and fir keep the very erosible soil in place on 96,000 high acres. Dense chaparral performs the same function in the lower foothills.

When something takes off the cover—and "something" is usually fire—only expensive flood-control works can stop the destructive rush of water.

A fire burned about 5,000 acres in one canyon on the Angeles in 1933. A flood followed, taking 30-odd lives and either destroying or badly damaging 400 homes in La Crescenta and Montrose. Heavy rains hit other sections of the Angeles too, but the floods came only from that one burned canyon.

The watershed value of the national forests is inestimable. You cannot mark down a dollars-and-cents figure for it. But timber and grazing uses do carry a price tag. Forest Service headquarters estimates they will bring more than $100,000,000 into the United States Treasury during 1956.

Like watershed, recreational use of the national forests has no hard-and-fast value; yet there is reason to believe it is now, or is well on the road to becoming, the second greatest asset of the public woodlands.

Another Forest Product: Serenity

As near as the Service can estimate, there will have been 50,000,000 visits to the national forests this year by folk who picnicked, skied, camped, hunted, fished, or just got away from it all. James K. Vessey, one of the wisest heads I encountered in the Forest Service, believes all these visitors took far more than happy memories home with them.

"This is the age of crowding into great cities, an era of tension-breeding hurry," said Jim, an assistant regional forester at Milwaukee, Wisconsin.

"Now, I'm a forester by profession, not a health expert, but I read in the newspapers how mental illness and juvenile delinquency are getting to be serious problems. I have a hunch some relief, maybe even an honest-to-goodness cure, might be to get a little solitude once in a while, in the kind of surroundings the good Lord originally meant man to live in."

When I traveled, it was out of the main visiting season for the forests, but I did see a little of the varied fun that people get from these havens of greenery and peace.

Take the April day, for example, when I soared in a Forest Service plane above Mount Hood National Forest in Oregon, looking down on some of the last extensive virgin timber stands in the United States. Giant fir clothed the mountains.*

Surprisingly, the country looked fairly open, although Monte Pierce, my pilot, said part of it was so steep that no logger had ever tried to operate in it. Virgin forest is more parklike than most people imagine. The ancient trees have crowded out younger competitors and underbrush.

* See "Wealth and Wonder of Northern State Trees," by William A. Dayton, National Geographic Magazine, November, 1953.

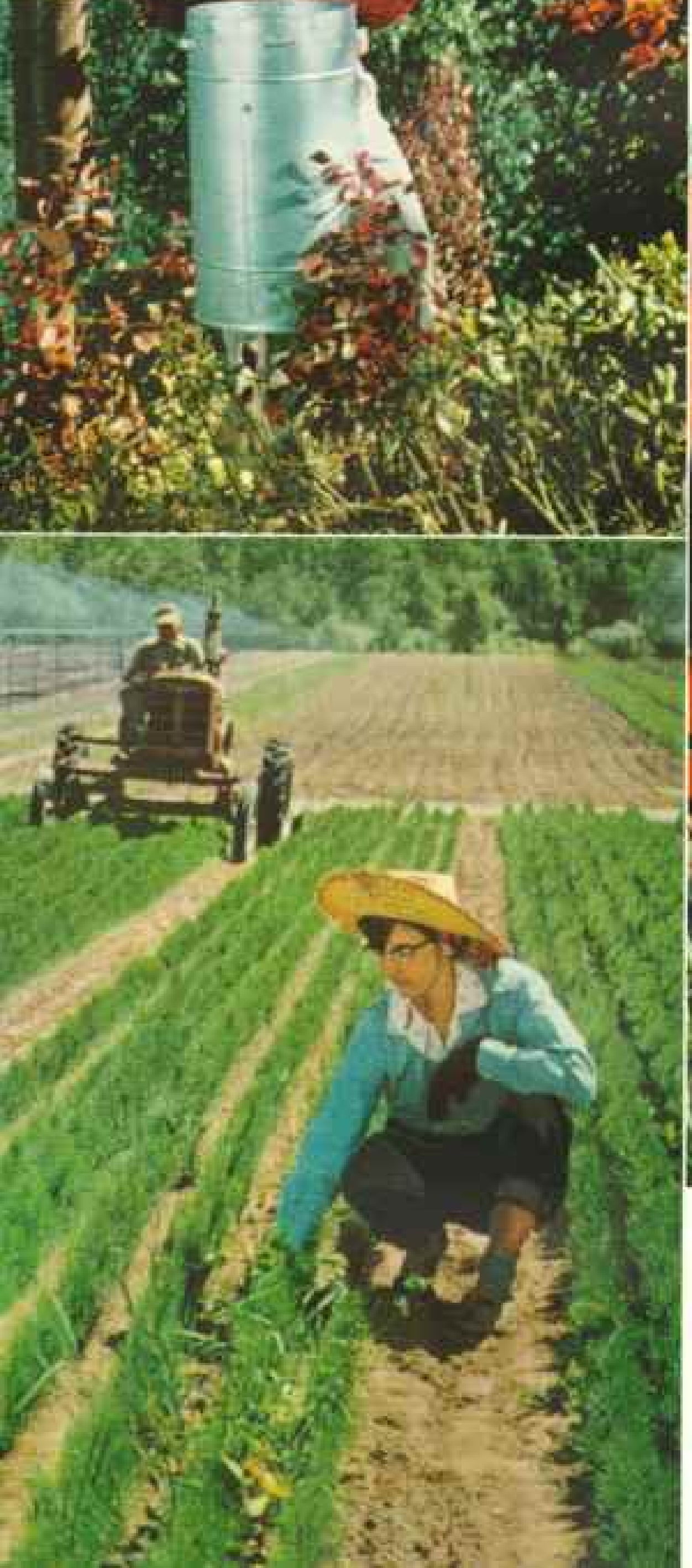
How Much Water Does a Forest Drink? Coweeta's Mountains Yield the Answer

These North Carolina watersheds serve as an outdoor laboratory for Forest Service scientists.

Following a six-year study of the natural water flow from this area, workers clear-cut the slope in the background, leaving every tree and bush where it fell. Each year they cut back new growth. Another forested watershed near by was cleared and cultivated; a third was fenced and the woodland grazed; a fourth was crudely logged. Throughout these experiments, weather stations and rain gauges (foreground) recorded the climate.

After 11 years this clear-cut slope showed increased streamflow, but there was no erosion because forest debris had protected the soil. Excessive runoff badly eroded the other three experimental watersheds, with severe soil loss.

By such experiments scientists learn forest management that yields clean, pure water.



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↑ Machine Plants 8,000 Trees a Day

Riding a tractor-drawn planter, the operator sets out red pine seedlings in a denuded section of Michigan's Ottawa National Forest.

←This Forest Service nursery near Watersmeet, Michigan, grows some 15 million pine and spruce seedlings a year. Workers weed the young plants by hand. Overhead pipes supply water.

We circled the beautiful mountain for which the forest is named. Beneath us incongruously appeared a parking lot with gleaming cars, and chimneys thrusting out of deep snow.

"What in the world . . .?" I began.

"Timberline Lodge," said Monte. "One of the finest ski resorts in the country. The snow is up to the roof line" (opposite).

Tiny black dots zipped down long white slopes like water bugs on a pond. We angled sharply for a closer look.

Plane Sends a Skier Sprawling

I think we caused a spill. A girl with streaming blond hair, gliding down the run, looked up and spotted us aiming in her general direction. She sat down abruptly in a shower of snow. Should she read this, Monte and I offer our apologies.

In striking contrast to the ski resorts that dot the northern forests from New England to the Pacific is Alexander Springs on the Ocala National Forest in Florida. Here people swim the year round in a crystal-clear pool where the water temperature hovers around 76°. Fishermen catch epic largemouth black bass in Alexander Springs Creek.

Tracks of the puma (locally called panther) show at sunup on the sands where fishermen have cleaned their catches. Fred Schultz, who operates the bathhouses and store, is full of "panther" stories.

"All of them phonies," baited Larry Newcomb, supervisor of Florida national forests.

"Why, durn it," retorted Fred, "only a month or so back I stood 15 feet from a mother 'panter' with two kittens. The kittens came to look me over, and ole maw just yawned; she knew who'd been leaving fish out for her!"

When we were out of Fred's hearing, Larry admitted to me that there were, indeed, panthers on the Ocala, as well as bears, deer, ducks, bobcats, and other varieties of furred and feathered game. "But," he added, "I still say that if a mother lion had opened her mouth at Fred, he'd have run so far we'd never have seen him again."

Fishermen—and fisherwomen and fisherchildren—are enthusiastic users of the forests. The stream I remember best was a tumultuous torrent of murky snow melt on the Chequamegon National Forest in Wisconsin. I guard its name; the day I saw it, there were a number of husky local citizens about, spying out the prospects for the imminent first day of the fishing season, and I enjoy life too much to risk giving away the location of their favorite fishing waters.

That day the rainbow trout were battling their way upstream to spawn. Whump! A streamlined iridescent torpedo shot from a deep pool into the rapids. The shallow, swift water barely reached to his dorsal fin, giving very little purchase to his powerful propulsive machinery. Nevertheless he made it to a higher pool, there to regain his strength for the next rapids.

There is so much fishing in the national forests that some of the streams and lakes must be stocked. J. Baylor Roberts, who made the photographs that illustrate this article, told me about an ultramodern method of stocking a lake.

"I was flying with a Forest Service pilot over the wilderness area of Superior National Forest, looking for a camper to photograph," he said (page 294). "The pilot remarked he wished he had his fish tanks in, he'd stock a back-country lake.

"I wanted to know how we could make pictures and stock a lake all at the same time. He said we wouldn't even have to land. They'd worked out a way to dive low, pull a lever, and literally bomb the lake with fingerling trout.*

"I asked him if the drop hurt the fish. 'No,' he said, 'unless I miss and drop them in the trees.' Quite a joker, that boy; he told me they put a couple of flying fish in each tank as instructors for the trout!"

Logging on the Lush Oregon Coast

You see Forest Service cooperation with private enterprise at its very best when you see a logging operation. The Service never does any commercial cutting, but sells the public timber on the stump to lumbermen who fell it and haul it away to the mill. I saw a timber sale on the Cascade Head Experimental Forest, a part of the Siuslaw National Forest on the Oregon coast.

Behind it lay months of planning. Carl Berntsen, who runs the experiments on the Cascade Head, had decided a tract should come down; it was overmature. Old trees had virtually stopped growing. While they awaited natural death, they were smothering new growth.

* See "New England, a Modern Pilgrim's Pride," by Beverley M. Bowie, National Geographic Magazine, June, 1955.

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Skiers Coast down the Roof of an Inn Buried in Oregon Snow

Winter guests use tunnels to enter Timberline Lodge, a resort in Mount Hood National Forest.

The tract was Douglas fir. Had it been regular national forest, not an experimental area, it would have been put to bid. The winning operator would have signed a contract with the Forest Service, agreeing to build the logging roads to Service standards. Sometimes the Government builds the roads. Either way, they remain Government property, for the future use of hunters, fishermen, fire crews, or other loggers.

Carl's operator went into the woods under the terms of a negotiated agreement. He assented to the usual Forest Service stipulations as to good forestry—for example, not to disfigure the hills, lest erosion begin; to halt operations on days of high fire danger; to dispose of waste limbs, tops, and chunks.

Now the loggers came in, each crew with a gasoline-driven chain saw. Not for the modern lumberjack is the slow labor of handsawing. The power saw can cut down any but the very largest tree in ten minutes or so (page 316).

At points selected for loading the logs onto trucks, spar trees were left standing. Daring high climbers went up these giants to strip them of branches and attach to their tops the long tackles that would be carried out into the woods to bring the timber in to the base of the spar tree.

In lumbermen's parlance, this was a "high-lead" operation: the tackle angled down from high up, so that it would lift the logs as it pulled, thus keeping them from fouling on rocks and stumps.

Horses or oxen brought in the logs in the old days. The modern high-lead rig has a gasoline or diesel engine. It can bring in several logs at a time, with amazing speed.

Caterpillar-tracked monsters called "jammers" stood at loading points to lift the logs onto huge trailer trucks. The drivers of these trucks must be among the world's most skillful; I saw them nonchalantly taking their 75-ton loads down logging roads on which I would hesitate to drive a jeep (page 319).

These loggers on the Cascade Head were handling big trees—300 or more years old, five or six feet in diameter, 200 feet high. This was saw timber. From it mills would cut boards and structural lumber, after setting aside the best clear bolts to be peeled into thin layers of veneer for plywood.

Pines Replace Cotton in Worn-out Fields

In the United States more wood is still cut for lumber than for anything else, but cutting for pulp is increasing. A pulp mill, obviously, can use smaller trees than a sawmill can, for the pulp mill grinds up everything.

Blessed with normally abundant rainfall and a long growing season, the South has for some years been steadily increasing its pulpwood production, stocking thousands of acres of cutover woods and worked-out cotton fields with valuable pines (page 298). Every year the West uses more logging waste, formerly burned or left to rot, for pulpwood; the North has long had a big pulp industry.

Out in the Superior National Forest of Minnesota, near Ely, lies Forest Center, a logging camp operated by the Tomahawk Timber Company. Tomahawk has a 25-year contract with the Forest Service to cut some saw timber and lots of pulpwood on many thousands of acres.

The operation represents the best kind of modern forestry. The company makes money on the wood it cuts, many hundreds of people get employment, local and Federal treasuries are swelled, and the Forest Service gets thousands of acres newly cleared for the planting of high-grade pine seedlings.

I drove along one of Forest Center's logging roads with Ranger Gus Block. Hidden power saws snarled in the woods on either hand. If the felling was modern, the haul to roadside was not; horses skidded in the logs, as in the old times.

The lumberjacks lived in trailers and shacks that moved ever deeper into the forest as the operation progressed. One or two had their wives with them, but most had automobiles parked handy and went home to neighboring towns on week ends.

One husky jack complained there was still too much snow in the woods to make logging either pleasant or profitable; the men are paid by the number of cords they cut. Quite casually, the man mentioned seeing moose and timber wolf tracks in his section of woods.

"What would you do if you walked up on either one?" I wanted to know.

"Just start up the chain saw," he grinned. "Nothing can stand that noise, not even my wife."

Despite the power saws and automobiles, something of the old logging camp flavor still clings to a place like Forest Center. Plenty of old-timers still work in the woods, men who can swing a double-bitted ax as though it were a ping-pong paddle.

Saturday nights are lots quieter, however. Tomahawk frowns on carousing, and Selma Niemi sees to it that loudmouths don't eat.

Swedish-born widow of a Finnish woodsman, Selma cooks for the Forest Center mill hands, office hands, lumberjacks strayed in from the woods, and visiting writers. Three meals a day she turns out for this crowd, and she does all the washing up too.

Silence Reigns at Chow Time

I found out how she manages it when I tried to strike up a conversation with her over my third plate of delicious stew.

"Mister writer, yust look on the wall," she said. "The sign says no talking at the table, und it means it, yessirree. Talking slows down eating, und I got to clean up quick for the next shift.

"Now look, I like you fine, but you finish up in seven minutes like the rest. Quit talking und eat, by yiminy!"

I ate.

"Smart boy," whispered Ranger Block. "Selma could pitch you, me, and three 'timber beasts' out the door at one time. She handled an ax in the woods with the best of them before she retired to this easy job."

But when I left, Selma filled my pockets with huge fresh cookies. "You can take your time und enyoy these," she whispered.

Out in the north woods around Forest Center, Indians trap beaver and gather wild rice. Compared to some national forest uses I encountered, these were fairly workaday.

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Ray Atkinson

Exploding Snow Pursues a Skier Leaping from a Cornice High on Mount Hood

Rangers of the Pisgah National Forest in western North Carolina issue permits for digging ginseng roots. This is valuable stuff; most of it finds its way to the Far East, where it is much in demand among the Chinese as a medicine.

"'Seng" diggers are the mystery folk of the mountains. They work singly and furtively, always watching their back trails lest competitors follow them to their favorite ginseng coves. They drop 'seng seed in secret places. All of them, however, duly check in with their loads at Forest Service ranger stations and pay the Government about $2 a pound for what they have dug.

Worm Grunters Harvest Bait

Another Pisgah familiar is the worm grunter. He jams a stick in the ground and rubs it with another, which produces a grunting sound. Vibration makes the fishing worms come up, and the worm grunter catches them for sale to cityfolk. These fellows don't have to pay a fee.

In the West, rangers issue permits to gather sword fern. This sells readily to florists, as does the galax similarly taken from southern national forests. California rangers told me they sold gnarled manzanita bushes and a kind of wild buckwheat; with these, the florists make the familiar living-room decoration known as a "ming tree."

Then there is the apiarist. On a nationwide scale he is big business. In his pickup truck and small trailer loaded with hives of honeybees, he follows the flowers wherever they bloom. I saw some of these apiarists in the Ocala and Osceola National Forests in Florida, where they had stopped to let their bees make honey from the blooms of tupelo gum and titi bushes. Here they sometimes argue with bears.

Most beekeepers protect the portable hives with electrified fences. This keeps nearly all the bears out, but sometimes a tough honey-struck bruin will grit his teeth, ignore the shock, climb the fence, and set to in the hives.

For reasons I do not know, many southern countryfolk have no fear of a bear. When a bear gets in the hives, a beekeeper will charge out of the truck and attack it with anything handy, usually a pine knot.

Many a country church stands free on a national forest. Scouts, civic and religious groups, and conservation organizations can rent summer-outing camps from the Forest Service for a nominal fee. In areas unsuited to general public use, the Service will rent you a plot for a reasonable fee, and on it you can build a summer home. The Service keeps a veto right, in case you want to build something out of character with the forest.

Ranger Chet Olson on the Coconino National Forest in Arizona rents locations to moviemakers. For a big picture needing lots of room, the Government may get as much as $50 a day per set—a mighty modest price for the glories of Oak Creek Canyon and the fabulously beautiful red-rock country at its lower end. Chet showed me a complete town built by the moviemen and already used in several westerns.

"They put up different signs, new building fronts, and new paint jobs for every picture," he said. "It wouldn't do, they tell me, for people to know they were seeing the same old place every time.

"You ought to see them age a brand new building. They spray some kind of stuff on the raw yellow lumber, and in an hour it looks like it's been weathering 100 years."

Pests Kill More Trees than Fire

The job of protecting all the varied wealth that lies sprawled in the national forests is a formidable one. Fire, bugs, disease, storm, misuse, harmful animals—the woods have a host of enemies.

Heretical as it may sound, the old axiom that fire is the main enemy is beginning to be questioned. Fire is still a tough customer, but insects and disease, the most recent figures disclose, kill ten times as many trees.

For one thing, fire fighting is becoming more efficient each year. Exploration and inventory of our national forests and their contents, on the other hand, is only just being

(Continued on page 315)

A Sturdy Brown Bear Named Smokey ➔ Serves as the Nation's Chief Firewarden

Smokey reminds Americans that men cause nine out of ten forest fires. A match dropped in the underbrush, a still-smoldering campfire left behind—and a cool green forest turns into an ugly, desolate waste.

Conservationists erected this 26-foot statue of Smokey and his helpful cubs in International Falls, Minnesota. The friendly bruin wears blue jeans and a ranger's broad-brimmed hat and carries a fire fighter's shovel. Upraised hand pledges watchfulness in the forests.


SMOKEY
SMOKEY SAYS
PREVENT FOREST FIRES

Maelstrom of Fire Roars Through a California Forest. Trees Bend Before Hot Winds

Brush burners near Sequoia National Forest started the McGee fire that raged for two weeks in September, 1955. Some 52 million board feet of timber were destroyed.

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Flames Leaping Hundreds of Feet Bathe Earth in the Fiery Light of Death

Racing across heavily timbered terrain, the blaze nears State Highway 180, gateway to Kings Canyon National Park. National Geographic photographer Roberts filmed the scene from a helicopter supplying the fire fighters.

↓ Ride's End: Man Meets Trees

Smokejumper's 28-foot parachute is brightly striped for visibility from the air. Two vents in the nylon permit steering.

This jumper manipulates shroud lines as he drifts down among Douglas firs. He carries 100 feet of rope for descent in case of a treetop landing.

↑ Smokejumpers Plunge into Montana Woods

Fires in remote back-country areas are the smokejumper's specialty.

Within two hours or less after a fire call, an aerial fire-fighting crew is usually at the blaze. Jumpers try to land 300 to 900 yards from the fire. Tools follow by parachute.

Two-man teams snuff out small fires; as many as 75 jumpers drop to fight fast-spreading conflagrations.

These jumpers spilling from a DC-3 were three of the scores of trainees in the Forest Service's smokejumping school at Missoula, Montana, last year. Here on graduation day they made their last practice jump. Later they saw duty in the national forests of Montana, Idaho, Oregon, Washington, and California.

A Parachutist Lands Safely; → His Job Has Just Begun

Reinforced suit, helmet, and mask guard against injury on landing. The jumper quickly strips off the protective clothing, stuffs it into a sack, and heads fireward. Plane ride, jump, and fire quenching may require only a few hours; the hike back through dense, trailless woods may take days.

← Timbermen Call Porky the Forest Gangster

Wherever the porcupine travels on his nocturnal hunts for food, dead or dying treetops mark his path.

Porky kills or stunts young trees by gnawing into the inner bark and cambium layer, which are vital to the trees' growth. If a crippled tree matures, its yield of timber is reduced.

↓ Western Pine Beetle: Small but Deadly

Insects kill seven times more saw timber than does fire.

The western pine beetle, no longer than a grain of rice, preys on ponderosa pine. The female bores winding channels through the inner bark to deposit her eggs. When galleries girdle the tree, it dies (lower). A fungus introduced by beetles often cuts off sap and hastens the conifer's death. This adult beetle is about eight times life size.

A Forest Service Crew Sprays an Engelmann Spruce Infested with Bark Beetles

Pests cause a multimillion-dollar loss each year in national forests. Spraying, logging, and sometimes the burning of infested trees check epidemic outbreaks. These men work in Lolo National Forest, Idaho.

West Coast Men Battle Wood and Water at the Annual Loggers' Jubilee

For two days each summer the sawmill town of Morton, Washington, takes on the air of an old-time logging camp. U. S. and Canadian lumberjacks compete with saws, axes, and modern machine tools.

Above: A contestant's crosscut saw whines through wood as a judge keeps time. One champion, performing on a TV show, cut a 30-inch log in a minute and 17 seconds.

Below: Birling, the art of spinning a floating log, calls for fast footwork. Losers end up in the pond.

completed, and the Service now has more complete information on how much timber the insects and tree ailments are taking and probably have been taking ever since there were forests in the Nation.

Yearly the tree scientists step up their battle against the silent killers. They spray great forest areas by air to kill the oddly named spruce budworm, which actually does most damage to balsam fir and the valuable Douglas fir (page 320). To control Engelmann spruce bark beetles, they squirt insecticides on individual trees (page 313). To keep white pine blister rust from spreading, they destroy currant and gooseberry bushes; the disease does not pass from tree to tree, but must spend part of its life cycle in these bushes.

In one of the Forest Service entomological laboratories I met a wasplike creature that is a friend of trees. He is so tiny I could not see him clearly except through a microscope. He nevertheless is a parasitic foe of forest-destroying bugs. The Service wants to encourage this little fellow and others like him, for a natural enemy is one of the best checks on a pest.

Flames Can Leap a Mile-wide Lake

Fire, that roaring enemy capable of leaping a mile-wide lake in a few seconds, has always been the sort of clear-cut opponent that Americans understand.*

Unfortunately, we are still prone to underrate that adversary until he strikes. For the past several years we have been averaging about 175,000 forest fires annually, and we started 90 percent of them ourselves, sometimes deliberately, but more often through sheer carelessness. Despite Smokey Bear, the campaign in the field of public education is not yet won (page 307).

We're lucky, then, that fire fighting today is a lot more efficient than it used to be. In addition to modern techniques, fire fighters have superb equipment—airplanes, helicopters, all-terrain ground transport, and radio communications.

Road and trail networks, over which they can speed instantly to a smoke, reach farther into the forests every year. For the areas where there are no roads, there are the famed smokejumpers (pages 310 and 311). The Forest Service's Equipment Development Center at Arcadia, California, works steadily at improving fire pumps and tankers, fire-line trenching machines, and other devices that go into the field with the fire crews.

"Actually, however," as one expert told me, "I don't believe that equipment improvement and development alone will show us how to keep from having the relatively few big fires that cause the most damage. I think our researchers must let their imaginations soar into the wild blue yonder for answers that today would seem fantastic."

Experts Study "Blowup" Fires

Such a one is George M. Byram of the Service's Southeastern Forest Experiment Station at Asheville, North Carolina. He is one of the men who are trying to find out what makes an ordinary, garden-variety forest fire—the kind that any competent fire crew can quickly cool—suddenly explode into a major conflagration.

Foresters call this a "blowup" fire. The McGee fire that last year nearly overran the General Grant Grove within the boundaries of the Kings Canyon National Park of California was a blowup (pages 288 and 308). So were the fires that turned Oregon's verdant Tillamook hills into ghastly barrens.

These infernos trap fire fighters, wipe out woods communities, and create fiery tornadoes that sometimes send swirling columns of gases and hot air 25,000 feet into the heavens.

"We can't give you the final answers on blowups," said Ralph M. Nelson of the division of fire research at Asheville. "We have made some interesting discoveries, however. One is that, in addition to the usual factors like fuel and ground-wind velocity, a turbulent atmosphere and jet streams of some kind tend to make an ordinary fire explode into a blowup.

"I don't mean the jet streams that race around the earth 20,000 to 40,000 feet high. I mean smaller ones that come far closer to the earth. We call them 'jet currents.'

"Any wind currents, of course, vary in speed. No rule to it—it's just a natural thing, the way one fellow will drive his car a little faster than another.

"Now when you have a wind that increases rapidly in speed as it goes higher into the air, you know what to expect. But when the wind speed *decreases* with height—in other words, when the upper winds are lagging behind the lower, thus creating a jet current—

* See "Forest Lookout," by Ella E. Clark, National Geographic Magazine, July, 1946.

"Timber-r-r-r!" Giant Douglas Fir Topples Earthward

A chain saw fells a mature tree in Gifford Pinchot National Forest, making way for new growth. This job took 10 minutes.

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↟ Pulpwood Packs a Cove on Lake Superior

In 1956 the Forest Service will sell more than $100,000,000 worth of timber, turning over the proceeds to the Treasury.

Spruce and balsam thinned from Superior National Forest make up most of this vast floating woodpile. Enclosed by a log boom, the raft holds some 3,500 cords. A tug will tow it 80 miles across the lake, at a mile an hour, for rail shipment to a paper mill.

An Arch Takes Shape ↠

Laminated wood, parallel layers of wood glued together, is a 20th-century development. Strong and durable, it finds many uses: beams and trusses for buildings and bridges; ship keels; aircraft spars.

This arch was made in Portland, Oregon, for a church in Gary, Indiana.

we find a fire under them mysteriously developing chimneylike convection currents and erratic behavior—and then the boys on the fire lines better watch out!"

Another group of Forest Service researchers and cooperators is reaching into the "blue yonder" out West. These are the workers in Project Skyfire. They hope to stop lightning-set blazes, which are the bane of the rugged and inaccessible national forests in the West and Southwest.

Seeding Clouds to Halt Lightning

They have been trying to find a pattern in fire-causing lightning storms, using specially trained lookouts on the regular Service fire towers to identify clouds, track lightning storms, and learn all they can about their behavior (page 322).

After they have enough data, they will see if they can break up dry lightning clouds before they loose their bolts of fire. When I talked to them, they were planning to seed clouds by plane this summer in Arizona and in the northern Rockies.

Stopping fires is a readily understandable form of conservation. But learning how to use wood more efficiently is conservation too. At Longview, Washington, after touring the 670-acre plant of the Weyerhaeuser Timber Company, I realized I had not seen a sawmill refuse burner, with which so many mills are still equipped.

"We burn our 'dirty wood'—sawdust, bark, and wood that can't be made into salable products—to generate steam and electricity," said Irvin Luiten, who was showing me around. "But we're fast reaching the point here and at some of our other mills where we have to supplement this fuel supply with oil. Wood is cellulose, too valuable to burn; we're turning more and more into useful products."

One section of the plant was taking short, narrow boards and making them into long, wide ones by gluing them edge-to-edge and end-to-end. It struck me that right here may be part of the answer to our growing scarcity of big saw timber.

In the extensive Weyerhaeuser timber holdings there is still much virgin Douglas fir forest, and in this forest are overmature trees attacked by a fungus that pocks the wood with white spots.

The company turns the pocked wood into "driftwood" paneling for homes and offices. I saw some of it in a display building. To me it suggested the pecky cypress and wormy chestnut popular in the East.

"After we've used everything we can for making lumber," Irvin continued, "we'll still have slabs, edgings, and trimmings that do not fall into the dirty-wood category. This we'll chip up for pulp manufacture."

Out of research came these and myriad other uses for wood.* Big companies like Weyerhaeuser have their own private research staffs. Large and small alike, however, lean heavily on the Forest Service's Forest Products Laboratory at Madison, Wisconsin.

Established in 1910, it has so many achievements that I can list only a few here. It pioneered the modern prefabricated house. It developed some of the basic processes that permit pulp mills to use short-fibered hardwoods and resinous pines.

It patented the internal fan-type kiln now in almost universal use. Its research provided the basis for all United States lumber grades. It pioneered in this country the gluing of many strips of wood into massive beams and arches—the process known now as lamination (page 317).

Many modern churches use laminated wood arches. I saw the firm of John Trumpy & Sons, Inc., yacht builders of Annapolis, Maryland, putting laminated keels, stems, and frames into new Navy minesweepers, which must be wooden lest they set off the modern magnetic mines they are designed to sweep.

Discoveries still pour out of the Forest Products Laboratory in a steady stream. The lab only recently announced it had a fiberboard it believes will be able to screen out atomic radiation while allowing life-sustaining oxygen to pass through.

* See "Versatile Wood Waits on Man," by Andrew H. Brown, NATIONAL GEOGRAPHIC MAGAZINE, July, 1951.

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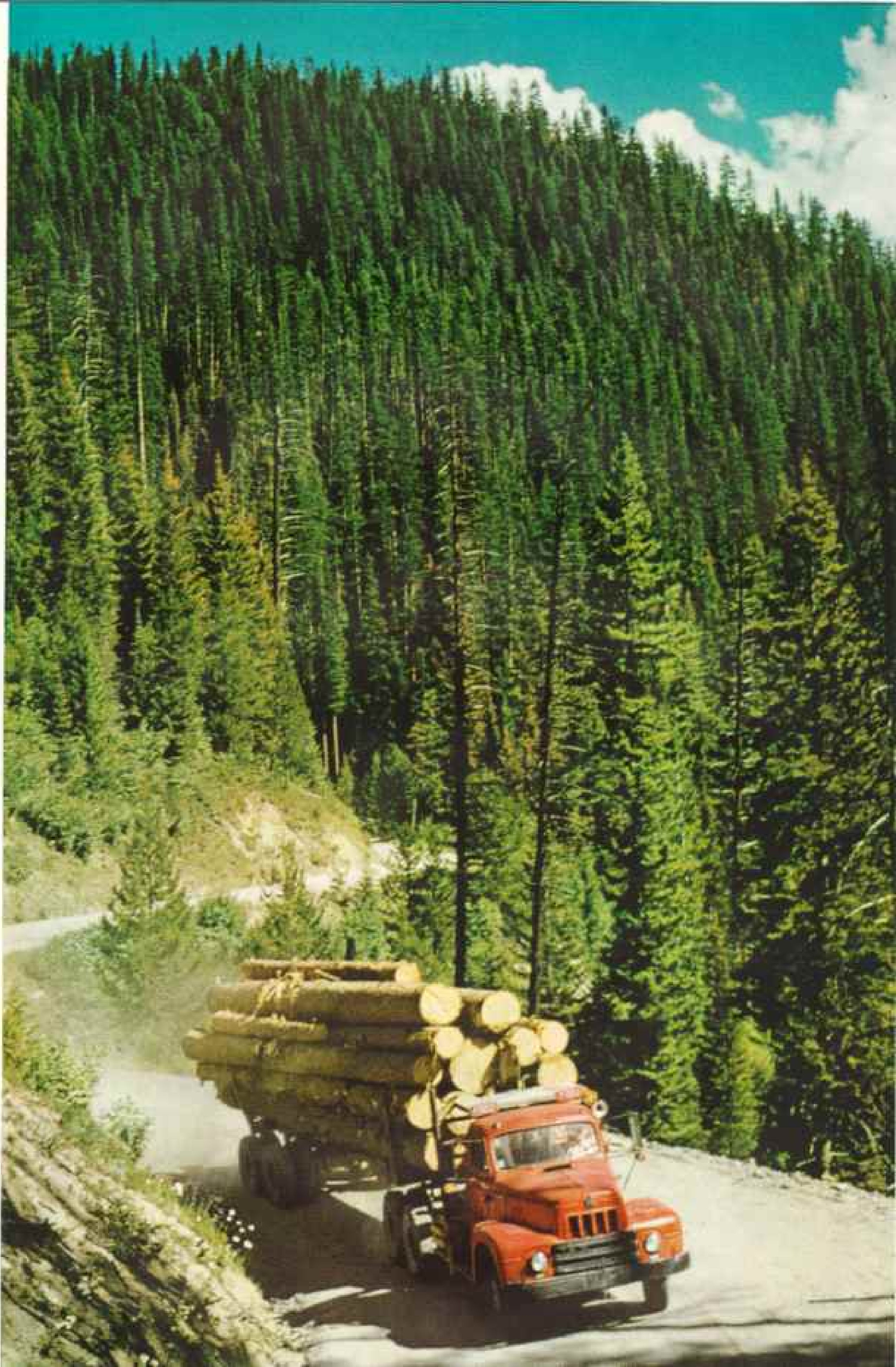
Idaho Logs Ride a Truck from Mountain to Mill →

To carry timber out of forest depths once required expensive rail lines, or planked flumes, which shot logs downhill to the nearest river.

Modern logging firms usually ship by truck. Diesel-powered vehicles carry loads up to 75 tons on special logging roads.

These logs came from spruces killed by beetles in Lolo National Forest. Modern foresters believe in culling old, unhealthy, or dead trees wherever possible, thus lessening fire hazard and giving young trees room to grow.



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A Wartime Flying Fortress Lays a Cloud of DDT Across an Insect-infested Forest

For only a few days in summer does the spruce budworm come out in the open where spray can catch him. In two weeks this B-17 and 13 other planes treated 170,000 acres in Bitterroot National Forest, Montana.

With waterproof paper overlays, technicians now can give low-grade lumber a smooth surface.

"Think of the bleachers at a ball park," said Dr. J. Alfred Hall, laboratory director. "Personally, when I do, I think about splinters. Our new board offers bleacherites of the future a new freedom of action."

Inevitably, the Forest Products Laboratory developed close ties with forest geneticists, since it is possible to grow wood for individual uses. If a livestock breeder can develop one hog for lean hams and another for lard, why should not a tree breeder be able to perform the equivalent forestry miracle?

Tree hybridization holds limitless promise. At Placerville, California, in experimental nurseries of the Forest Service's Institute of Forest Genetics, I saw a row of trees that professional foresters with me could not identify. F. I. (Pete) Righter, in charge of the institute, finally told them it was a three-way hybrid of ponderosa, Jeffrey, and Coulter pines, produced by hand-pollination (page 291).

"It grows fast like Coulter," said Pete, "and shows promise of having the better wood quality of the other two parents. Some day we may have whole forests of this or something even better, turning out quality timber at a rate unknown in nature."

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A cross between eastern white pine and Himalayan white pine may be the answer to white pine blister rust. The foreign tree resists the disease and appears to have passed on this characteristic to the hybrid.

"Breeding trees takes a little time," Pete Righter told me, "but we get results quicker than is generally realized. Fortunately we don't have to have the high degree of uniformity in trees that is necessary in agricultural products. Also, we find that poor hybrids die off speedily in ordinary forest competition, so we get negative answers, at least, in a very short time."

Faster than hybridization is simple selection of the best trees for perpetuation. You merely gather seed from selected ones and plant it. High-quality seedlings usually result.

For even quicker results the forester takes cuttings from the best trees and either grafts them onto established root systems or forces them to make roots of their own. The air-layering of slash pine, an important southern tree, has been developed into a fine art. Branches are made to grow root systems while still on the parent tree. Then they are cut and planted to grow in seed orchards.

Forestry started late in this country; yet it has come a long way since the days of Gifford Pinchot, who had to learn his profession in Europe because there were no forestry schools in the United States.

Out in the woods, according to the Forest Service's Timber Resource Review, the bright spots are the national and other public forests and the holdings of large forest industry operators. But 60 percent of the Nation's commercial forests are owned in small parcels by some 4,500,000 farmers, bankers, doctors, lawyers, and others whose prime interest is not forestry. For the most part, the Review says, their woods are not healthy; they are not being left in productive condition to grow new timber crops.

Cooperating to "Keep America Green"

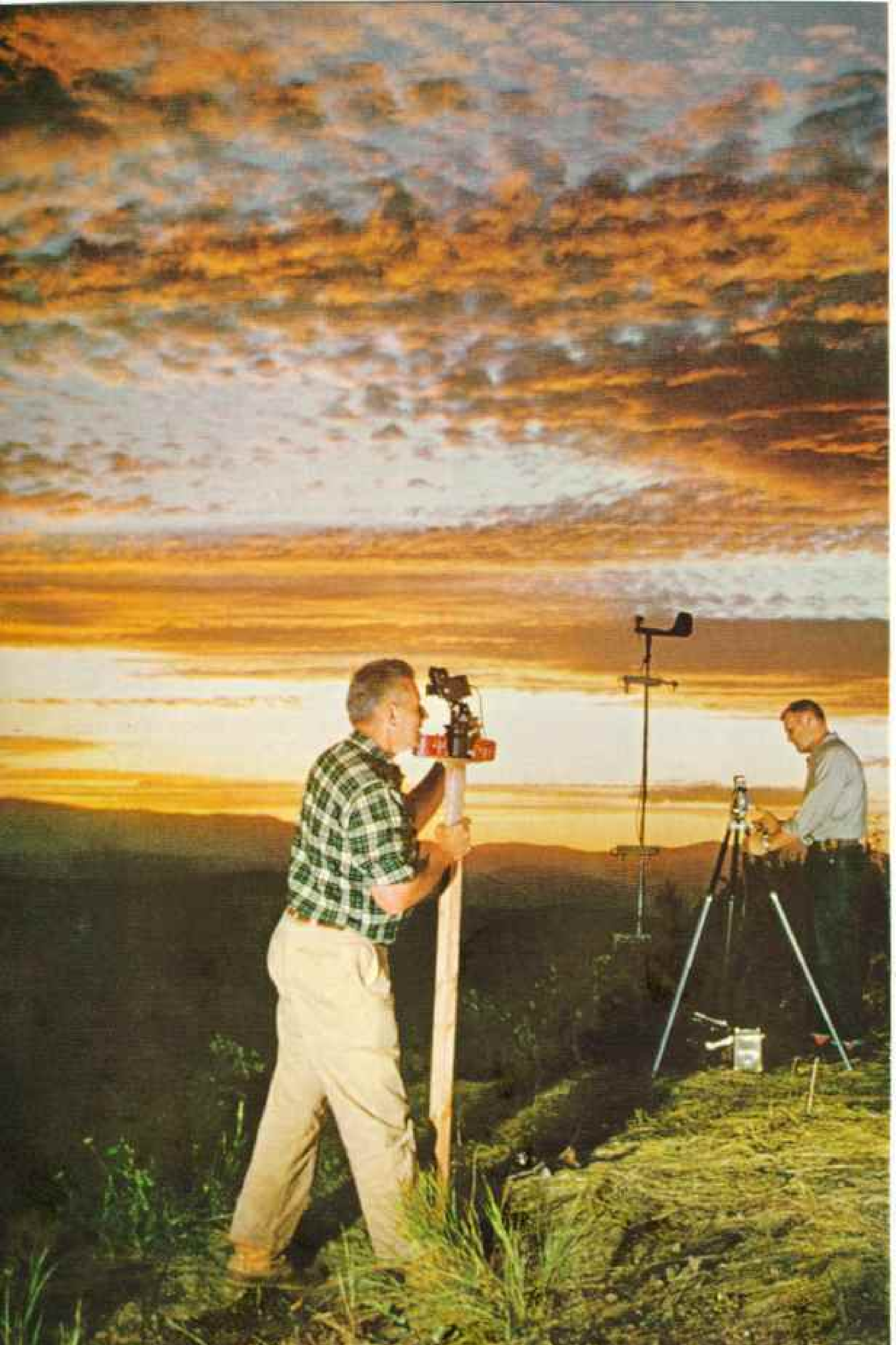
These small owners need to be shown the need for good forestry and how to practice it. For years the Forest Service and State forestry agencies have been cooperating in programs to help them. Results of the teamwork show plainly in organized fire protection and low-cost seedling trees.

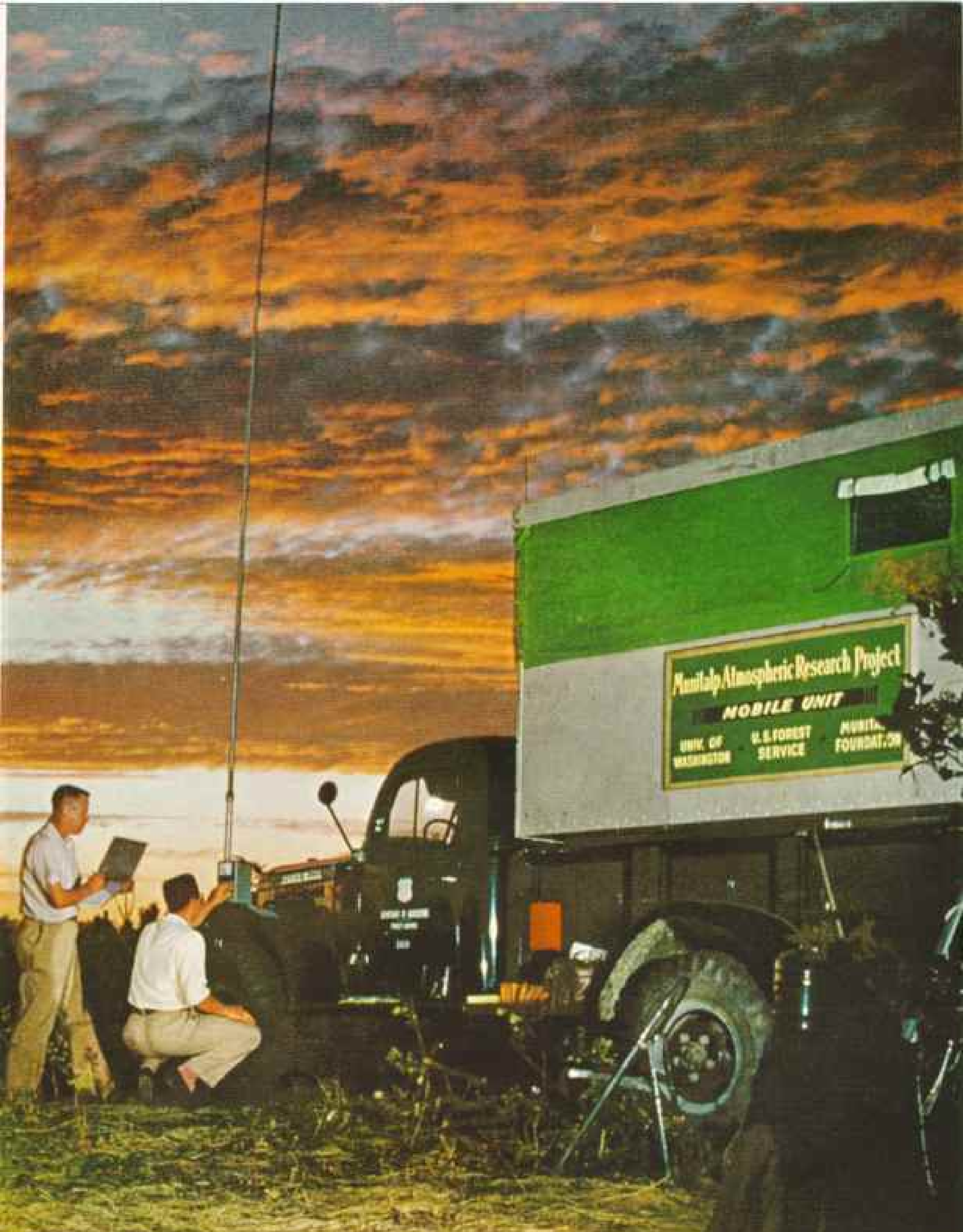
Cooperative project foresters give on-the-ground technical aid to thousands of woodland owners every year. Federal and State extension services give farm forestry information and lend a hand to 4-H youths learning how to take care of trees.

Private groups by the hundreds swell the tide, organizations like the Boy Scouts and the Izaak Walton League of America. The Southern Pulpwood Conservation Association ceaselessly pleads for good forestry in the piney woods; Trees for Tomorrow, Inc., for scientific management in the Wisconsin timberlands. With its nationwide "Keep America Green" campaign, American Forest Products Industries provides valuable help in fire prevention to the Forest Service's and State foresters' Smokey Bear.

When I returned to Washington, I saw chief forester McArdle again. "I hope," he said, "you've seen some poor forest as well as good."

He must have noticed my bewilderment. "I don't want anyone to feel we still don't





Scientists Scan Idaho's Sunset Sky; Project Skyfire Probes the Clouds for Secrets

Lightning ignites some 6,000 fires annually in western forests. Operation Skyfire, sponsored by a meteorological research foundation, the Forest Service, the U. S. Weather Bureau, and others, seeks to determine whether cloud seeding can eliminate lightning. These meteorologists gather data on alto-cumulus clouds over Priest River Experimental Forest. Theodolite (left) measures direction and velocity of cloud movement. Time-lapse camera (on tripod) makes color movies of cloud development. Antenna detects atmospheric electricity.

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Wilderness Riders Follow Danaher Creek in Flathead National Forest, Montana

have a long way to go," he explained to me.

"It's true the national forests are steadily improving, and that a lot of private forest owners are doing an excellent job of managing their timberlands.

"But our population is growing steadily, and this Nation will be making ever-increasing demands on its forests—for wood to supply expanding industries and greater consumer demand, for usable supplies of water, for recreation, and the help toward physical and spiritual health that people can get from the forests.

"If we are to meet these growing demands, we'll have to make our forests more productive than they are now, and then keep them that way. We must make them yield their full potential, nothing less. That is the goal." *

From what I saw of the Forest Service, the work is in good hands. If the Service continues to get the support it needs when the going is rough, then never again should there be a generation of Americans in danger of forgetting the wind song in the trees.

* Further information about the national forests may be obtained from the Forest Service, United States Department of Agriculture, Washington 25, D. C.

Progress and Pageantry in Changing Nigeria

Bulldozers and Penicillin, Science and Democracy Come to Grips With Colorful Age-old Customs in Britain's Largest Colony

By W. Robert Moore

Chief, Foreign Editorial Staff, National Geographic Magazine

With Illustrations from Photographs by the Author

JUNGLE drums talked in excited rhythms as bizarre, raffia-shrouded juju men pranced and twirled. Scimitar-waving horsemen charged past in medieval chain mail and bulky padded trappings. The occasion: to welcome Queen Elizabeth II on her epochal visit to Nigeria early this year.

Wherever the royal party stopped on its nearly 2,000-mile tour of the colony—from the steamy capital of Lagos in the south to mud-walled Kano in the north—gay crowds massed to shout their enthusiastic greetings. Local rulers, shaded by bright ceremonial parasols, paraded in rich flowing robes, ornate turbans, pink coral crowns (page 334).

At Kaduna, capital of the Northern Region, the Moslem emirs and chieftains saluted the Queen at the first durbar, or gathering of princes, to be held for a British sovereign since King George V made his triumphal tour of India in 1911 (page 337).

Probably not since her coronation had Queen Elizabeth witnessed such a brilliant display of pageantry. As for the Nigerians, her visit was for most of them the big event of their lives. It was the first time that a reigning British monarch had toured the colony, and they outdid themselves welcoming her.

No Longer the "White Man's Grave"

Nigeria, a keystone wedged at the curve of Africa's western bulge, is Great Britain's largest colonial territory (map, page 330). For years, thanks to its tropical diseases and enervating heat, it bore the reputation of the "white man's grave." But modern medicine, sanitation, and economic development have largely erased that somber notoriety.*

Today political progress also leavens the country. Though Nigeria still retains many of its native courts, ancient customs, and tribal ways, its people, with British assistance, are acquiring the mechanics of representative self-government.

During her visit the Queen had ample opportunity to observe this rapidly changing pattern of life. She attended the federal and regional parliaments, inaugurated the new Federal Courts System, visited new industrial and power installations. She saw methods of combating the dread tsetse fly menace and inspected educational and medical projects, including the leper colony on the Oji River.

In three event-crammed weeks of travel she gained a vivid impression of the colony's diverse peoples and geography.

Leaf-clad Men Work Beside Machines

In size alone, Nigeria is almost three times that of the British Isles, or about the combined area of Texas and Oklahoma. Its 30 million people comprise some 250 different tribal groups. They range from the larger, more advanced Yoruba and Ibo groups in the south and Moslem Hausas of the north to primitive pagans who wear only clusters of leaves or a waist string of beads.

When I visited the Jos plateau, I saw these pagans incongruously working beside snorting bulldozers and draglines, mining tin ore.

But no less strange were the experiences told me by the manager of a petroleum company drilling for oil in southern Nigeria.

"We ran into a problem with the local people," he said, "when we accidentally disturbed one of their sacred groves. We settled it by paying £10 [$28.20] and furnishing them a white cow, some yams, and palm wine for sacrifices. Another problem was to convince the oil palm growers that our borings would not drain oil from their trees. We're down now to 7,500 feet," he added with a smile, "and the palm trees are still bearing!"

On the January night I arrived by plane at Kano in northern Nigeria, the air was so sharp I was glad I had a topcoat. Next day a cold, dust-laden wind, the harmattan, swept south from the Sahara like thick gray fog.

* See "Nigeria: From the Bight of Benin to Africa's Desert Sands," by Helen Trybulowski Gilles, National Geographic Magazine, May, 1944.

reducing the visibility to a few hundred yards. Yet when I reached Lagos a few days later, I felt my clothes grow damp from the tropical heat almost before the plane wheels touched the runway.

In that 500-mile flight we passed from dry, almost treeless plains, across low bushlands, and then over a belt of high forest before coming down on the hot, humid coast. A tangle of mangroves fringed the shores, threaded by numerous bayoulike river channels.

Riding into town from the airport, I discovered that the capital sits on a low island in a lagoon at the mouth of the Ogun River. A 917-foot causeway to Iddo Island and the 2,455-foot Carter Bridge over the second water gap tie it to the mainland.

Lagos Once Dealt in Slaves

The roots of Lagos reach back to the 15th century, when the Portuguese began trading along the coast. But until a century ago, when the British first set up a consulate here and then established the city as a colony in 1862, Lagos dealt mainly in slaves. In truth, the water channels indenting the entire littoral became avenues for that unfortunate traffic. Since then these waterways have come to be dignified by the name of "oil rivers," from the trade in palm oil.

Lagos remains the colony's chief seaport, shipping the bulk of its cacao, peanuts, and palm oil. Except for the broad Marina (the waterfront thoroughfare) and a few business streets, however, the main section of town still retains a rather haphazard air. Within it huddle the two- and three-story homes of most of the city's 272,000 dwellers.

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← **Britain's Ambassador Extraordinary Inspects Her Country's Largest Outpost**

Early this year Queen Elizabeth II favored Nigeria with the first visit ever paid to west Africa by a reigning British monarch.

With the afternoon temperature hovering close to 100° F., the Queen greets Nigeria's white-robed Minister of Education at Kano, ancient Moslem stronghold of the colony's Northern Region (page 342). Behind her the Duke of Edinburgh talks with the brocade-costumed Premier of the Northern Region. British royal arms hang above the canopy.

After acknowledging a delegation of schoolgirls garbed in vivid red and green, the Queen was whisked from the oven-hot airport to the cool shelter of Kano's mud-walled palace. The royal party's gleaming Argonaut plane waits in the background.

Kodachrome by Brian Brake, Magnum

Now, however, Lagos is undergoing a thorough face lifting as new buildings crop up. First among those to be fully air-conditioned was that of the Federal House of Representatives, opened in 1952.

On the Ikoyi plain, beyond the crowded district, spreads an expanding residential suburb that contains the spacious homes, apartments, and clubs of the European community. A racecourse, golf links, and yacht club provide recreation.

Gay Market a Riot of Colors

Certainly one of the gayest, if not the neatest, places in Lagos is its large open market near one end of Carter Bridge. In the morning hundreds of vendors and shoppers, many of them women, animate its lanes, displaying tropical fruits, vegetables, red peppers, grains, fish, and fowl. Others preside over stalls of brilliant cloths, beads, and imported gewgaws. The new market that was being planned will doubtless be more efficient; it can hardly be so openly colorful.

On the mainland opposite Lagos lies the new port development, opened by the Queen. Swampy areas have been filled in, new roads laid, and brick-stucco buildings are rapidly going up.

"We've space designed to house 60,000 to 80,000 persons. We're expanding the docks and providing for light industries," one of the engineers told me.

At the docks we paused to watch motorcars, trucks, tractors, and mechanical equipment being unloaded from the berthed ships. "Nigeria is getting wheels," my companion remarked. "Something the people did not even know until white men brought them."

"They've certainly taken to the wheel now," I commented, thinking of the motorcars, trucks, "mammy wagons," and bicycles galore with which I had already done battle on Nigeria's roads and streets.

To me, these mammy wagons, or covered carryall trucks, were a source of wonder and awe. Whenever I saw one unload, I marveled how so many passengers, many of them buxom women with bright-eyed "pikins" slung on their backs, ever crowded in. Almost everyone carried baskets, bundles, or big calabashes. That some of the vehicles function at all is almost as great a surprise, for beside these antiques the old one-horse shay would have seemed a late-model vehicle.

Scores of these trucks ply the country roads

Union Jacks Flutter as School Children Salute Their Queen

Elizabeth did her best to see and be seen by most of Nigeria's 30,000,000 people, who comprise more than half of Britain's colonial subjects and whose numbers place Nigeria first among the world's Negro countries. It was an uphill job. The complex land covers an area nearly as large as Texas and Oklahoma combined, but it has only a tenth the railroad mileage and an eightieth as many miles of paved road.

Still largely agricultural, Nigeria sends a never-ending flow of peanuts, cotton, palm oil and kernels, cacao, rubber, and bananas to Great Britain and buys manufactured goods in return. This export-import trade totals more than $400,000,000 a year.

Nigerians greeted Her Majesty's appearances with unbridled enthusiasm. Here, on the spacious racecourse of Lagos, the colony's capital and second largest city, nearly 30,000 school children stage an excited rally.

With shouts of "*Ekabo*" (Welcome) and "*Kabiyesi*" (Long live the Queen) ringing about them, the royal couple ride between ranks of flag-waving admirers. Beside the driver sits Elizabeth's Nigerian equerry, Maj. J. T. Aguiyi-Ironsi, of the Queen's Own Nigeria Regiment (page 332).

Youngsters in foreground wear uniforms of scarlet and blue; teachers dress more decorously.

Said the Queen, still fresh and smiling as she concluded her marathon 20-day, 2,000-mile tour:

"The peoples of Nigeria have welcomed me with one voice, and I hope that this may help you to feel a greater unity among yourselves."

Brian Brake, Magnum

and carry people to and from market. Above their windshields and often on their tail gates they bear such rather alarming slogans as "Abide with Me, Oh Lord"; "Trust in God, and Try Your Luck"; and "The Hand of God on All Roads."

Two less religious carryalls had "Tell Me Another" and "One Way." As the driver of One Way leaned from an open door to look around a cracked windshield while he steered with one hand, I felt that one-way traffic on the road would certainly have been a much safer arrangement.

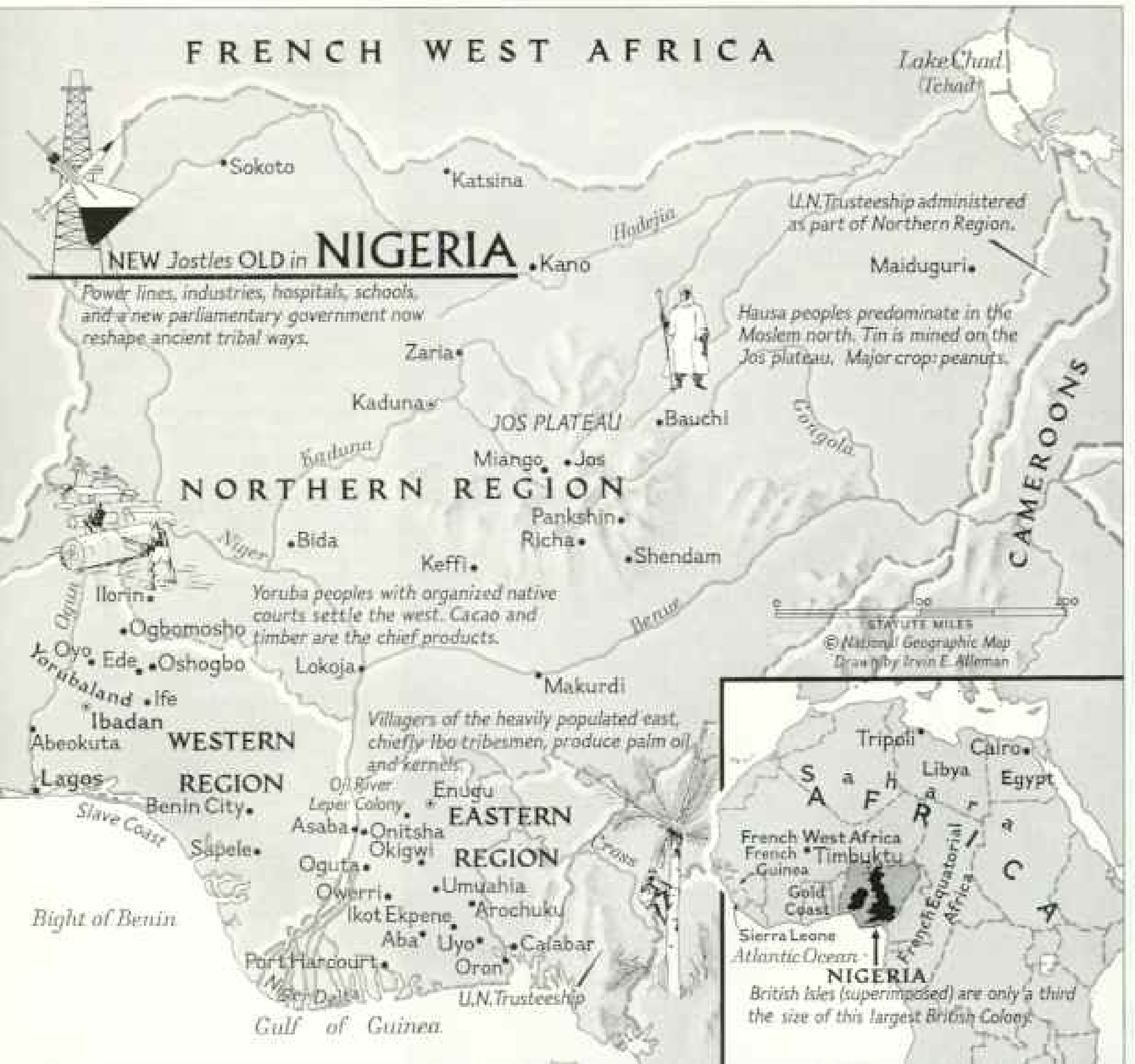
Bicycles are everywhere. The chief aspiration of most Nigerian men apparently is to get enough cash to buy one. In Kano, particularly, I discovered that the renting of bicycles was a thriving business. One odd note: the owners usually keep the original paper wrappings around the frames. They complain as loudly over damage to the paper as to the paint itself.

In oil palm districts, however, bicycles do heavy duty in carting tins of palm oil to purchasing centers. Along the roads I saw some cyclists hauling as many as six or eight four-gallon tins tied on handlebars, luggage carriers, and on either side of the rear wheel.

Leaving Lagos one morning by "kit-car" (half-ton pickup truck), with my cases, cameras, and an extra drum of gasoline in the rear, I set out with a driver to explore the Western and Eastern Regions.

(Continued on page 339)

Populous Nigeria Stretches from Steaming Rain Forests to Sahara's Dusty Edges



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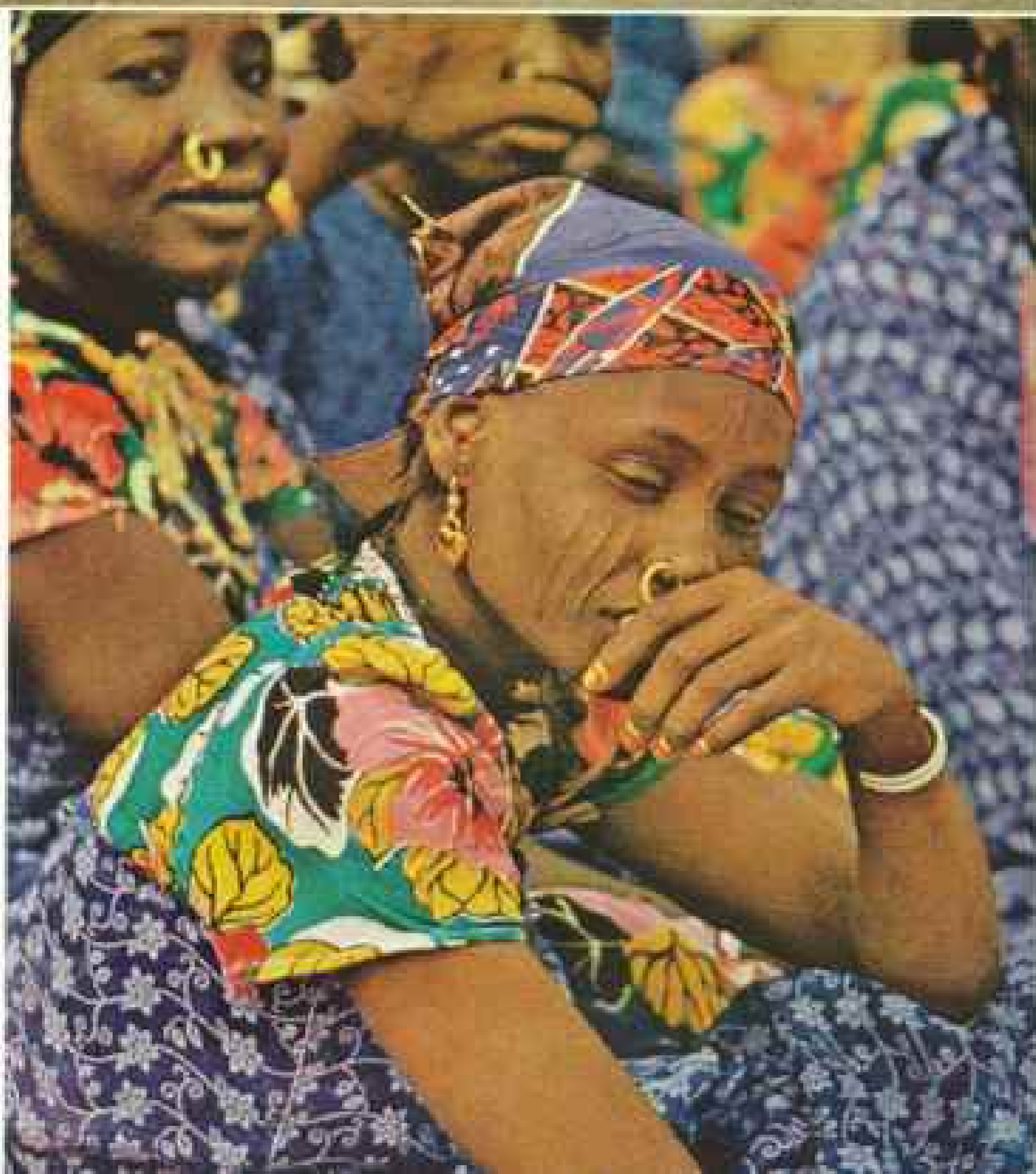
↟ Nigerian Cabinet Minister Trails a 20-foot Train

In matching costumes from the same bolt of lustrous cloth, the Minister of Labour and Welfare and his wife parade to a meeting of the colony's Federal Parliament in Lagos. Chief Festus Okotie-Eboh outdoes his wife's finery with a boater topped with feathers. His train ends as an oversize necktie beneath the page boy's chin.

Taking his place in the Federal House of Representatives, the Minister heard a Loyal Address welcoming Queen Elizabeth to Nigeria.



➔In the north, where Moslem customs prevail, women rarely show themselves without veils. This gaily clad belle has come from a pagan village on the Jos plateau to take part in Kaduna's lavish durbar, staged to entertain the Queen (pages 336-337). Facial scars, identifying one's clan, are gradually falling into disuse. Fabric for the dress probably was woven in an English cotton mill.

Queen Elizabeth's Honor Guard Receives a New Name

At Enugu, capital of the colony's Eastern Region, the Queen inspected a smartly uniformed honor guard of the Nigeria Regiment, "whose arms drill," commented one British newspaperman, "could hardly be bettered by the Guards in London." Impressed, Her Majesty bestowed a new title before she left the country: the Queen's Own Nigeria Regiment. Behind her, the Duke of Edinburgh salutes the colors.

The force dates from 1863, when a small unit of native constabulary was formed. By 1886 some 400 men were in service; they were led by five British and two African officers. In World War II Nigerians served in Burma alongside British and Gurkha troops and played an active role in the defeat of Italian forces in east Africa.

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Nigerians Stand in Line ➔ for a Royal Greeting

Throughout her tour Queen Elizabeth's simple tastes shone in settings of tribal splendor, as one dignitary after another stepped forward to present his greetings and attest his loyalty.

Here at Enugu the Hon. I. U. Imeh, Minister of Trade of the Eastern Region government, clad in traditional robe and close-fitting cap, meets the Queen. Other government officials await their turns.

Dressed in formal whites and feather-crowned topee, Governor Sir Clement Pleass stands at Elizabeth's right.

The Duke of Edinburgh, in a marshal's uniform, escorts Lady Pleass. ➔Scarlet and white mark these trumpeters as retainers of the Etsu of Nupe, whose domain lies in Niger Province. Here they sound a fanfare during the durbar at Kaduna (page 337). Medals on their robes were given to participants in the ceremonies.

Photographs by Brian Brake, Magnum

Heralded by Trumpets, the White-robed Mai Bedde Enters the Durbar Ground at Kaduna

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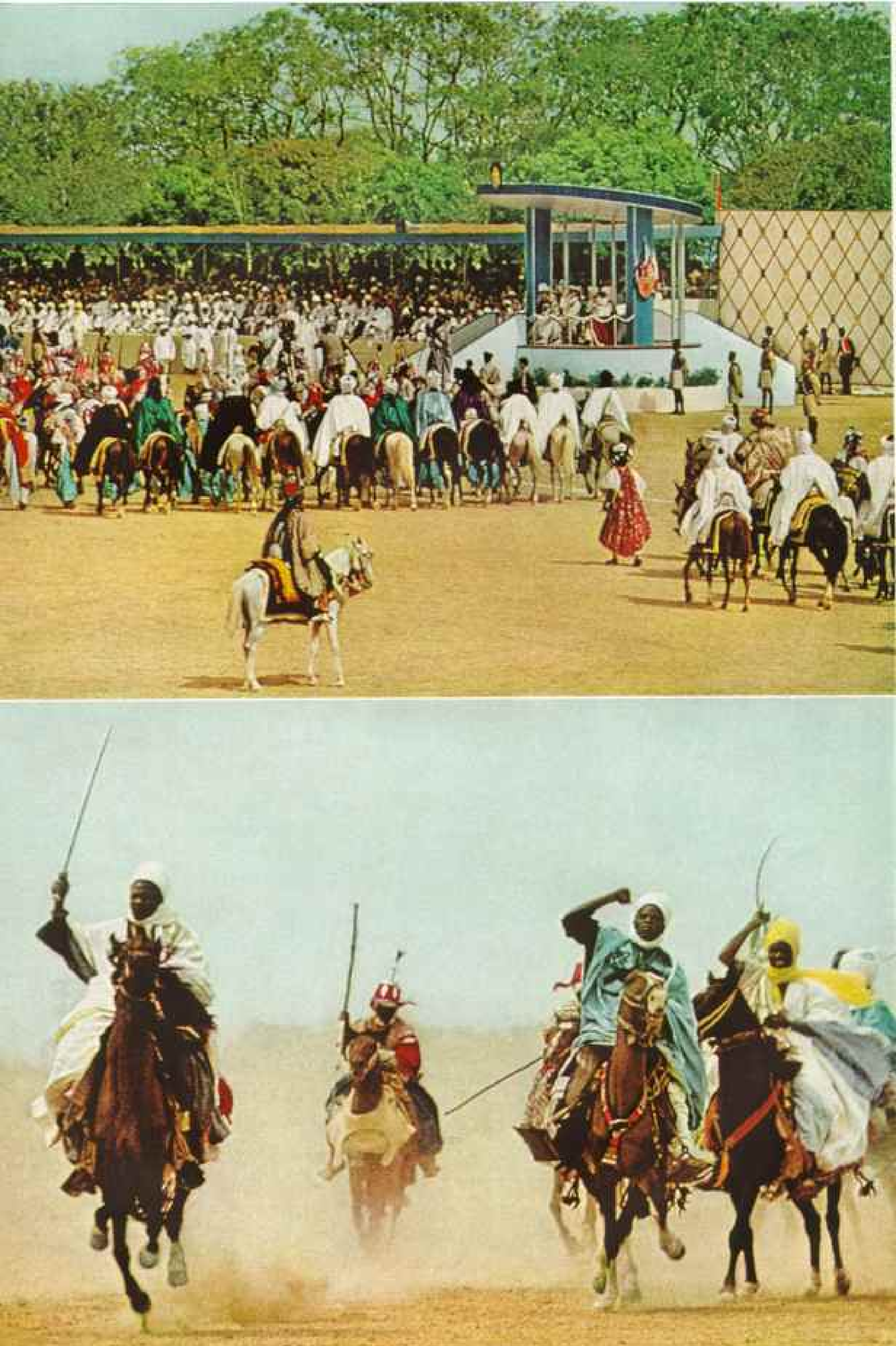
Brian Brake, Magnum

Retainers Carry His Bright Parasol, Embroidered Rug, and Gleaming Staff of Office



← Medieval Pageantry Lives Again in Kaduna

Not since 1911, when Elizabeth's grandfather, George V, attended a durbar in India, had a British monarch been treated to the splendor of a "gathering of the princes."

These horsemen, a part of the 500 massed for the ceremony in Kaduna, pass in review before Elizabeth and acknowledge allegiance to the Crown.

↓ Armed Riders Gallop Toward Their Queen

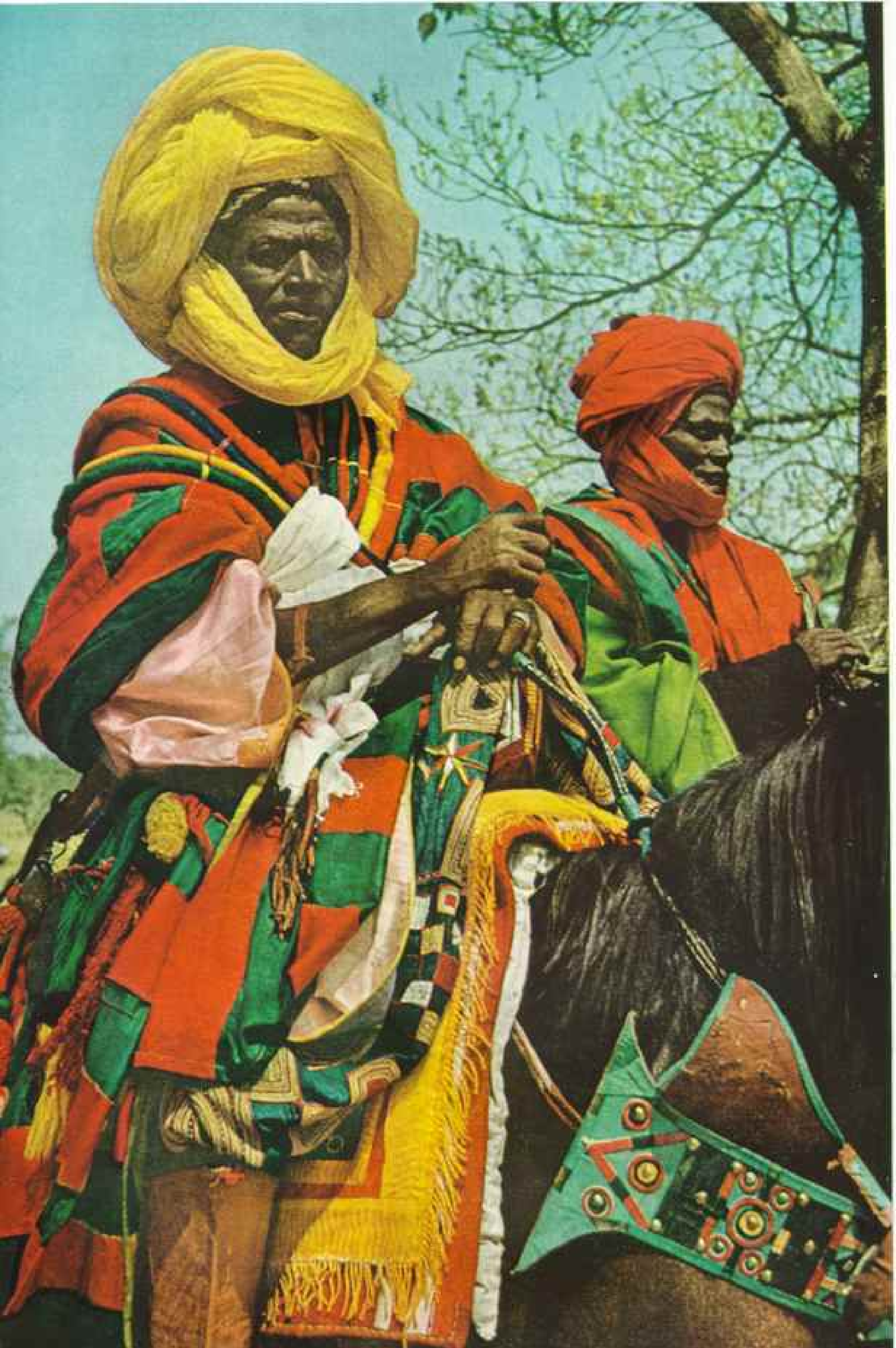
Thundering to a climax, wave after wave of horsemen charged up to the reviewing stand (above) and reined back their stallions dramatically a few yards short of the Queen. Raising spears and swords, they rode off in a swirling cloud of dust and color.

Many riders wore chain mail and protected their mounts with quilted cotton armor.

This ceremonial charge used to be an important maneuver in North African warfare.

Another 6,000 Nigerians paid their respects on foot.

Brian Brake, Magnum



We swung out past the airport and headed northward through oil palm groves and green forests. In many places trees towered to magnificent heights beside the roadway.

Sixty-five miles by road inland we came to Abeokuta, seat of one of the western chiefs, the Alake of Abeokuta, whom I had met at Lagos. Clad in purple-and-gold robes and wearing a high coral crown, he had paraded into parliament under a red-and-yellow umbrella.

The town spills down a hillside and spreads into a valley, seemingly almost a solid expanse of corrugated-iron roofs. Here workers produce many of the tied-and-dyed cloths worn by the people of the region (knots tied in the cloth preserve parts of it from the dye and help to create a pattern).

Ibadan, Africa's Largest Tropical City

An even greater expanse of tin roofs dominates Ibadan, 40-odd miles farther on. The city sprawls in a vast circle, a maze of mud and plaster houses accented by its town hall, which perches on a sharp hill like an acropolis. Within this circle dwell some 459,000 persons, ranking Ibadan as one of the major cities on the African continent.

We reached the town in drowsy early afternoon. Goats and sheep slept in the narrow ribbons of shade cast by the houses; their masters dozed away the siesta. The market places were almost deserted.

"Wait a while," said the young Yoruba man with me, "and you'll see plenty of people in the market. Let's visit the university."

Both the British, who have built the new University College, and students who attend classes can be proud of its facilities.

"Looks rather like a unit for the British Industries Fair, doesn't it?" a young instructor joked when we strolled through the halls, but in his eyes I detected pride at such achievement here in equatorial Africa.

Lecture halls, laboratories, dormitories, and commons are modern, indeed almost modernistic, structures of concrete, glass, and steel.

In a dissecting room of the medical department I paused to watch a young woman student skillfully using a scalpel. "She's one of our best students," a doctor whispered. "We're getting a long way from the bush."

A long way, indeed. Yet only a few miles away in this land of contrasts I came upon juju men performing strange mystical rites.

Near sunset we returned to the center of town. Streets were crowded, and the markets were filling (page 359). A procession of singing and dancing people, led by drummers and men shaking calabash rattles, converged upon one market place.

"A wedding procession," said my young Yoruba guide. "People celebrating weddings and other feasts often come here."

In one section of the market near the stalls of spices, yams, and fresh vegetables, we saw a group of white-gowned Hausa traders buying and bagging kola nuts to be sent to the northern provinces. These bitter reddish nuts, which contain the stimulant caffeine, are chewed as extensively by the Moslems as is betel nut in Asia. Some nuts are shipped by air even as far as Cairo.

In another section women had spread out enormous piles of locally dyed cotton cloths, used both for women's dresses and for loose tunics for men. Blue is Yorubaland's favorite color.

The Alafin of Oyo Holds Court

From Ibadan we drove north to Oyo to visit the native chieftain, whose title is Alafin. I called at the palace in company with the British A.D.O. (Assistant District Officer). Men lounged in the courtyards and offices, and the Alafin met us in informal house robes. In the course of the conversation, with the A.D.O. translating, the Alafin mentioned that his court would meet later in the morning. I could take photographs if I wished.

When I returned a short time later and was ushered into the assembly room, I was amazed at the transformation. All the court officials were dressed in their best robes, and the room appeared like a flower bed suddenly burst into full bloom. The red-plush throne chair, flanked by two enormous elephant tusks, however, was still empty.

But almost immediately afterward there came a sudden burst of drums and blast of

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← Billowing Turbans and Layers of Cloth Guard Hausa Horsemen from the Sun

The Queen's party got an advance peek at Kaduna's durbar finery when they drove from the airport the previous day. Hundreds of costumed Nigerians lined their route.

Instead of wearing light clothing in the heat of the day, the peoples of many Moslem countries put on layer after layer of fabric to insulate their bodies from the sun.

 Brian Brake, Magnum

← Beaded Veil Shields the Alafin of Oyo from the Vulgar Gaze of His Subjects

Page 340: On infrequent public appearances the Alafin conceals his royal features behind beads of coral and gold. Red coral covers his staff of office. Elephant tusks on either side of the gilded throne project above wives and attendants.

Lower: Feigning a slip and fall, an acrobatic stilt dancer delights a crowd in Lagos, including the Queen. Slaves brought this difficult art to the Americas; their descendants still practice it on some islands in the West Indies.

long horns. Into the room walked the Alafin, surrounded by his attendants and wives. I could not recognize the chief as the person I had met in the morning, for he was dressed in blue-and-purple-striped robes and his face was completely concealed by long strings of beads that hung from the rim of his coral-and-gold crown. In one hand he carried a coral-beaded staff, in the other a large white hair fly whisk (opposite).

I popped flashbulbs to the squealed surprise of some of the women and the proud, solemn posing of the Alafin and his courtiers. Later, in an open courtyard, I watched the procession and the dances that went on before the observant though bead-concealed eyes of the Alafin.

The musicians used not only horns and drums but huge calabash rattles, shaken in rumba rhythm. Unlike Spanish *maracas*, which have seeds inside, these enormous rattles were strung with loops of cowrie shells outside, the hollow calabashes serving only as resonance chambers.

Though his court had historic flavor, the Alafin, exiled since my visit, preferred modern transport. He had just bought a new Daimler automobile.

Rhode Island Reds Crow in Africa

A few miles from Oyo I visited the Fashola Agricultural Station. I talked with Mr. Harold Wilcox, who at that time supervised the experimental research in stock breeding and mechanical farming.

Here grazed fat Ndama cattle, a dwarf breed imported from French Guinea because of their resistance to trypanosomiasis, caused by the tsetse fly.

"Our primary need is for good beef cattle bred right here," Mr. Wilcox said, "for cattle brought from the north arrive in bad condition. Our aim is to build up our herds and distribute the bulls at least through the Western Region. It'll take time, though. The Yoruba are not a cattle people, and the land has many tsetse. That's why we have so few herds in the south.

"We're also working with chickens," he said, leading me toward the poultry yards.

"They look like Rhode Island Reds," I remarked.

"They are. An excellent bird. We are sending out to chicken growers both hens and cocks, but mainly cocks for crossing with local fowl. We also sell some eggs. Gradually the people will get better eggs and larger, better birds for eating."

Tractors were at work in the adjoining fields. "Our idea is that local farmers, grouping together, will be able to get equipment and cultivate more area without large individual costs," Mr. Wilcox explained.

Yoruba Warrior Slays His Own People

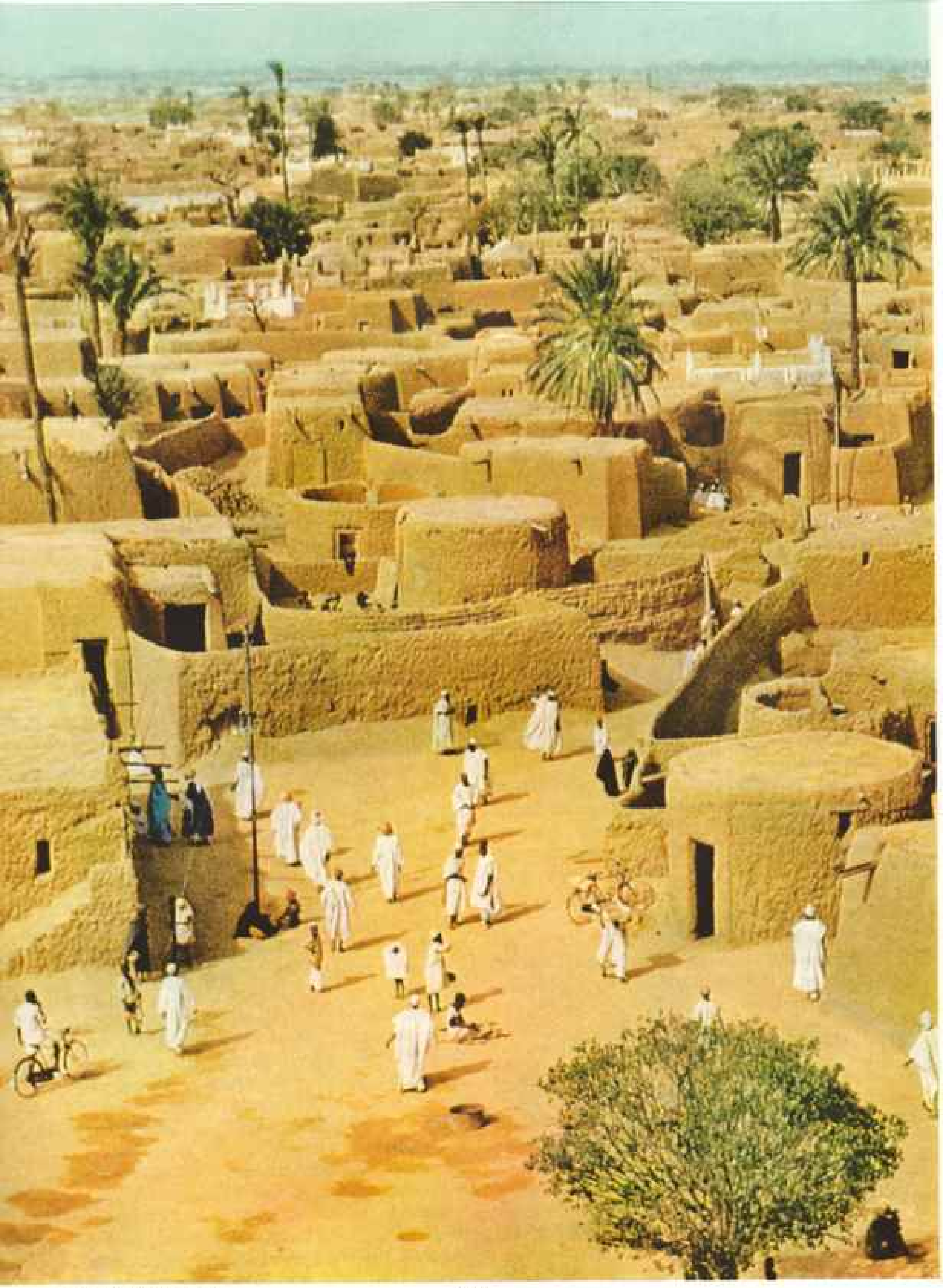
From Oyo I journeyed eastward to Ife. As the Alafin of Oyo had been acknowledged politically dominant among the Yoruba chiefs, so the Oni of Ife traditionally is regarded as their spiritual leader. We called on the present Oni, Sir Adesoji Aderemi, and found him a genial person with a keen sense of humor.

Later we visited some of the sacred places in and about town. Most of these shrines are only small stone images reached by narrow paths through the bush. Especially sacred however, is the circular tomb (now tin-roofed) of Oni Oduduwa, supposedly the founder of Ife. The shrine is not open, but in it, I was told, is a sacred well—and the chain by which Oduduwa drew himself to heaven.

In town, too, stands the large stone staff of Oranyan, son of Oduduwa, about whom an interesting legend is told. Oranyan had gained a reputation as one of the greatest Yoruba warriors. He carried his conquest as far as Benin and promised to return to Ife should the town ever be in trouble.

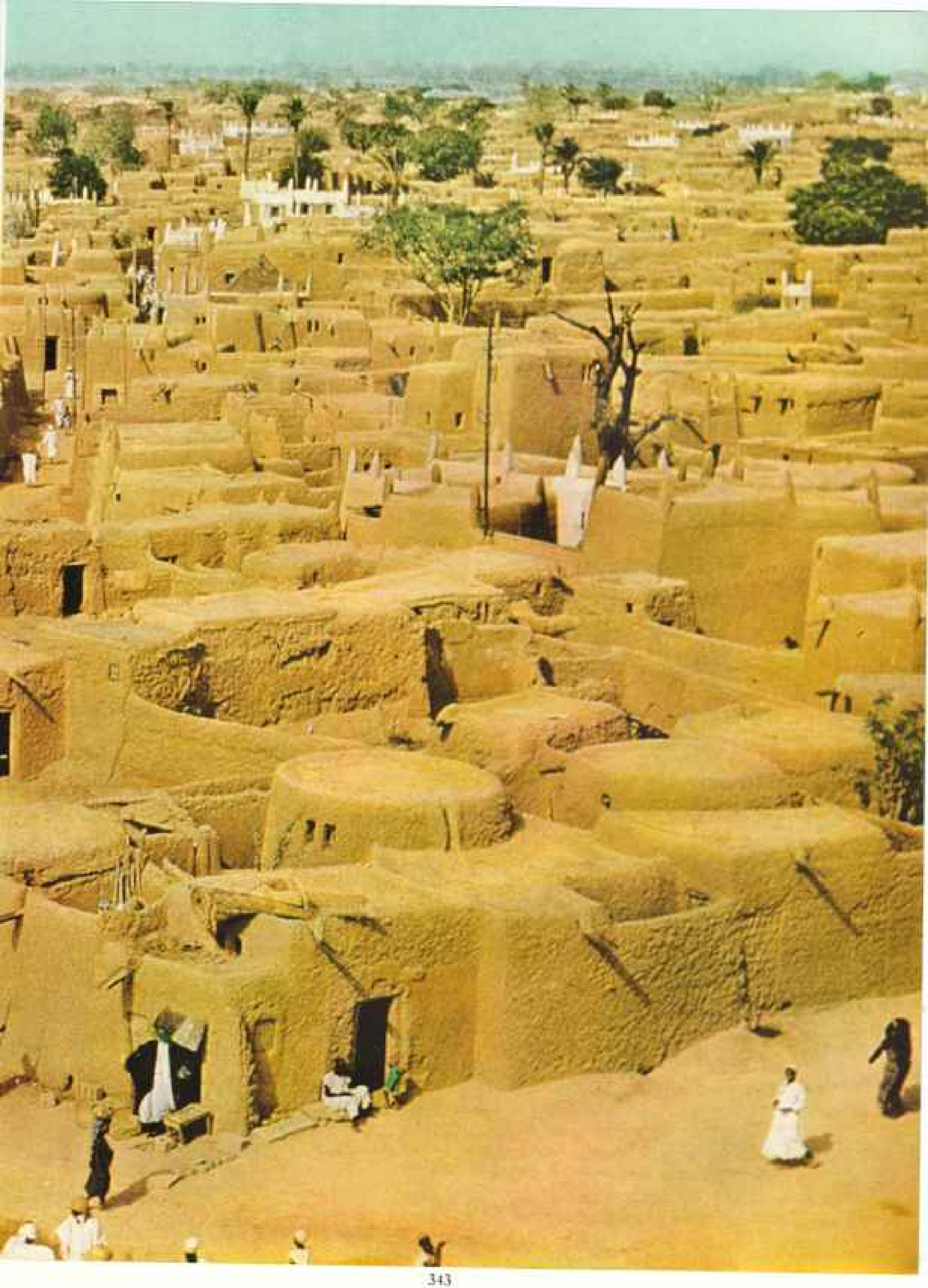
To test him, Ife called. Oranyan came back, furiously slaughtering all who stood in his way. The only trouble was that he did not notice whom he was killing. When he realized to his horror that he had destroyed many of his own people of Ife, he plunged his staff into the ground and vanished. The staff is still there, a 17-foot-high column.

Elsewhere in Ife I was shown the remnant of a well-laid paved street. "A woman who once became the Oni of Ife had it built," my



Helter-skelter Adobe Houses Create a Street Puzzle in Kano, Hub of Northern Nigeria

Fifteen gates admit a teeming trade in hand-woven cloth, peanuts, and dyed goatskins destined for sale in North Africa as morocco leather. A fresh coat of mud every few years keeps houses in repair.



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1,000 Turbulent Years Have Lent Color to the City, a Venerable Rival of Timbuktu

British guns breached mud walls in 1903, and the sixtieth king of Kano surrendered. Today the ancient caravan center prides itself on safe water, electricity, and a 350-bed hospital.

informant explained. "She forced the men to dig clay, make bricks, and lay the streets." He smiled. "There's never been another female Oni since!"

Skillfully executed bronze and terra-cotta heads excavated in the district furnish tangible proof that Ife once enjoyed a period of high artistic development. Several samples of these finely modeled heads, the faces grooved with lines that may indicate elaborate scarification, grace the town's modest museum (page 348). In the collection are huge loops of copper with coiled ends that may have served for money, as did similarly twisted smaller pieces. The age of these heads and ornaments is uncertain, though authorities tentatively date them from the early 15th century.

Throughout the Western Region as we rode through Ibadan, Oyo, Ife, and on to Benin City, we passed many cacao plantations and stopped at several groves. The thumbnail-size pink blossoms, I found, burst from tree trunks and thick limbs, rather than from branch ends. On other trees hung partly grown or ripening pods, some six to eight inches long (page 357).

At one plantation I watched men gathering and opening the pods. Whacking them around the center with a large knife, they split them in two, scoop out the pulp-covered beans, and place them in fermentation bins or in banana-leaf wrappings until the pulp disintegrates. Then the cacao is spread in the sun to dry and be cleaned.

Nigeria produces more than 100,000 tons annually of these flavorous brown beans, second only to the combined value of palm oil and palm kernels in the country's export. Today considerable effort is being made to rid the plantations of black pod and other diseases that menace the crop.

Priests Once Sacrificed Human Victims to Appease Benin's Guardian Spirit

In earlier days, no town on the west coast of Africa had a more grisly reputation than Benin City, where for many years a highly organized and powerful Negro state existed. Outwardly its power rested in a dominant Oba, or king, though there is evidence that an even greater influence was exerted by a theocracy of priests.

It was this priesthood whose worship of the guardian spirit, or juju, of Benin demanded an appalling number of human sacrifices for the religious and court rites. For years Benin also was an important center in the slave trade, which depopulated whole villages in the interior.

Medieval Bastions of Sun-dried Mud Ring Moslem Cities of Hausaland →

Page 345: Before the British brought peace to warring tribes, townspeople in the Hausa-speaking north protected their settlements with walls 40 to 50 feet thick. Suburbs in many cities are bursting the bonds of these old fortifications.

This wall, eroded by summer rains, stands at Katsina, 90 miles northwest of Kano.

Lower: Empty calabashes crown the heads of market-bound women near Ibadan. Some of these gourds attain 2-foot diameters. Many are used in the carving of spoons and bowls.

To call the city civilized in the light of such activities may savor of the absurd, from our present-day viewpoint. Yet Benin possessed a native culture superior to most of its neighbors, as the quality of its old bronzes, ivory carvings, and other art work indicates.

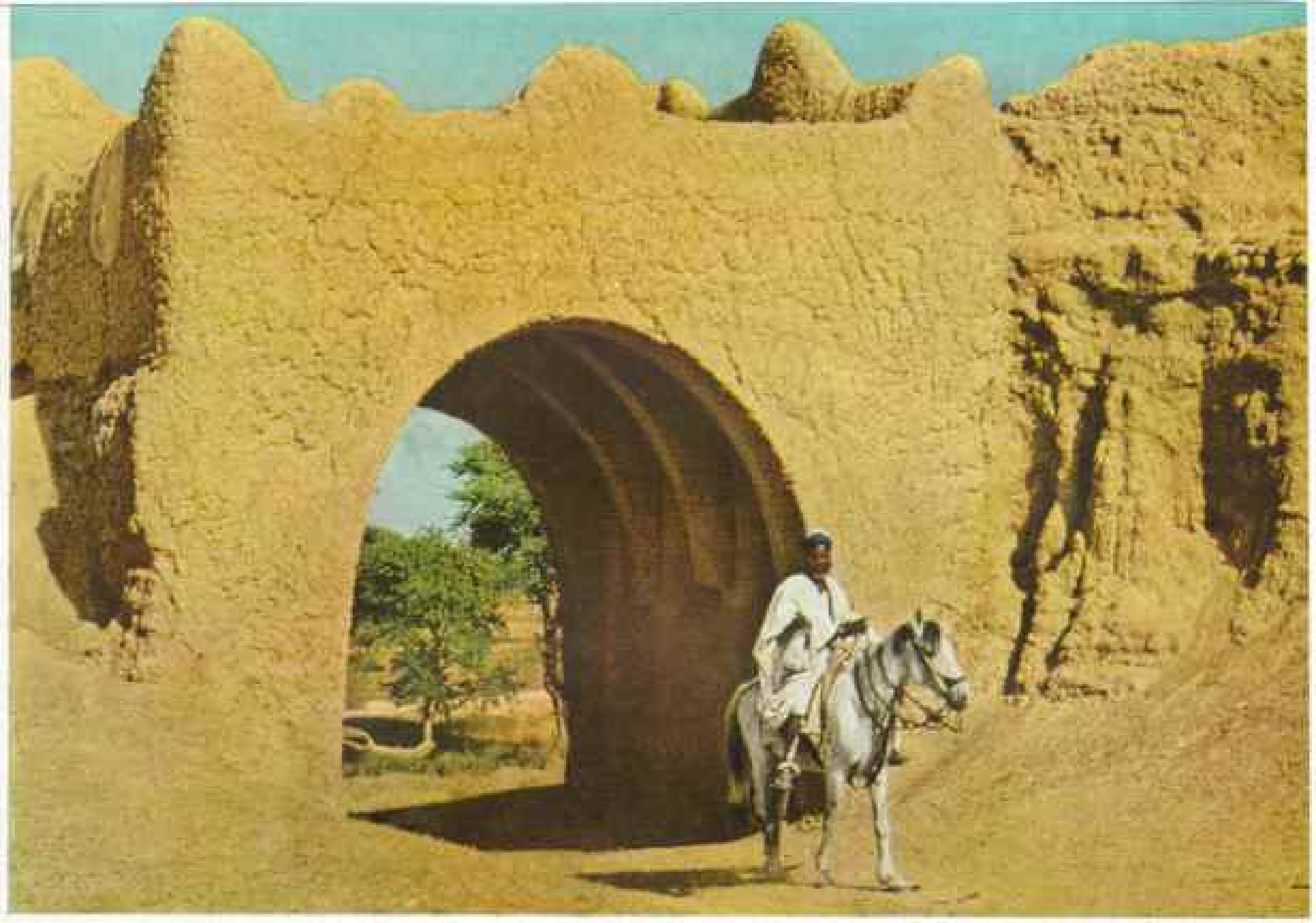
Late in the 15th century the Portuguese established trade with Benin, especially for slaves. British, Dutch, and French came later to deal not only in slaves but in ivory, palm oil, and pepper as well.

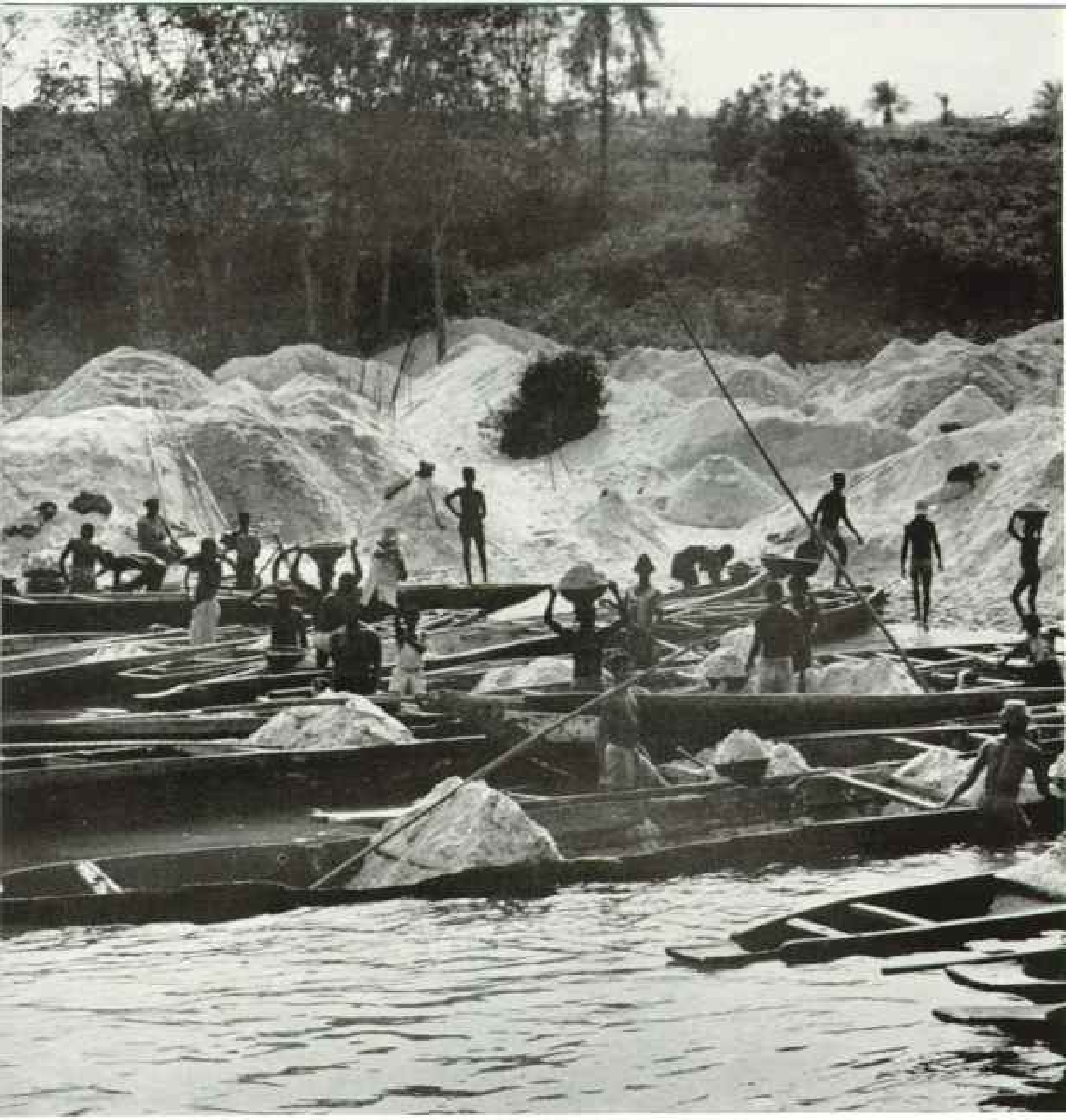
In 1897, after the British had made several ineffective treaties with the Oba, a British consular officer, six companions, and scores of porters were massacred on their way to Benin. To punish the Oba for this slaughter, Adm. Sir Harry Rawson organized a punitive expedition and led 1,200 men in an attack against the town. Entering the city, they found the place literally strewn with human sacrifices by which the Oba and priests had sought to ward off defeat.

I was somewhat surprised to find Benin now a sunny town little different from other settlements in southern Nigeria. However, I did see several shrines of the priests' ancient cults.

One was the ancestral shrine at the home of Chief Ogiamwen. "My ancestors owned large tracts of land here before the Oba came from Ife; we still hold certain claims," the chief explained as he led me into a room where several bronze heads and carved wooden staves, called *ughere*, rested on a stepped altar. The skulls of several animals hung above the altar.

"When each new Oba is selected," the chief elaborated, "he always visits here and presents a new ughere. At an Oba's installation a mock battle is held between our forces, and a ritual division of land is made between us."





346

Slender, Frail Canoes, Laden to the Gunwales, Haul Sand to a Riverside Stockpile

had been used in grim sacrifices.

Elsewhere I saw a statue of Olokun, god of the sea, portrayed in the garb and pose of an Oba. The figure had high coral neckbands and crown, and, in the manner of a monarch, had arm bearers supporting his elbows.

From such yesterdays of Benin I traveled southward to Sapele, where a sawmill and a plywood plant, equipped with the latest machinery, handle millions of feet of timber a year. Most of the logs are hardwoods, many of them richly grained African mahoganies.

"Our target is some 6,500,000 cubic feet of forest extraction a year to meet our present needs," said the manager, Mr. J. A. Stirling. "Our output now is about 700,000 cubic feet of plywood, 1,500,000 cubic feet of lumber, and 40,000 to 50,000 tons of whole logs shipped."

In the river lay huge rafts of logs, some of which had been floated or towed a good 250 miles. "We do more towing now than formerly," said one of the timbermen, "to save time and to prevent thieves from stealing our logs. With logs worth about £40 ($112) apiece, some raftsmen find it convenient to be asleep or absent while rafts are cut and

347

Laborers Carry Head-borne Loads to Aba, a Center of Nigeria's Palm Oil Industry

logs floated away. We used to lose a lot of logs that way every year."

At the plywood mill I watched sharp blades pare whirling logs into thin layers of wood, like the unrolling of a carpet. The sheets next are cut into uniform lengths, passed through drying kilns, glued, laminated, and put in huge presses. Eventually they emerge as beautifully grained multiple-ply panels.

A large freighter, lying in a bend of the river just below the plant, loaded both plywood and whole logs for transport to the United Kingdom (page 356).

Roaming eastward from Sapele over twisting bush roads, we came to the Asaba-Onitsha crossing of the majestic Niger River. This sweeping waterway is the third longest in Africa and ranks among the first 10 rivers in the world. It rises less than 200 miles inland from the coast of Sierra Leone and curves in a wide, lazy arc through French West Africa and Nigeria.

At Lokoja, some 115 miles north of Onitsha, the Benue, Nigeria's second major stream, joins the Niger. Thence the Niger flows southward to empty into the Gulf of Guinea by a maze of bush-hemmed delta channels.

A large motor ferry plies back and forth

348

↑ Nimble Fingers Create a Bright Tribal Pattern

Traditionally, Nigerians weave textiles on narrow hand looms and sew the strips together. This wide loom operates at Oyo. Memory alone serves as guide in the weaving of the complex design.

← Ancient Bronze Head Wears Facial Scars

In 1910 German explorer Leo Frobenius reported the discovery of a bronze head of great beauty at Ife, in southern Nigeria. Other heads were unearthed 28 years later by workmen digging the foundation of a new house. Twenty of these lifelike sculptures are now known. Several, including this one, have grooves resembling the elaborate facial scars still used as marks of identification among some clans (page 339). Others show lines of holes, possibly for the attachment of hair.

The heads represent one of the crowning achievements of Negro art. Some historians explain their technical perfection by claiming a connection with the portraiture of ancient Greece or Egypt. Others believe the heads to be purely African, dating from the early 15th century. They may be likenesses of long-dead Yoruba rulers.

between Asaba and Onitsha, carrying automobiles and passengers (page 363).

When I drove down to the river, I saw a large colony of fishermen camped on a sand island far out in the water. Several dugouts loaded with people were on their way there. I decided to go too.

I ended up hiring a small tipsy dugout that threatened to overturn at every paddle stroke. The boatman laughed as I breathlessly clutched my cameras.

Scores of fishing families occupied the sand strip. Some lived in freighting craft anchored along the shore; others camped in small matting huts pitched on the sands. When rains raise the river level, they move.

Meanwhile, men busily dried and repaired their nets, patched boats, and prepared long fish lines and hooks. In the Onitsha market place and near-by villages later, I found quantities of fresh and smoked fish these people had caught and cured.

349 George Rodger, Magnum

Mobile Department Store Trails Buyers

Smiling Hausa girl balances wares on her head as she wanders through Kano's market place. In addition to locks and keys, she offers lemon drops, glue, a watch chain, rosaries, an egg cup, a book on astronomy, and a history of the British Commonwealth.

My attention was attracted also to vendors selling bread. None advertised vitamin-enriched loaves, yet I could not help wondering what ingredients were included. On the boxes in which the sellers kept their stocks appeared the bold label, "Buy Zion Bread—the original bread for decency, appetite, delicacy, and vigour."

From Onitsha we went first to Enugu, capital of the Eastern Region, and thence to Okigwi, Umuahia, Ikot Ekpene, Uyo, Calabar, Owerri, and other places with strange names.

On this circuit I soon appreciated that the main export crop of the Eastern Region is palm oil and kernels. Many of the palms grow wild, rather than in plantations. In increasing numbers the gatherers now take their oil palm nuts to small Government-sponsored plants to have the oil extracted, where it can be done more efficiently than by hand at home.

Another fact impressed me—the concentration of people. In some districts 600 to 1,000 persons dwell per square mile, living on oil production and small gardens of yams, coco yams (a variety of taro), and cassava. Market days and festivals they enliven with potations of fermented palm wine.

In Enugu coal mining is important. From underground mines workers dig some 750,000 tons of coal a year. Seven thousand persons are employed in the operation.

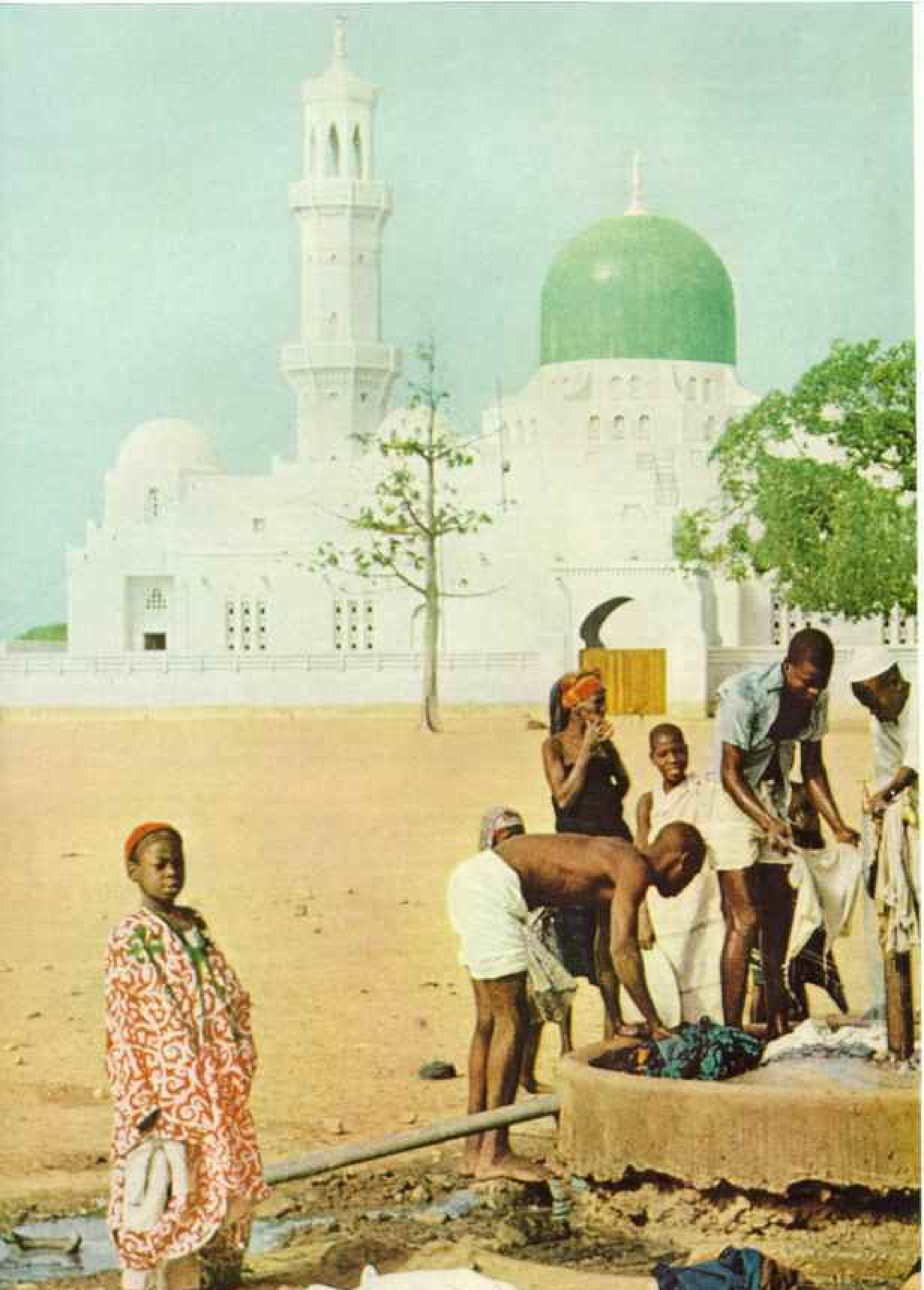
Nigeria Sends Coals to Newcastle

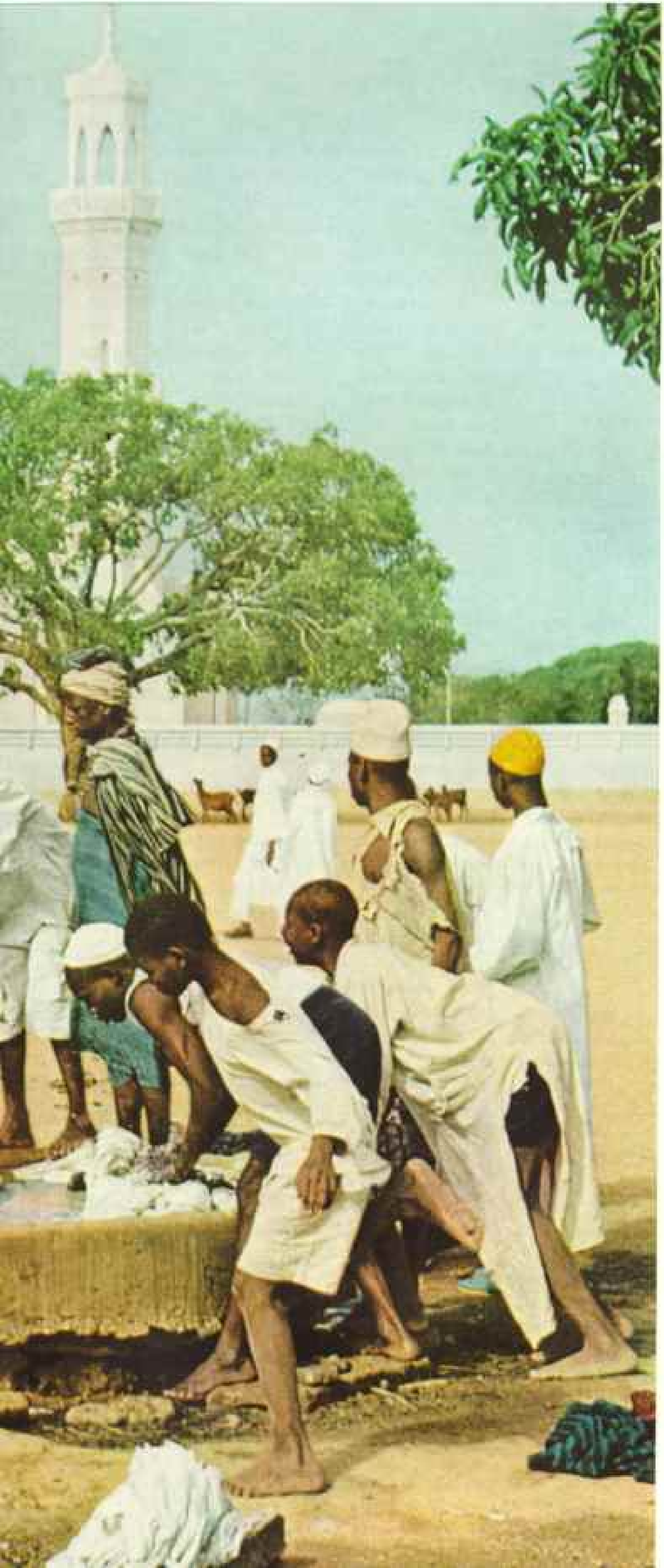
"Where does the coal go?" I asked a Welsh mining engineer who showed me around.

"Locally and to the Gold Coast. You've heard about carrying coals to Newcastle," he added with a twinkle in his eye. "We've even shipped a small amount of coal to England."

The coal seam being worked, he pointed out, averages about 4½ feet thick. "Other seams here are only about 2½ feet thick," he explained, "but the men don't like working on their knees, as I had to do in my early mining days at home."

When I reached the Ikot Ekpene district, I was immediately struck by the vivid grave markers I saw. Many portray the persons whose graves they mark, with the individual standing on a pedestal or sitting in a chair,





A Gleaming Mosque Towers Above Kano

No part of Africa exceeds Nigeria in complexity. Language, racial and tribal makeup, and terrain have conspired to splinter the land into a multitude of competing allegiances in manners, politics, and religions.

In the north, where Mohammed's tenets were introduced from across the Sahara, the majority of Nigerians are Moslems. In the south, Portuguese explorers brought the spark of Christianity in the 15th century, only to see it quickly extinguished. Missionaries re-established the faith 400 years later. Today Christianity holds a million adherents, particularly in towns of the south.

Between Islamic and Christian areas lies an irregular-shaped pagan zone whose people cling doggedly to belief in malevolent spirits.

At Kano's new stone mosque an estimated 30,000 to 40,000 Moslems gather each Friday for afternoon prayer, filling the structure and its courtyard and overflowing beyond the walls.

Graceful minarets flank the mosque's green-tiled dome. That on the right may be entered by nonbelievers, who climb its 103 spiraled steps to gaze out over Kano (pages 342-343). Only Moslems enter the rest of the structure.

Mohammed enjoined his followers to wash before each of their daily devotions. This busy group concerns itself with a more mundane matter: doing laundry at an outlet of the city water supply. Behind them goats gaze longingly at the foliage of one of Kano's few trees.

often arrayed in European dress, wearing a sun helmet, and holding a walking stick.

Not only is much emphasis placed upon burial here, but the relatives frequently stage ceremonies for the deceased years afterward. At one village we came upon such a celebration. An orchestra beat wildly on log drums and shook seed rattles; young women danced in a circle. Inquiring about it, I learned that they were holding a special celebration for a chief who had died 16 years before.

Girls Fattened for Marriage

Quite by chance I came upon another unusual ceremony one day when I entered a village. A noisy crowd was celebrating in the market place. In its midst a man carried on his shoulders an overly plump girl bedecked with a crown.

"You're lucky to see this," said the British A.D.O. "The girl is a fattened bride being taken to her husband's home. It's an ancient custom still practiced by some families."

The rite, he explained, was designed not so much to make the bride excessively fat as to prepare her for marriage.

Months before her wedding, the girl retires to a reserved room. Women bring her food and rub her body, first with palm oil and later with white clay. During this period of rest and preparation she learns cookery and care of the home. By the time she "comes out," however, she has often become grotesquely fat from inactivity, pampering, and gorging.

To reach Calabar, I had to go to Oron, then ride by ferry for several miles across the island-studded outlet of the Cross River. Aboard ship we glided past islands where the flimsy huts of fishermen perched in mangrove tangles like birds' nests. Numerous fishing craft dotted the river.

Markets at both Oron and Calabar were filled with quantities of smoked fish, looped head to tail on long spits, that these fishermen had processed. Cyclists pedaled inland carrying huge crates and bundles of the smoked catches.

Though a portion of Calabar lies cluttered in a low saddle between the hills, the rest of the town is pleasantly located on a high bluff above the river. From the port go cargoes of palm oil and rubber produced on plantations in the district.

In marked contrast with the Yoruba of the Western Region, the Ibo and other people east of the Niger never possessed strong local chieftains with kingly courts. Today, however, they are perhaps the most ambitious and keenly political people in the colony.

Recrossing the Cross River, we drove to Owerri to see the oil-drilling operations of the Shell-BP Petroleum Development Company of Nigeria, Ltd.

"We began our oil explorations of the sedimentary areas of Nigeria in 1937," said the manager. "Work was discontinued during the war, but since 1946 we have renewed our operations with increased intensity. We're now employing about 2,500 persons—regional staff, laborers, and expatriates."

He showed me over the installations. In workshops I saw student classes busily bending over lathes, welding, and performing other specialized tasks. "We're getting quite a group of skilled workers," he said. "Some of these African lads are remarkably keen and quick to learn."

At a near-by towering derrick noisy drilling was under way.

"What do you think of your chances for finding oil?" I asked when the manager paused to examine the rock cutting samples that had just been brought up.

"We hope, of course, but can't be certain. Oil exploration is tricky business; it depends upon three conditions—the creation of oil, trapping, and an exploitable reservoir. Even if the oil's down below, it's an expensive proposition to locate it. We've spent £12 million thus far, and we've only started."

From such oil speculation I went to Oguta where oil (from palms) is a sure thing. Approximately one-sixth of Nigeria's palm oil comes from this district. Along the roads women toted oil tins on their heads and boys wheeled bicycles burdened with heavy loads. All were on their way to the oil-collection center.

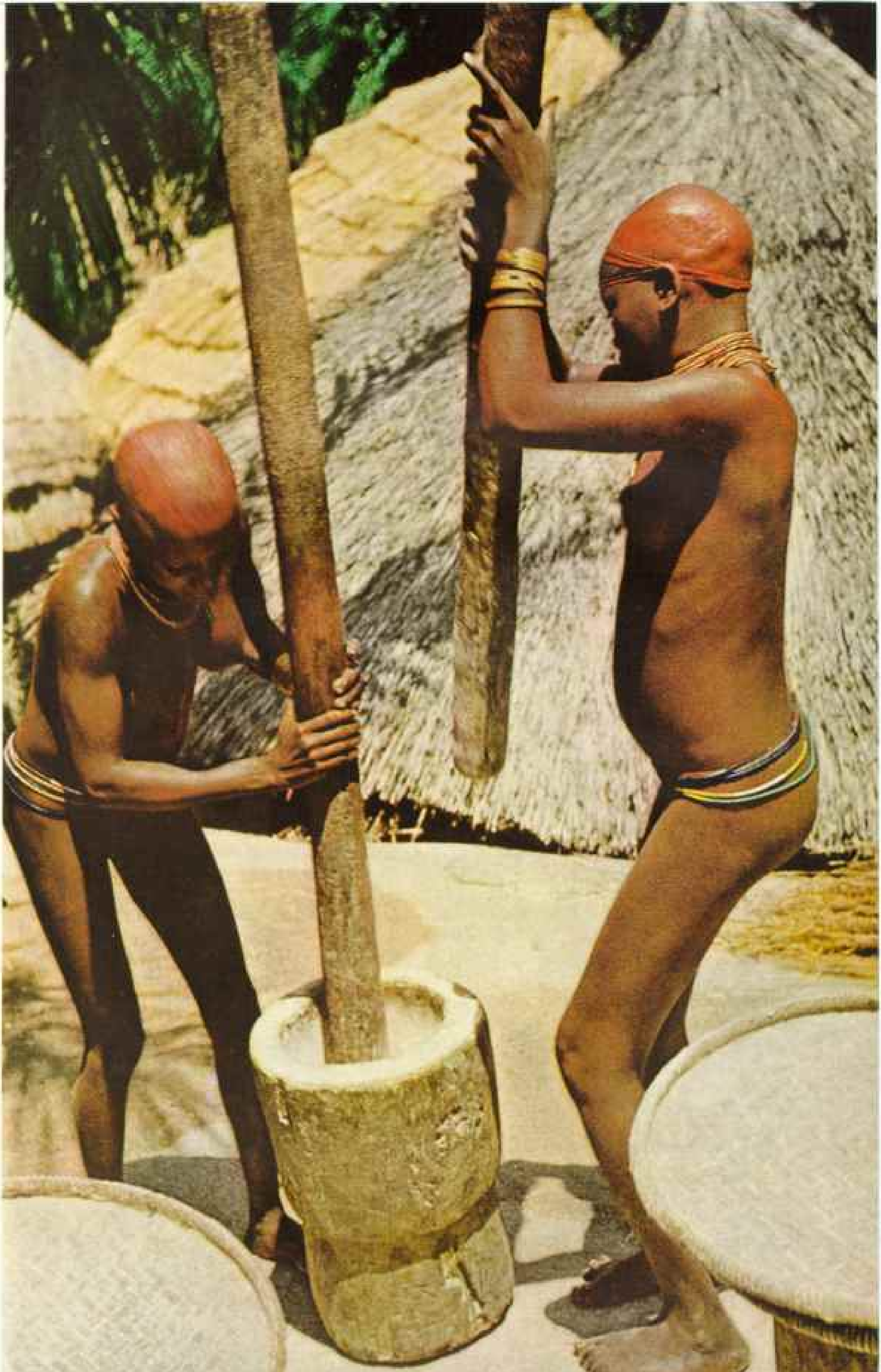
Near the shore of a long, slender lake coopers assembled wooden oil casks. In the water men fastened filled casks and metal drums into rafts for floating downriver.

"During summer high water we dispatch 25 to 50 rafts, each made up of 60 casks,

Page 353

Shaved Heads and Bead Dresses Satisfy Pagan Fashion →

Isolation preserves Nigeria's Jos plateau as an island of primitive culture. These women, residents of the village of Richa, pound grain in a mortar.



from the beach every day," said a British supervisor.

Annually, Nigeria ships 150,000 to 200,000 tons of palm oil and more than double that tonnage of oil-rich palm kernels.

After roaming southern Nigeria, I flew north to Jos, on the central plateau. It was like landing in a different country. The plateau rears like a rocky island above the surrounding countryside, its edges shorn into steep scarps and bastioned by rocky eroded hills. Wide undulating plains average 4,000 feet in elevation, but here and there rise peaks more than 6,000 feet high.

The freshness of the climate recommends Jos as a vacation retreat for Europeans. And here I found one of the pleasantest resthouses in all Nigeria.

The town itself is relatively new, sprung from the advent of tin mining on the plateau. When natives from the surrounding pagan tribes visit Jos's markets, they trot into town clad only in simple tufts of leaves or abbreviated loincloths.

Until the British began tin exploitation, attracting the Hausas and other plains peoples as laborers, these primitive pagans were almost the sole occupants of the plateau. There was a reason.

Over the centuries, tides of migrating Hausa, Fulani, and other peoples swept around the base of the plateau, forcing the weaker pagan tribes to retreat to its heights. They found safety in the inaccessible escarpments and rocky hills around the plateau's edge. And here they remained.

I visited a number of their villages, small clusters of circular mud-and-thatch huts. Some perch among chaotic boulders; others are further protected by encircling hedges of prickly euphorbia.

These pagans form not a single tribe but many groups. Each has its own language, peculiar customs, and distinctive though scanty dress—a few beads, tufts of leaves, cane bands, or palm-leaf modesty fans. Some tribes wear almost nothing at all (page 353).

Tin, Columbite, Uranium—and Cattle

Mountainous red earth dumps and yawning holes around Jos mark extensive mining operations. All mines are opencuts. In some, bulldozers, draglines, and powerful scrapers tear at the earth. In others, hydraulic jets sluice away soil layers bearing tin ore, which appears as black granules of cassiterite.

Along with the 10,000 to 12,000 tons of tin ore produced annually, rare columbite ore is also found. It is valuable now in making heat-resistant alloys for use in the manufacture of jet engines. Here, too, geologists have found uranium ores.

After watching tin ore being dug, washed in long sluices, and sampled and tested in the laboratory, I drove one day to visit a group of Fulani cattle herders. By chance we had chosen a day when they were conducting one of their ceremonial floggings, a custom I had been told was officially banned.

Floggings Test Fulani Courage

The Fulani are a remarkable group of people whose origin, habits, and even appearance set them apart from the Negroid tribal groups of Nigeria. A cattle-herding folk, they are believed to have come from Northern Africa or "from the east"; actually, their routes into Nigeria are only vaguely known.

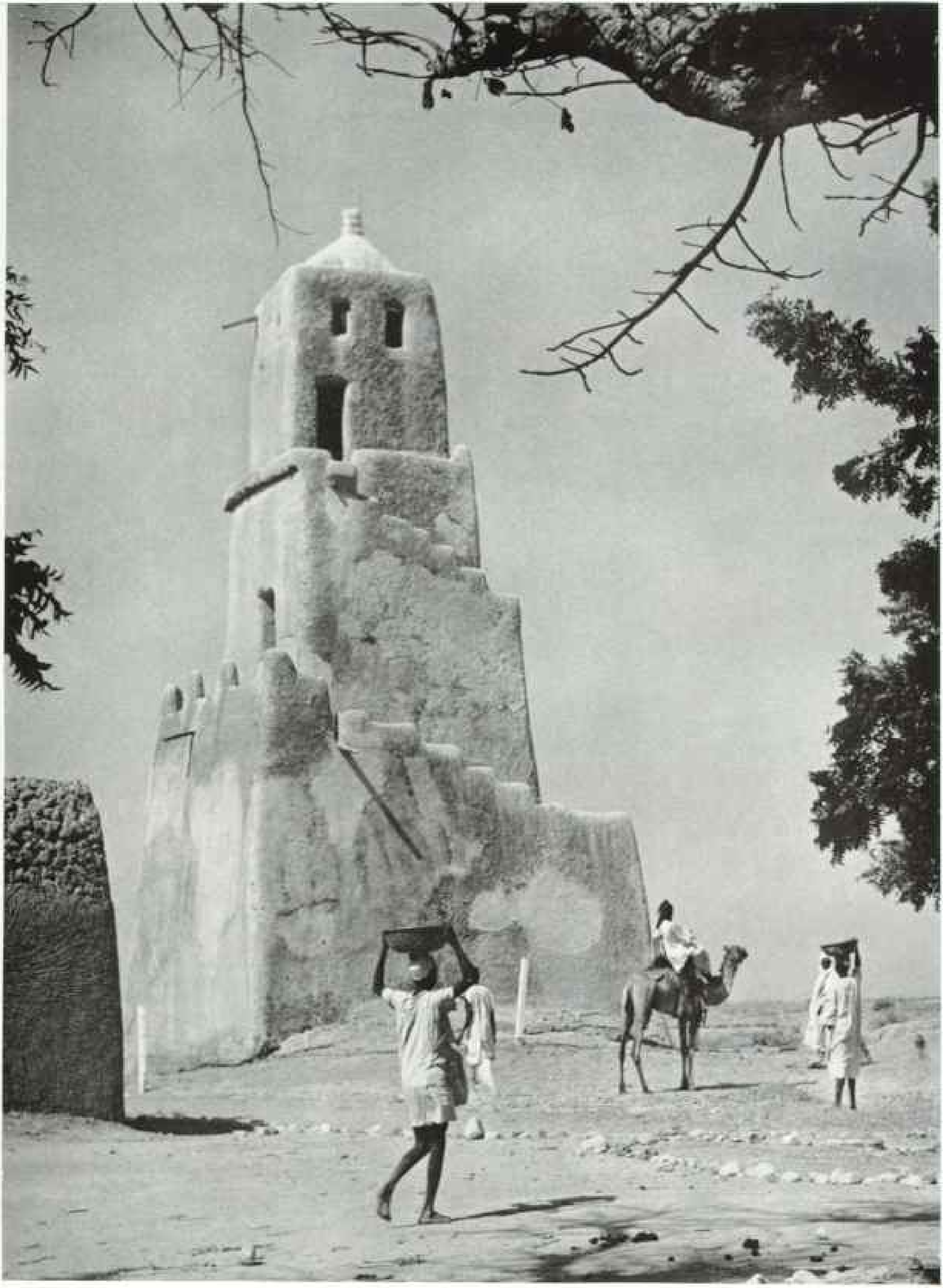
What is known is that from the 13th century onward they migrated in increasing numbers into the northern portion of the country. Some of them settled in the Hausa states, to become lords over the resident peoples; others continued their nomadic life, pasturing large herds of cattle.

The town Fulani have long since lost most of their distinctive characteristics through intermarriage, though northern rulers still pride themselves on their Fulani blood. The nomadic Fulani, however, retain many of their original features of light-brown skin, aquiline nose, and delicate facial modeling.

In recent years, as the pagan tribes have become less hostile, these cattle folk have ventured to bring their herds onto the plateau. At one of their settlements we heard drums beating and found a large crowd gathered. In the midst of a large circle several young men, perhaps in their early twenties, were awaiting their initiation into the rites of manhood.

My companion knew one of the Fulani chiefs, so we were allowed to stand on the side lines and watch. Soon one young man raised his arms and stood admiring himself in a small mirror he held. Atop his head he balanced the horn of an animal.

From one side came another young man, dancing and flourishing a stout withe with a knot on its end. Suddenly he whirled and struck the initiate a hard blow across the chest, raising an angry red wale.



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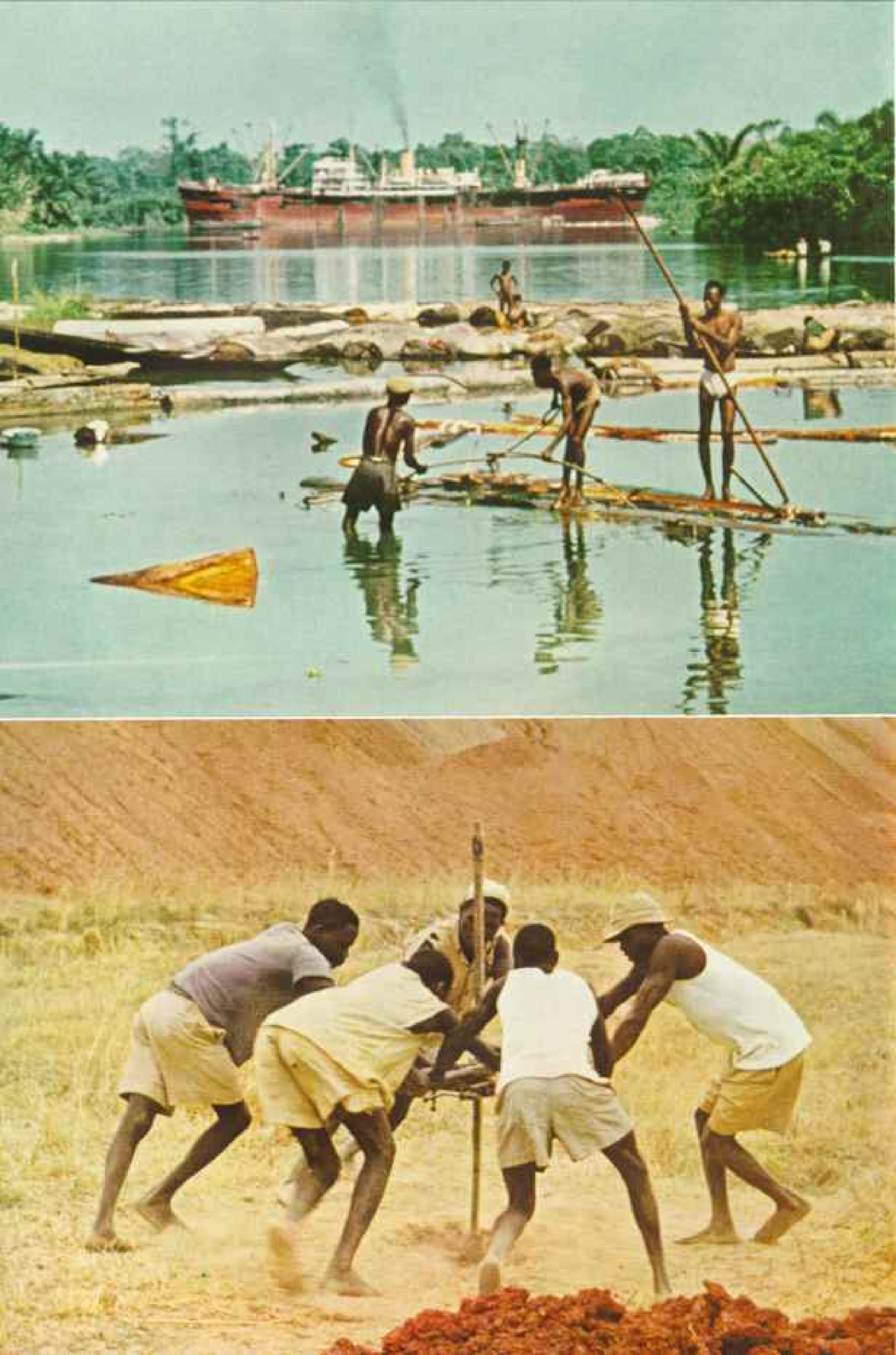
Spiral Staircase Climbs Katsina Minaret. Veiled Tuareg Rides a Camel in from the Sahara

Tribesmen from remote oases drive their mounts to northern Nigeria to help with the peanut harvest. Paid off, they buy supplies, including cloth from Kano, and disappear into the desert until the following season.



← Lumberjacks Balance on Mahogany Rafts

Fine furniture gets its start in the steaming rain forests of west Africa.

Here at Sapele, on the tortuous Benin River, workmen break up rafts of hardwood logs destined for a riverside plywood factory.

Distant freighter loads finished veneers for European furniture makers.

←Page 356, lower: Like sailors walking a capstan, tin miners drill holes in an open-face mine on the Jos plateau. Dynamite detonated below the surface loosens the soil above the ore so it can be scraped away. Spare drills lie at right.

↓Nigeria annually ships 100,000 tons of chocolate beans, representing about 15 percent of world production.

Cacao fruit develops on tree trunks and main limbs instead of leafy branches.

These pods ripen at Oyo, in western Nigeria.

The horn remained balanced, and the initiate continued to smile as if nothing had happened. Girls on the side lines ran up to him, cheering and laughing to indicate their approval of his courage. Again the person with the stick danced up and struck another blow.

After the third blow, other young men gathered round the initiate and pressed coins against his forehead to test whether or not the blows had brought sweat to his skin. The coins fell off and the girls cheered.

The boy was still calm. He then was marched before his elders and, after bowing, retired from the circle. He had proved he was able to take punishment without flinching. One after the other, all the initiates went through the ordeal.

Most young Fulani men successfully brave these floggings, but sometimes one fails and has to go through the ordeal again or else be considered a weakling. A few have died from the severe blows they receive. Though many Fulani youths of delicate features appear almost effeminate, they certainly do not lack stamina and courage. The great majority proudly display scars on their chests.

A British District Officer, with whom I talked later, told me that Hausa menfolk often asked him if there were any Fulani in England. When informed there were none, they asked in surprise, "Then how do you get meat and milk if you have no cattle herders?"

On another side trip from Jos I rode down the steep southern slopes of the plateau to Pankshin and Shendam. In village markets I saw numerous tribal folk come to shop.

"Within the 3,600 square miles of this district," the British A.D.O. at Pankshin told me, "there are at least 20 tribes, each speaking a different language."

Many of these tribal groups live in the hills, impoverished and isolated. Now the British are aiding some of them to abandon their rocky hill refuges and unproductive fields and resettle on richer lands below.

I visited one resettlement area near Shendam. Four years before, no one had lived there; now the area is occupied by 300 families—some 2,000 individuals. One of the farm villages was so new that men were still mixing mud to build walls and were bringing in poles and thatch for the roofs. On newly cleared fields the people were growing corn, rice, sesame, peanuts, and Guinea corn, and were harvesting more food than they had ever known before (page 363).

Magic of the Printed Word Holds West African Youngsters Spellbound

Only one in five Nigerian children attends classes. The rest have no school close by, or receive purely religious education. Literacy programs in the villages attack the problem by teaching apt pupils, who in turn pass the knowledge on to neighbors. This boy reads the *Nigeria Review* to friends in Onitsha.

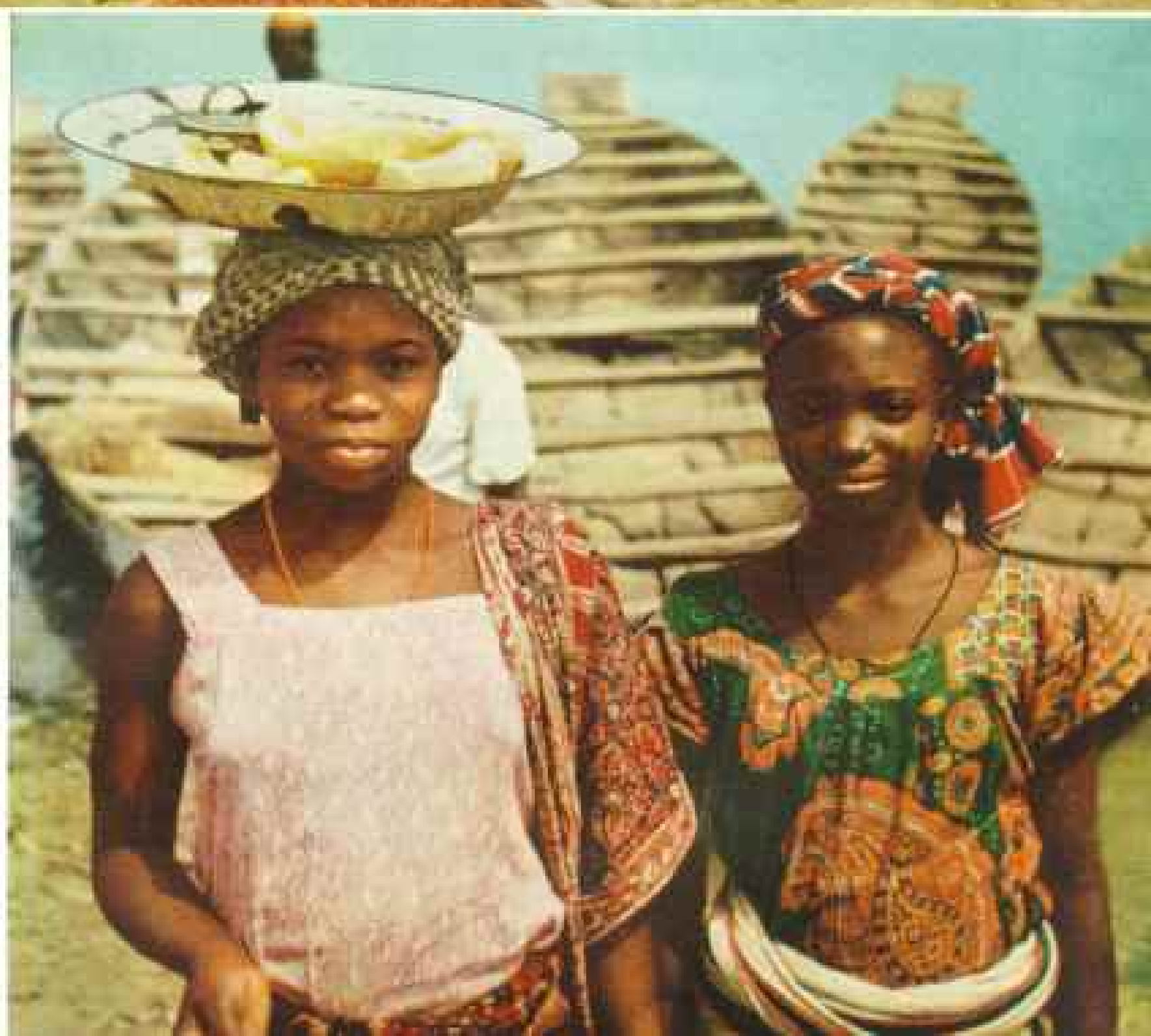
Camera Press-Pix

↑ Sidewalk Supermarket Draws Ibadan Wives

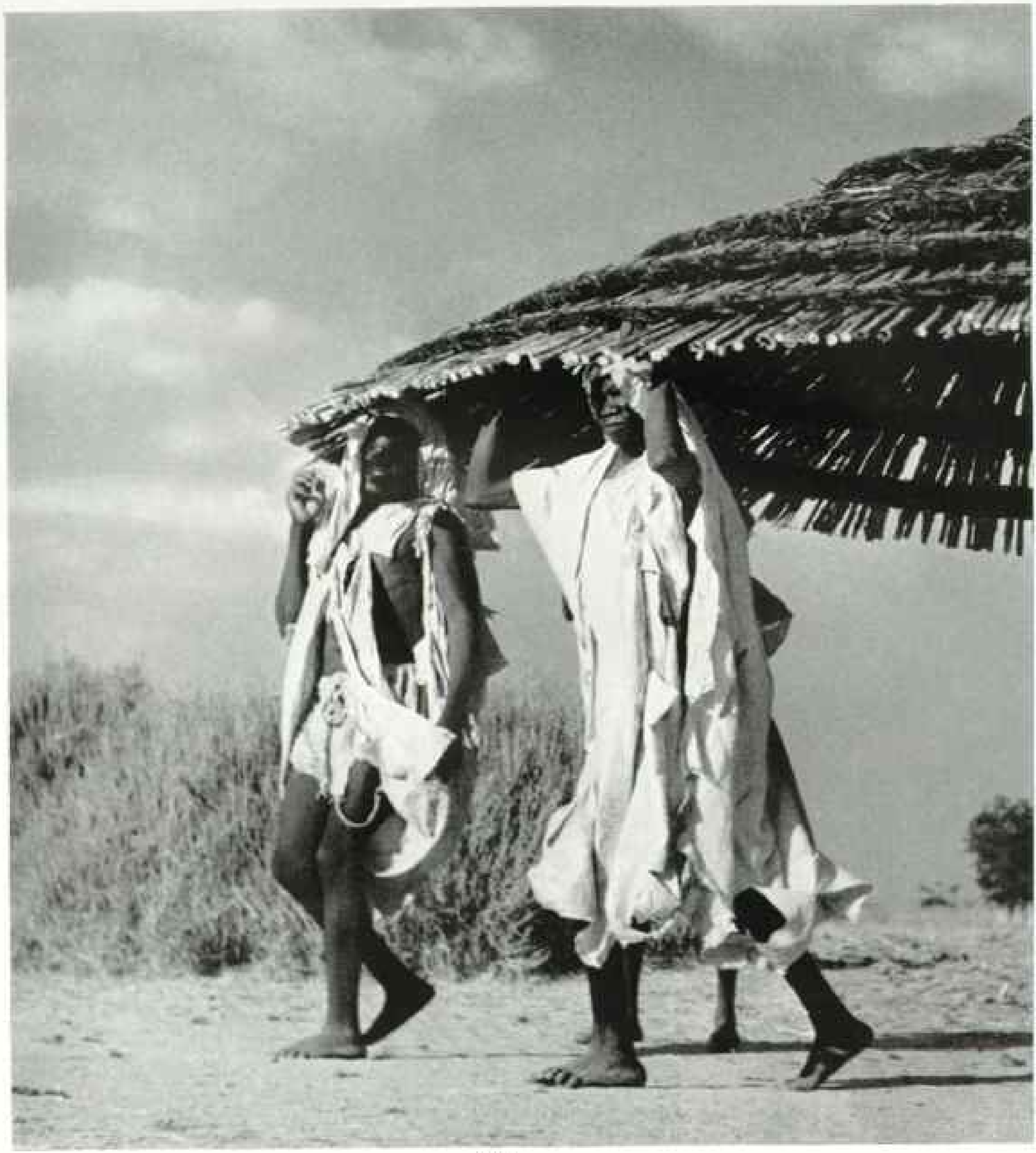
Halved calabashes display dried foods in the central market place of Nigeria's largest city.

Foreground tray holds red peppers, so widely used in cooking that Europeans can hardly swallow the food. Corn, sorghum, and peas fill other containers.

Indigo colors the wrap-around skirts and carefully folded turbans of these Yoruba women.



➔Scars mark the cheeks of these girls near Asaba, on the Niger River. Enamelware basin holds papaya slices. Fishing boats crowd the riverbank.



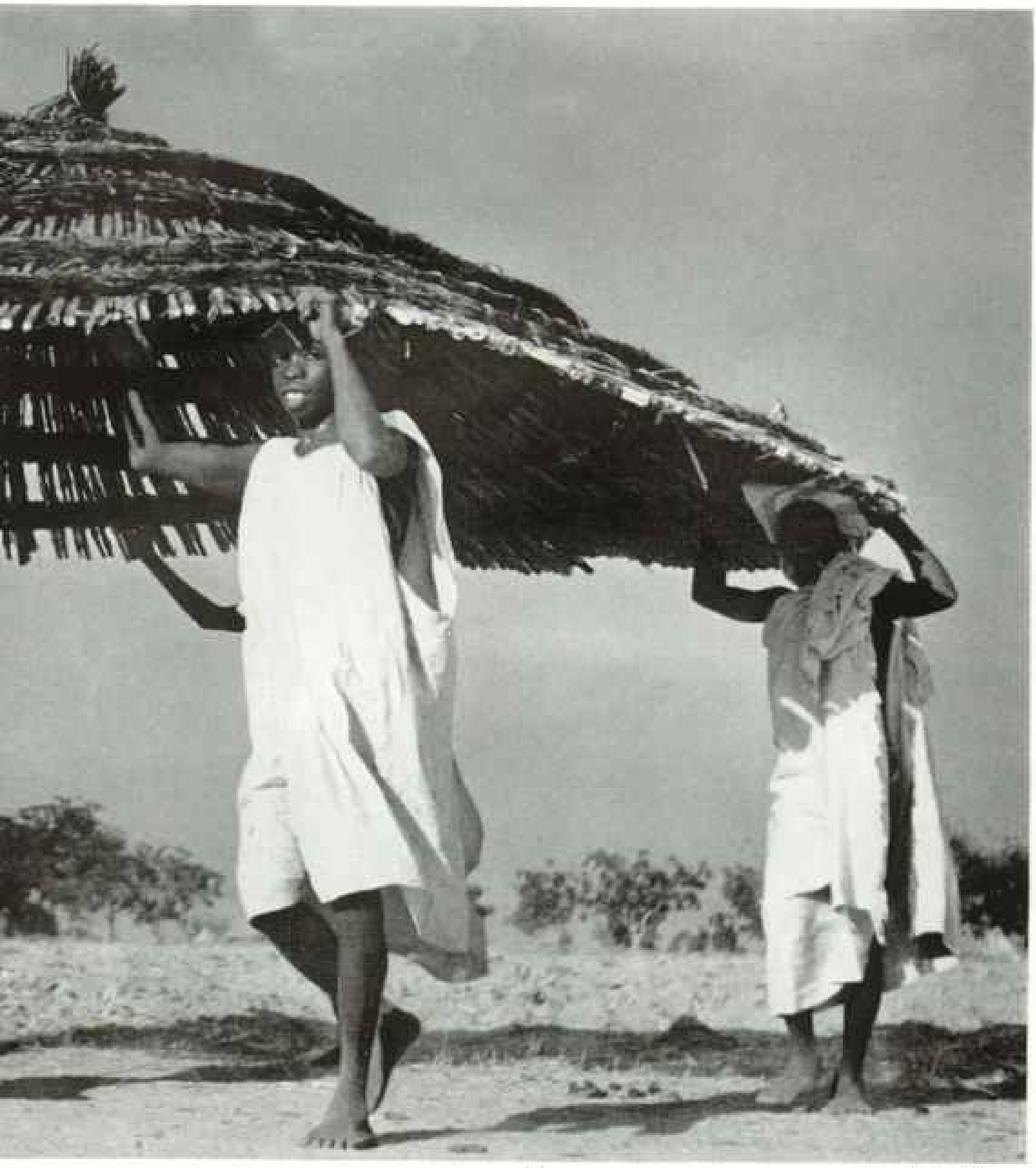
Not a Bandstand with Living Columns, but a Ready-made Roof on Its Way Home

From Jos I flew to Kano and later went by plane and motorcar to explore several towns of the Northern Region.

This region is as much unlike southern Nigeria as if the two were half a continent apart. Here is a Moslem world teeming with people garbed in the loose robes, caps, and turbans common to Arab lands. Here, too, are mud-built towns protected for centuries by thick earthen walls, most of which still remain almost intact (page 345).

Largest of these centers is Kano, a city of 162,000 persons living in or just outside its 11-mile circuit of walls. A maze of red-earth homes, Kano is built of clay dug from borrow pits right within the city. Most houses are sturdily built, and many decorated ornately. Its streets and twisting lanes are alive with life and color (page 342).*

* See "Safari Through Changing Africa," by Elsie May Bell Grosvenor, NATIONAL GEOGRAPHIC MAGAZINE, August, 1951.



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George Rodger-Magnum

When Thatch Is Added, the Framework Will Shed Kano's Drenching Summer Rains

Through limericks and romantic descriptions, Timbuktu, in French West Africa, has come to be regarded as the most colorful city of interior Africa.* To me, Kano deserves fully as much emphasis. For centuries it has been an important political and trade center. I saw pits where cloths still are dyed blue with vegetable indigo for local use and for the caravan trade. And in secluded courtyards I watched goatskins being fleshed, tanned, and dyed into the red, green, and brown leather known to merchants everywhere as "morocco."

Although the British have been in northern Nigeria since its occupation in 1903 by Sir Frederick (later Lord) Lugard, they have left much of the local government in the hands of the native rulers. Most bear the title of emir, though Sokoto has a sultan who also is considered the religious leader.

* See "Timbuktu and Beyond," by Laura C. Boulton, NATIONAL GEOGRAPHIC MAGAZINE, May, 1941.

↓ Beads, Belts, and Painted Socks Garb Pagan Dandies

Highland aborigines of Nigeria favor an Adam-and-Eve costume of leaves hanging fore and aft. Store-bought belts, shorts, and berets worn by these young herdsmen of Miango show the influence of near-by Jos, a tin-mining center. Village festivities provide an excuse for the holiday finery.

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↑ Africa's "Hoboken Ferry" Spans the Sluggish Niger

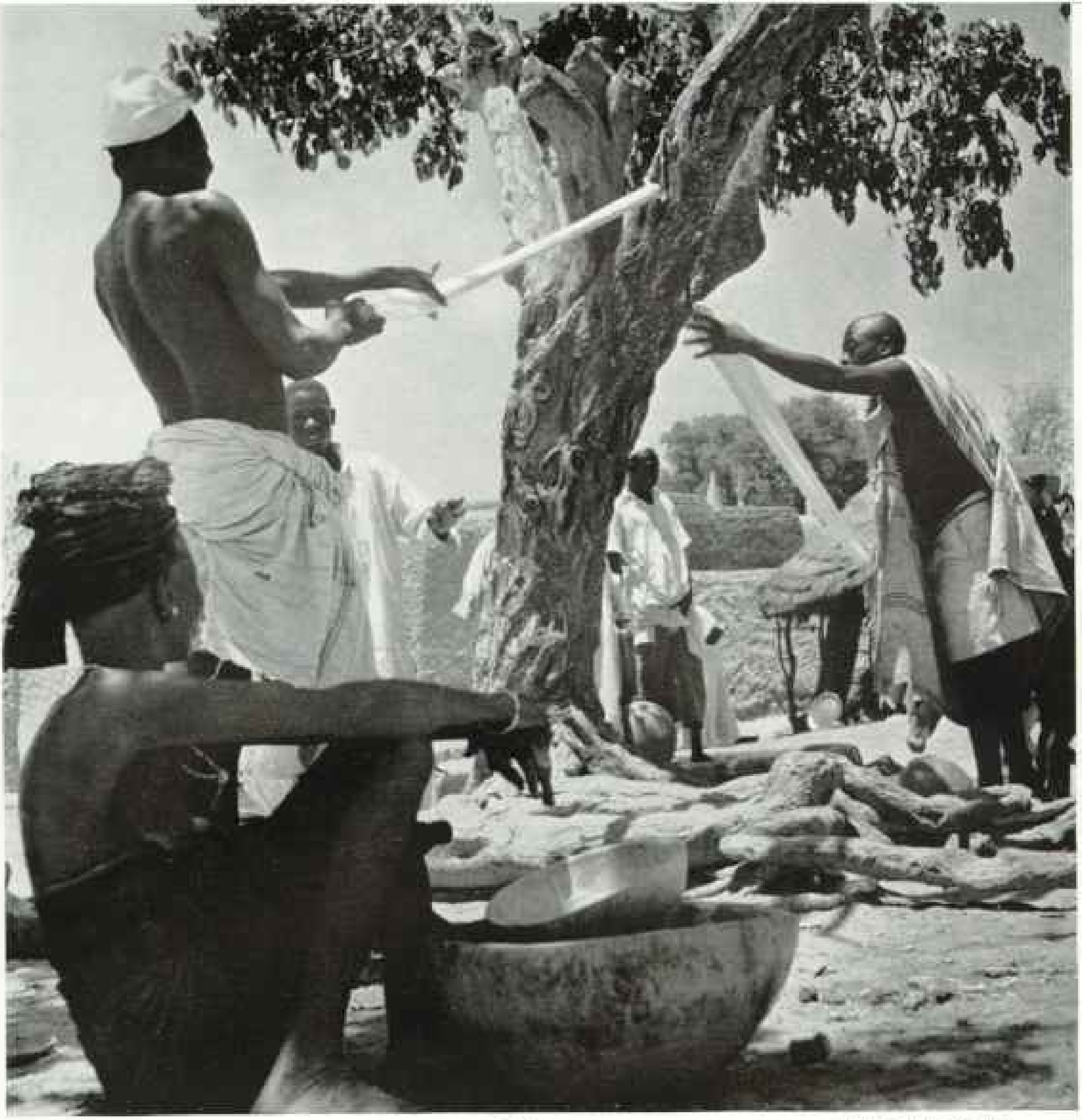
The continent's third longest river, the Niger sweeps in a 2,600-mile arc from Sierra Leone to Nigeria, where it spills into the Atlantic across a swampy 200-mile-wide delta. Parts of the river may be navigated only in high water. The Niger's erratic course long puzzled explorers, who considered it an arm of the Nile.

Here, 140 miles from the river's mouth, Nigerians quit the ferry connecting Asaba and Onitsha. Others wait to make the return journey.

➔Grain sorghum is as important to Africans as corn is to American Indians. One type gives the red dye used in the manufacture of morocco leather. In the United States other varieties provide sirup, fodder, and chicken feed.

These pagan farmers near Pankshin bring in a bumper crop of Guinea corn, a variety of sorghum. Their wives will crush its starchy seeds for porridge and cakes.

Kodachrome (left) by J. Wayne Fredericks



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George Rodger-Magnum

Kano Taffy Pullers Stretch Their Product from Iron Hooks in a Tree

These Nigerians work a mixture of sugar, water, honey, and almonds until it hardens. Hawkers carry the nougatlike candy, called *balawa*, through dusty streets in open trays.

The court of the Emir of Kano occupies a sizable walled-in section near the center of the city, and here, particularly on Moslem festival days, occur ceremonies that delight the eye.

Within the multiple mud walls and courts I met the Emir and many of his court members. Among them were the Wali, the venerable legal advisor in Moslem law; the Ciroma, or senior counselor; and the Sarkin Shanu, a title that means King of the Cattle but actually is applied to the mayor of Kano.

I also met the Madaki, who heads one of the largest nonroyal families in Kano Province and serves as the Emir's representative during his absences from town. His title means Controller of the Horses, and on the morning that I met him he seemed indeed to be fulfilling his title. Enveloped in a dark cape elaborately embroidered, the Madaki rode a superb horse whose bridle, saddle, saddlecloth, and stirrups were heavily ornamented with silver.

When I was escorted into the palace courtyards, where court messengers garbed in red and green lounged around the gateways, I found myself in a throng of the Emir's vividly robed horsemen. Some wore tunics of chain mail, reminiscent of the Crusades; others, both men and horses, were bedecked in quilted regalia once designed as a protection against spears and arrows.

In one of the inner reception rooms of the

palace, built of mud as are the other city dwellings, the Emir received me. He was swathed in snowy-white robes and turban and, following the general custom of the north, had veiled the lower portion of his face in the loose loops of a soft scarf.

Umbrella Shades Emir on Horseback

Shortly after he had greeted me, he mounted his horse and, surrounded by fan and umbrella bearers, rode from the courtyard.

Except for the Queen's visit, courtly parades and processions of gaily panoplied horsemen are now reserved mainly for ceremonies connected with the feasts of the Bairam, or Sallah. These take place at the end of Ramadan, the Moslem fast month, and again 70 days later.

Several of the other northern emirs have horse guards with similar gay trappings. The horsemanship I saw in Katsina, however, was of quite a different nature. The Emir of Katsina, his brother, several members of the court, and young British officials made up opposing teams for an exciting polo game that surged up and down the field. The Emir turned out to be an excellent player in his own right.

As a beast of burden, however, the humble donkey rather than the horse carries the load in the north. Trotting donkeys are everywhere, half hidden under all sorts and sizes of strange cargo.

Guards at Airport Ride Camels

Camels also are common. In fact, one of the first sights one sees on landing at the Kano airport is two camels, gift of the late Emir. On them ride guards who blow long horns to clear workmen from the runways as planes arrive.

Though today trucks challenge the utility of camels, hundreds of the desert beasts still come shuffling into Kano. When I first arrived in this mazelike city, I saw long caravans trekking in from outlying districts with bulky loads of peanuts. Many of the camel drivers are desert Tuareg working at this job seasonally, easily recognized by their black or dark-blue face cloths.

That peanuts are big (and little) business in northern Nigeria was eloquently witnessed by an incident of a few years ago. As the Lagos newspaper reported it in part:

"Two B.O.A.C. aircraft left London airport this week laden with £90,000 in one-shilling pieces for Nigeria. The 1,800,000 coins are destined for Kano and weigh over 10 tons. Since December 5, B.O.A.C. has flown some 50 tons, representing 9,000,000 shillings (exclusive of the above flights). These 'financial' flights are due to a bumper crop of groundnuts in northern Nigeria. Groundnuts are fetching £36 per ton compared to £21 per ton a year ago."

The coins were to pay both small growers and workmen for a year's crop estimated at some 350,000 tons. Because of the slowness of the railway, men stacked bags into mountainous pyramids, awaiting shipment to the coast. By 1956 groundnut prices had risen to £45 a ton.

In the district about Zaria I found quite a different agricultural economy. Here cotton replaces peanuts as the chief reliable crop.

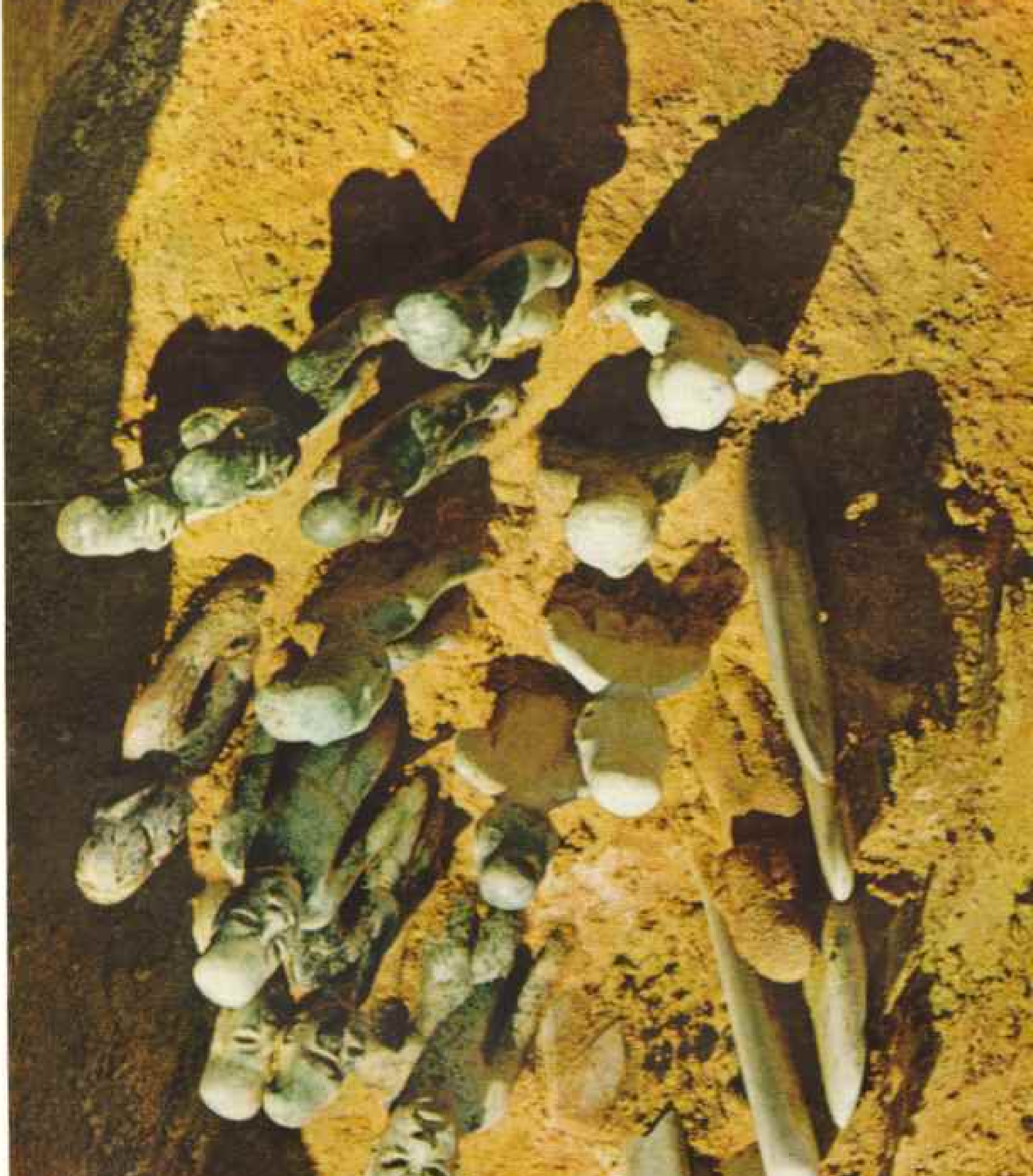
Americans Ferried Planes Via Maiduguri

At Maiduguri, in the northeastern corner of Nigeria, our plane picked up an interesting African product: bale after bale of skins of lizard and crocodile. Men catch these reptiles around the marshy fringes of Lake Chad, on the border between Nigeria and the French territories. The hides are destined to become shoes and purses.

Remote as these airports at Maiduguri and Kano may seem, many an American GI doubtless still remembers them. For here were stationed during World War II the men who kept these links in the aerial ferry service functioning across Africa.

Temperatures had been in the low 40's when I first arrived at Kano in January, and people sought the sunshine to get warm. By the time I left in late March, they were seeking the coolness within their thick-walled homes. The thermometer at midday, in the shade, soared to 110° F. Rains, breaking the heat, would not come until late May or early in June.

Leaving Nigeria, I rode north to Tripoli on the edge of the Sahara to get cool.



Gifts for the Jaguar God

By Philip Drucker and Robert F. Heizer

Coleaders of the National Geographic Society–Smithsonian Institution–University of California Olmec Archeological Expedition

ABOUT A.D. 410, as the barbarian Visigoths swarmed over Europe and sacked ancient Rome, a tribe of American Indians was building elaborate tombs and monuments of basalt rock and green serpentine in a swampy rain forest of southern Mexico. They carved massive, 20-ton stone heads and, to honor their jungle deity, a fierce jaguar god, buried huge pavementlike mosaic masks and offerings of precious jade.

They were the Olmec, a mysterious people who vanished—no one knows where or why—seven centuries before Columbus first saw the New World.

Priests Ruled Olmec from La Venta

In 1955 we led the latest in a series of archeological expeditions cosponsored by the National Geographic Society and the Smithsonian Institution to uncover the statues, tombs, and works of art of this lost civilization. This time we also had the support of the University of California. We continued the exploration begun in 1940 by Dr. Matthew W. Stirling, of the Smithsonian, whose teams first dug up the great stone heads and investigated the Olmec sacred city at La Venta in western Tabasco.

Dr. Stirling's work had traced the broad archeological outlines of La Venta, uncovered a mosaic of the jaguar god, and suggested that the Olmec may have been the first Central Americans to create a true civilization.

From a dated stone (then identified as Mayan because of similar calendric hieroglyphs) which he unearthed in 1939 at Tres Zapotes in the near-by province of Veracruz, Dr. Stirling has estimated that the Olmec ruled this part of Mexico as early as 291 B.C. Some 300 or 400 years later they began to build their ceremonial site at La Venta.*

These people had developed a knowledge of mathematics and apparently of hieroglyphics, and were using an excellent pre-Mayan calendar. Their citizens included some first-rate architects, engineers, artists, and jewelers. Incredibly, they managed to move single stones weighing as much as 30 tons to La Venta from quarries some 60 miles away.

It remained for our expedition to establish beyond reasonable doubt that La Venta served as the religious—and perhaps political—capital of the Olmec civilization. From this holy, if cramped, island east of the Tonalá River, theocratic rulers dominated the hinterland. Tribute poured in to them from far-off villages, and, at their command, great armies of laborers assembled to dig, build, and carry.

What was the religion that inspired the Olmec to such a fervor of labor and artistry? No written records survive, but one object which we uncovered gives us an idea of what their rituals may have looked like. It is the group of 16 miniature human figures shown in the photograph on the facing page.

Mystery of the Sixteenth Man

These odd little men, their heads grotesquely elongated, seem to be performing an important religious ceremony. Fifteen of them, carved from jade or serpentine, confront another made of some conglomerate of granitic sand.

Who is this sixteenth figure, backed against a row of six slender celts of jade? Is he high priest, or victim? Are the four tiny men at his right marching in to pay him homage, or to slaughter him in some gory sacrificial ceremony? We can only wonder.

In this and other ways the Olmec remain as mysterious as ever. We still do not know where they came from nor why they suddenly disappeared from the American scene.

As baffling as any single fact about the Olmec is the passion they had for burying their most treasured structures and possessions—not years later, but apparently almost as soon as they were completed. Under tons of clay went carefully worked figurines, their

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Page 366

← **Long-pated Priests of La Venta Enact a Forgotten Ritual**

Olmec figurines, eight inches high, emerge into the light of day after burial for 15 centuries in the Mexican earth. Most were carved from jade or serpentine. The eroded figure backed against the jade ax blades may have been the priests' leader—or their sacrificial victim. A column of four men seems to march into the meeting.

* See "Discovering the New World's Oldest Dated Work of Man," by Matthew W. Stirling, National Geographic Magazine, August, 1939.

Tumbled Basalt Columns Outline a Buried Monument

The Olmec had a passion, unusual among ancient civilizations, for burying immediately their religious offerings. Above ground they left only mounds, sculptured monuments, platforms, and columns to mark these hidden sacrifices to their forest god, the jaguar.

Jungle growth, studded with trees 30 feet high, wholly obscured this site when the National Geographic Society–Smithsonian Institution–University of California expedition revisited it in 1955.

Workmen here begin to excavate the upper levels of the offering. They unearthed a mask of the jaguar god laid upon 27 layers of thick serpentine blocks. The Olmec, like other tribes in pre-Columbian Mexico, appear to have covered old structures with new at significant intervals in their religious calendar.

Phillip Drucker

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← Block-and-tackle Rig Yields to Older Method →

For reasons best known to themselves, the Olmec chose to place their religious capital at La Venta, a swamp-girt island east of the Tonalá River, 60 air miles from the nearest basalt quarries. To embellish their huge subterranean monuments, they floated two-ton blocks on rafts as far as possible, then manhandled them through forest and marsh.

➔Page 369: Expedition workmen clearing the site may unwittingly have demonstrated how the ancient Olmec solved their transport problem. Disdaining the newfangled block and tackle, they cut poles, slung the big columns from them, and marched off with their burden, a jostling, joking, but effective team of stevedores.

Phillip Drucker (left) and R. J. Squier

370 Phillip Bowles

Surveyor's Rod Measures a Slice of Olmec Time

Creating the first true civilization yet found in Central America, the Olmec people produced works of art both strong and subtle and used a calendar the Mayans may have borrowed. Cautiously peeling off one layer of history after another, archeologists worked back through the centuries to expose this serpentine pavement in the Ceremonial Court at prehistoric La Venta. Below the pavement they found five more such offerings. Tomb of basalt columns in background was discovered in 1942 hidden in a mound.

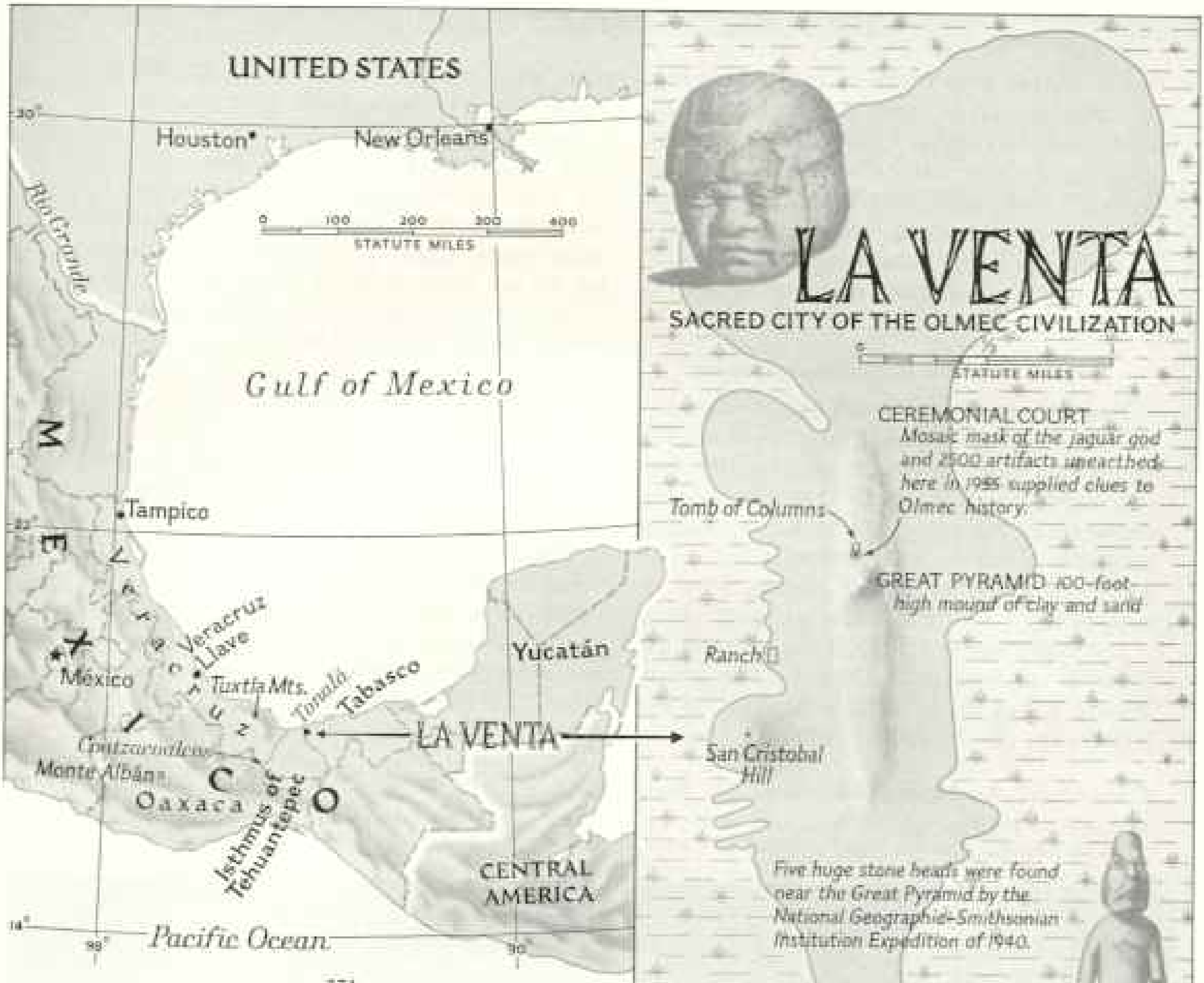
most precious gems, their gaudiest monuments.

In one corner of La Venta's main Ceremonial Court, for instance, we uncovered a magnificent 15½-foot-square mask of the jaguar god. It was composed of 486 neatly cut squares of green serpentine, its mouth stained with brilliant orange sand; stylized plumes decorated the angular skull. Supporting it lay a massive foundation of 27 layers of stone blocks set in clay mortar.

Yet seemingly no sooner was the mask finished than it was covered, first with a coating of olive-colored clay and then with some 500 additional tons of pink clay. Above ground at La Venta they left only pyramided mounds, sculptured monuments, platforms, and columns marking courts and submerged mosaics.

Were they mad? Well, as we sometimes point out to friends: If we consider that future archeologists may discover Fort Knox in Kentucky and speculate why the people of this strange American culture should dig up gold in one part of the world and bury it again in another, we may feel a little less patronizing about the Olmec.

The jaguar god the Olmec worshiped was a forest deity, and it was certainly easy enough for us to feel respect for his power when we returned to La Venta. For in the 12 years that had passed since the excavations of Dr. Stirling and Dr. Waldo R. Wedel in 1943, the jungle had counter-attacked fiercely. A rank



tangle of vegetation, studded with trees 30 feet tall and a foot thick, had sprung up on tracts they had so painstakingly cleared.*

As we glided up the Tonalá in our mahogany dugout and an occasional snowy egret flapped from the shallows to a perch among the writhing mangroves, life along the river looked much as it always had. But, significantly enough, our canoe now sported an outboard motor, and when we approached La Venta itself, we found not the sleepy encampment of a few Indian families but a boom town of several hundred workers. Modern technology is closing in on La Venta.

In 1955 the oil agency Petróleos Mexicanos had brought in a well near the island, opening a major field. Now we watched a road link to the national highway system being pushed right across the swamps. Bulldozers and trucks roared through woods where deer and ocelot once wandered at will. Juke boxes assaulted the air with tunes popular a year or two before in Mexico City.

But the hospitality of old friends like Don Sebastián Torres, venerable patriarch of La Venta, had not changed. Though he now has a small army of sons, sons-in-law, grandsons, and great-grandchildren, he still goes to his fields each day to plant and cultivate.

"A man who loves his land does not abandon it casually," he told us.

On a sandy ridge lent us by Don Sebastián, we set up our camp. As in other years, we decided in favor of thick roofs of palm thatch, which insulated us well against the tropical sun. Walls of small poles, set upright, allowed good ventilation yet proved sturdy enough to resist the gale-like *nortes* that swept in from the Gulf of Mexico on occasion.

* See, in the National Geographic Magazine: "La Venta's Green Stone Tigers," September, 1943; "Finding Jewels of Jade in a Mexican Swamp," November, 1942; "Great Stone Faces of the Mexican Jungle," September, 1940, all by Matthew W. Stirling.

For lumber with which to make our camp furniture as well as boxes for our collections, we depended on timber felled right on the spot. Two loggers in our crew chopped the straight-trunked trees with long-handled, single-bit axes and hewed them square. Then they mounted the large timbers on scaffolding and laboriously ripped them into boards with a 9-foot saw.

Snakes Menace Expedition Diggers

Presently we began clearing the archeological site—not only of jungle growth but of such ungracious hosts as the fer-de-lance, the rattler, and the coral snake. The howler monkey retreated to the fringe of the forest, waking us before dawn with lugubrious roars. The ocelot contented itself with robbing Don Sebastián's hen roosts and left us quite alone.

Our staff consisted, besides ourselves, of the Mexican archeologist, Eduardo Contreras; Robert J. Squier and Pierre Agrinier of the University of California; Manuel Moreno, camp superintendent; and 12-year-old Stephen Heizer—junior assistant and camp mascot.

Since we had a well-stocked medical chest, crew members often asked our help in treating minor injuries and ailments. One of our workmen, however, bothered by a host of rather vague aches, spurned our miracle drugs for a far more colorful kind of therapy.

Juvencio took his pains to Doña Anita, an elderly Indian with local fame as a *curandera*, or medicine woman. She applied a combination of Indian magic, medieval Spanish folk remedies, and Christian prayer. So far as Juvencio was concerned, it worked; he felt much better, and that was what mattered to him.

The heart of the La Venta site, as our previous expeditions had determined, covers a gentle ridge, some 600 feet wide, that runs north and south for about half a mile. At its center rises the Great Pyramid, a mound about 100 feet high and some 300 feet on a side. North of the pyramid lies the Cere-

Ceremonial Ax Heads Offered to the Jaguar God Suggest Teeth of Prehistoric Monsters

Too soft for practical use, the large axes at left were made of serpentine for rituals. Some weigh as much as 20 pounds. Harder, finely polished jade axes at right were buried years later as a second offering.

373 Phillip Druckan

Binding Babies' Heads Produced High-browed Priests Like These Figurines

Four of the heavy-jowled men who depicted an ancient ritual (page 366) stand for their portrait after scientific resurrection in 1955. Sculptors drilled the eye sockets deep enough to receive eyeballs of semiprecious stones. Pockmarked figure at left shows the effect of soil chemicals on its granitic body.

monial Court, and beyond it the Tomb of Columns (page 370). On a precise line along this axis were buried nearly all of La Venta's most striking tombs, altars, and offerings.

Dr. Stirling's group had found in 1943 the first great jaguar mask of La Venta in the southeast corner of the court. We discovered its identical twin in the southwest (page 374).

The bases of the structure turned out to lie much deeper than we had expected. A whole season—January to May—went by before we had fully uncovered the mosaic platform and its massive foundations.

Everywhere we dug, moving backward in time, we found ample proof that the Olmec had repeatedly rebuilt their structures. Perhaps the priests decreed these revisions and refurbishings to stimulate their people's religious fervor. Perhaps it was to mark the end of some calendric period or the start of a new.

At any rate, we were to encounter one pavement upon another, one coat of bright clay blotting out a second and a third, an adobe platform trimmed, repaired, rearranged. The Olmec's final touch on the Ceremonial Court had been to surround it with a perimeter of basalt columns, about 190 feet long and 136 feet wide, and to floor it with scarlet clay.

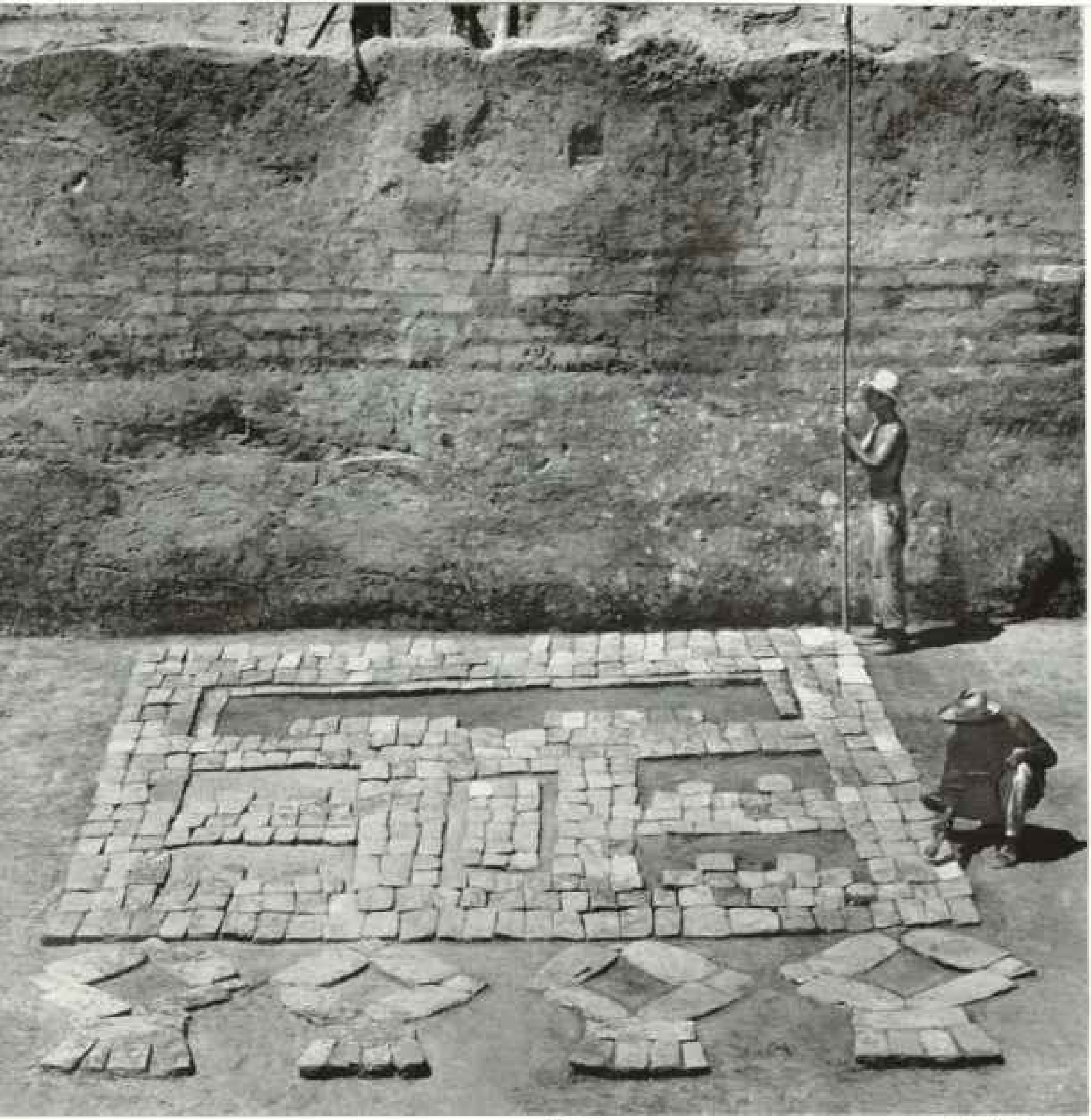
These thin floors seem almost to have been painted on, perhaps replacing those washed bare by the previous season's rain. But at least the builders had given some thought to providing runoff. Aware that any enclosure in the rain-drenched jungles of Tabasco would become a duckpond during part of each year, the Olmec architects deliberately laid their floors with a slight grade and, in later periods, devised systems of shallow drain gutters.

After the Olmec people abandoned La Venta, about A.D. 800, gales gradually drifted the court four or five feet deep in sand. When Dr. Stirling first glimpsed it, only the crowns of the columns protruded.

Awed Intruders Left Crude Offerings

Embedded in the loose sand we found evidence of a curious fact: a later people than the Olmec, ignorant of the court's mysterious symbolism, yet awe-struck by the colonnade and the sculptured monuments, had made offerings of crude pottery to these unknown gods.

In the course of our extensive excavations we found still other buried pavements as striking as the mask of the jaguar god—huge, solidly based, precisely engineered. Time has dulled the polish of their serpentine blocks,



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B. P. Beisse

Four Eyes of a Jaguar Mask Stare Up at the Sun for the First Time in 15 Centuries

Olmec artists had scarcely completed this weird mosaic before they hid it under 500 tons of clay and a platform of orange and yellow adobe bricks, still discernible in the embankment. Mouth of jaguar's stylized face lies nearest wall. Rectangle of 18 blocks in center represents nose. On either side appear double eyes, signifying the god's all-seeing gaze. Stones in diamond pattern at border form the deity's plumed crest.

But when they were first laid down they must have been both magnificent and brilliant in their brief moment of glory, before their creators secreted them forever (they thought) beneath tons of earth.

We were struck, too, by the care with which the ancient builders kept the dune sand from caving in upon their work before they had finished it. All around their pit they neatly laid clay retaining walls that sloped back toward the lips of the shaft.

It was on the east side of the court that we uncovered the curious group of 16 figurines, frozen in the middle of their strange rites. The significance of this offering lies not only in the picture it gives us of Olmec religion but also in another bizarre fact.

Long after these small, solemn actors had been entombed, someone cut a hole through the brightly colored floors of the court directly above them, had a look, and then carefully covered them up once more. From this strange act, whatever its religious purpose, we can infer something extraordinarily interest-

ing—to locate so precisely this buried scene the Olmec priests must have possessed very accurate records indeed, perhaps even architectural plans and diagrams.

Certainly the Olmec artisans were men of skill. Just above one of the pavements, the builders had deposited two identical offerings of nine gleaming gray ax blades of jade, a concave mirror of black metallic hematite, and about a thousand small jade beads.

The mirrors were masterpieces. Each had been so perfectly ground that when we rotated it the reflection we caught was never distorted in the least. Yet the hematite was so tough that we could not even scratch it with knives of hard Swedish steel. Such mirrors doubtless served equally well to adorn important personages or to kindle ritual fires.

The pottery we unearthed was not the most beautiful that men have ever fired, but it has proved of major scientific value, both by helping us to date the successive stages of the La Venta complex and by definitely tying in these stages to Olmec culture.

Our best clue to the age of the whole site, however, will come from charcoal deposits we have just submitted to carbon-14 analysis. These, we expect, will place the earliest structures and offerings about the beginning of the Christian era.

Huge Stones Hauled Miles Without Wheels

Where did the Olmec get their gems and great blocks in the first place? La Venta, after all, is situated in a swampy coastal plain. Our best guess is that they quarried their basalt and obsidian in the Tuxtla Mountains, some 60 miles away by crow's flight but much longer by tortuous overland trails and water routes.

The serpentine and schist may well have come from the southwest, on the Isthmus of Tehuantepec near the headwaters of the Coatzacoalcos or Tonalá Rivers. Where the Olmec found their handsome blue, gray, and green jades, their rock crystal, their hematite, and their brilliant red cinnabar, we can't be sure. But their presence at La Venta unquestionably implies that the Olmec had a widespread net of trade and communications.

Most of the stone columns enclosing the court weighed a good two tons. To transport burdens of this size through rough country, with neither wheels nor beasts of burden, is a truly formidable assignment.

We got some notion of the technique the Olmec probably used by watching our own native workmen. In removing the huge columns from their beds, we tried at first to employ the block and tackle and skids. But they soon abandoned these newfangled devices for the time-honored system of slinging the weight from poles and getting everybody and his brother to shoulder them (page 369).

Mosaic Mask Goes to Mexico City

Superficially, this method more closely resembled a freshman riot at college than an engineering venture. A happy, confused throng milled about under the carrying poles, everyone offering advice, jeers, and comment on his own feats of endurance.

Yet somehow the job got done, with surprising speed and efficiency.

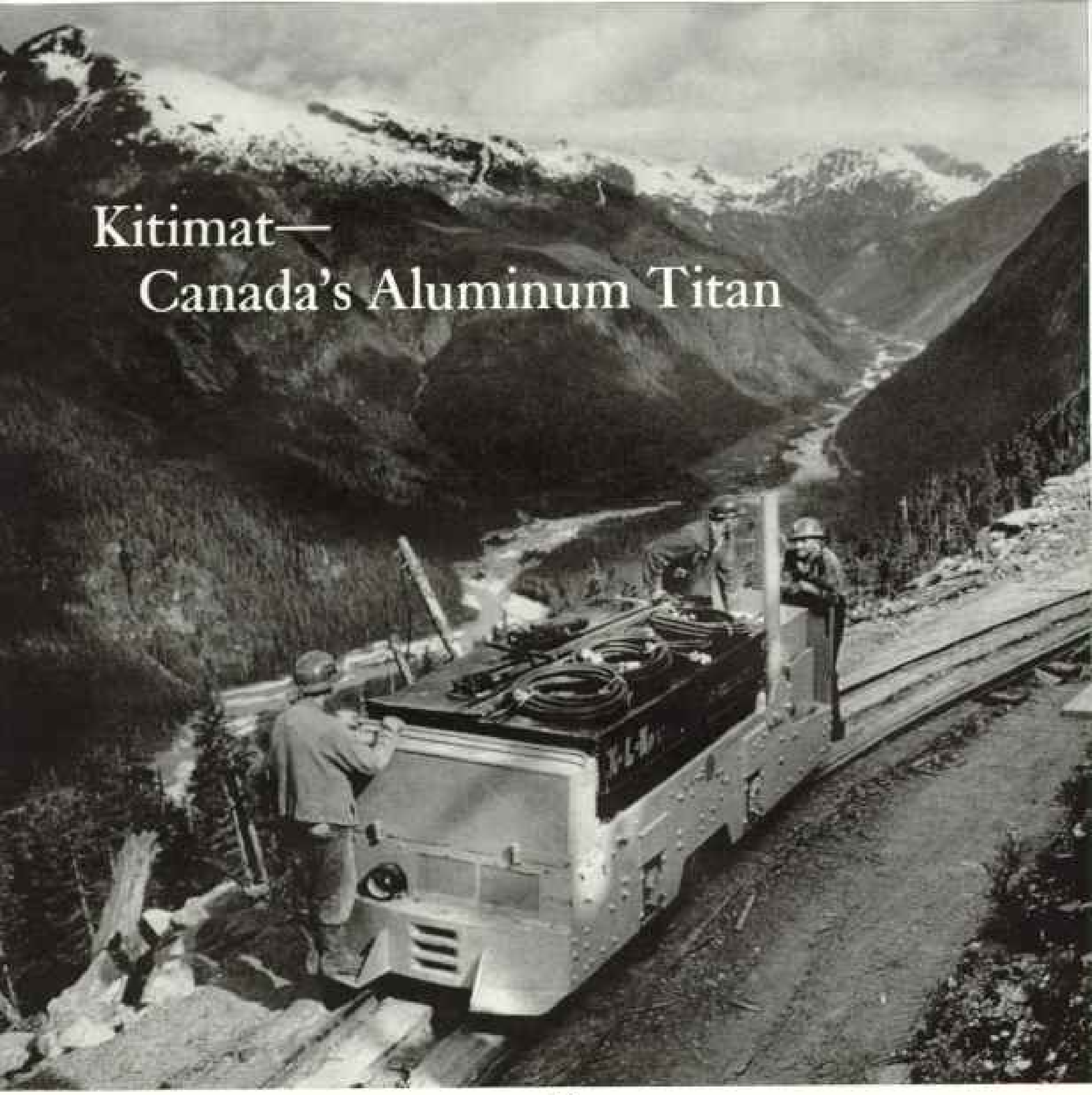
As our season at La Venta drew to a close, we had some excuse for a sense of satisfaction. We had not merely excavated, but we had also righted and helped preserve many monuments already uncovered. We had shipped off to Mexico City the entire mosaic mask of the jaguar god, now permanently displayed in the patio of the National Museum of Mexico. We had collected more than 2,500 artifacts of jade and related materials—many unique—and we had garnered much new information on the brief evolution of this strange Olmec civilization.

Other answers to the Meso-American riddle may still lie buried in the central pyramid of La Venta, answers that may reveal more clearly the relations of the Olmec with the early Maya temple builders to the eastward, and with the ancient Zapotec who raised the splendid acropolis of Monte Albán in the Oaxacan highlands.*

But that's another story, for other explorers to unearth. It will be at least a year before we have fully assessed, in the laboratory and at our desks, all the archeological treasure which this latest expedition cosponsored by the Society has brought back.

* See "Monte Albán, Richest Archeological Find in America," by Dr. Alfonso Caso, in the NATIONAL GEOGRAPHIC MAGAZINE, October, 1932.

Kitimat—
Canada's Aluminum Titan



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By David S. Boyer

Foreign Editorial Staff, National Geographic Magazine

With Illustrations from Photographs by the Author

"WE admire the Americans for the way they shovel up mountains and shift river courses and throw the map all around the place," Canada's famous Stephen Leacock wrote 20 years ago.

Yankees even talk lightly, the humorist said, of damming rivers to make them run backwards over the mountains. Canadians, he noted proudly, were cut of the same cloth.

I could vouch for that. Flying high above the fiords and forest-covered ranges of frontier British Columbia in a Mallard seaplane, I was looking down on Kitimat for the first time.

Kitimat!

Canadians were actually doing what Leacock had joked about! They had dammed a river, run it backwards through a mountain, dropped it down a man-made waterfall 16 times higher than Niagara, and then released it into the Pacific.

Why?

To produce electricity to make aluminum. For aluminum requires cheap power, in steady, enormous quantities.

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Geography had set the stage for an engineering extravaganza, but the Aluminum Company of Canada (Alcan), principal subsidiary of the world-wide Aluminium, Ltd., had had to transform the landscape.

First of all, the Nechako River flowed the wrong way. Its headstreams tumbled out of mile-high mountains—glacier-ridden ranges backed up against the sea. Icy runoff waters swept inland, through sprawling lakes, into the Nechako, down the mighty Fraser. Four hundred miles southward, at Vancouver, the Nechako waters finally found the sea.

To prevent this waste of water power, Alcan built Kenney Dam, controlling an upper Nechako drainage area as large as Connecticut plus half of Rhode Island. Water backed up until a chain of lakes formed an inland sea.

Miners High Above Kemano Valley Ride an Electric Locomotive

Kitimat, the new aluminum project in British Columbia, has taken shape in a wilderness. To bring hydroelectric power to furnaces, engineers remade a rugged landscape, tunneling a mountain, damming and reversing a river. These hard-rock miners, with their pneumatic drills and hoses, work half a mile up the slope of Mount DuBose (page 394).

West of Kenney Dam, 125 miles, the gigantic reservoir pushed against the Coast Mountains (map, page 381). The reservoir level was half a mile high and a mere 10 miles from Pacific tidewater. From that height a tremendous water pressure could be produced for a sea-level power station at Kemano. But the mere 10 miles were through solid granite!

All that was needed to create a powerhouse unrivaled anywhere was a tunnel. Today the tunnel exists, 10 miles long through Mount DuBose, large enough to hold a pair of diesel locomotives side by side.

Still within the mountain, the water plummets 2,600 feet through generators singing with more kilowatts than any others in the world today. They churn out electrical energy for aluminum in an atom-bomb-proof excavation that will one day be big enough to dry-dock the *Queen Mary*.

But the story doesn't end at Kemano. Kitimat, the once sleepy fishing village that gave the project its name, lies 50 miles away, at the head of a deepwater fiord like Kemano's. Here stands the smelter where, at the touch of electricity, a powdery extract of bauxite ore becomes the miracle metal aluminum (page 393). Over a snowy mountain pass, high-tension lines carry Kemano's electrical energy to Kitimat's ever-glowing furnaces (page 383).

Aluminum smelters consume electricity voraciously. Producing a ton of metal requires enough energy to supply the electrical needs of the average American home for 10 years. Cheap electricity is so important that it pays Alcan to haul raw material 5,600 miles from Jamaica, then ship finished ingots to Canadian and United States manufacturers. An increase of a tenth of a cent in the cost of a kilowatt-hour would boom production costs $20 a ton.

As I flew north from Vancouver, I could appreciate why Alcan came to this pioneer north country to execute the most expensive project ever attempted by private industry. Windows of the Mallard seaplane framed a panorama of volcanic mountain range. Cup-

378 Aluminium Company of Canada, Ltd.

16 Niagaras High! This 11-foot Tube Penetrates a Mountain

A temporary ladder climbs one of a pair of penstocks that split the head of water from Kenney Dam (pages 396, 397). Bored upward inside Mount DuBose, the tubes tip at a 45-degree angle. Roaring through the steel-lined conduits, the stream hits Pelton wheels in Kemano powerhouse (opposite) with a pressure of 1,126 pounds to the square inch.

like cirques stored mammoth pockets of snow above long U-shaped canyons hollowed out ages ago by glaciers. Below me, in deepfreeze, was almost limitless waterpower.

"Not much of a spot to crash-land a seaplane," the pilot said, "but a great place to store electric power!"

He had flown these mountains since the job began in 1951, and his touch of pride was typical of everyone who had a part in shaping the epic of Kitimat.

Suddenly the pilot pointed downwards. Over the peaks and snow fields the high-voltage power line plunged into the Kemano Valley and disappeared inside the powerhouse in Mount DuBose. Ahead, the transmission towers walked down a slope toward Kitimat, the only level space large enough for the huge smelter and its attendant city.

Here a carefully planned frontier metropolis for 50,000 people, soon to be the third largest in British Columbia, is rising from the wilderness. A few years ago the only humans here were "Kit-a-maat" Indians, the "People of the Falling Snow."

Our plane landed in a fountain of spray, almost close enough to splash an ore-laden freighter from Jamaica. The Mallard waddled up a concrete ramp, like the duck for which it was named.

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Cavernous Kemano Powerhouse, Carved in a Rock Mountain, Could Embrace a Cathedral

To build the world's largest underground power station, miners burrowed a quarter-mile inside Mount DuBose. Solid granite walls help contain the enormous pressure inside the penstocks (opposite) and make the station secure against landslides and air raids. Vaulted and ribbed with concrete, the cave is now 80 feet wide, 155 feet high, and 700 feet long. Four giant generators produce power for Kitimat's sea-level smelter. Construction equipment still cluttered the room when the overhead crane lowered this generator rotor into position.

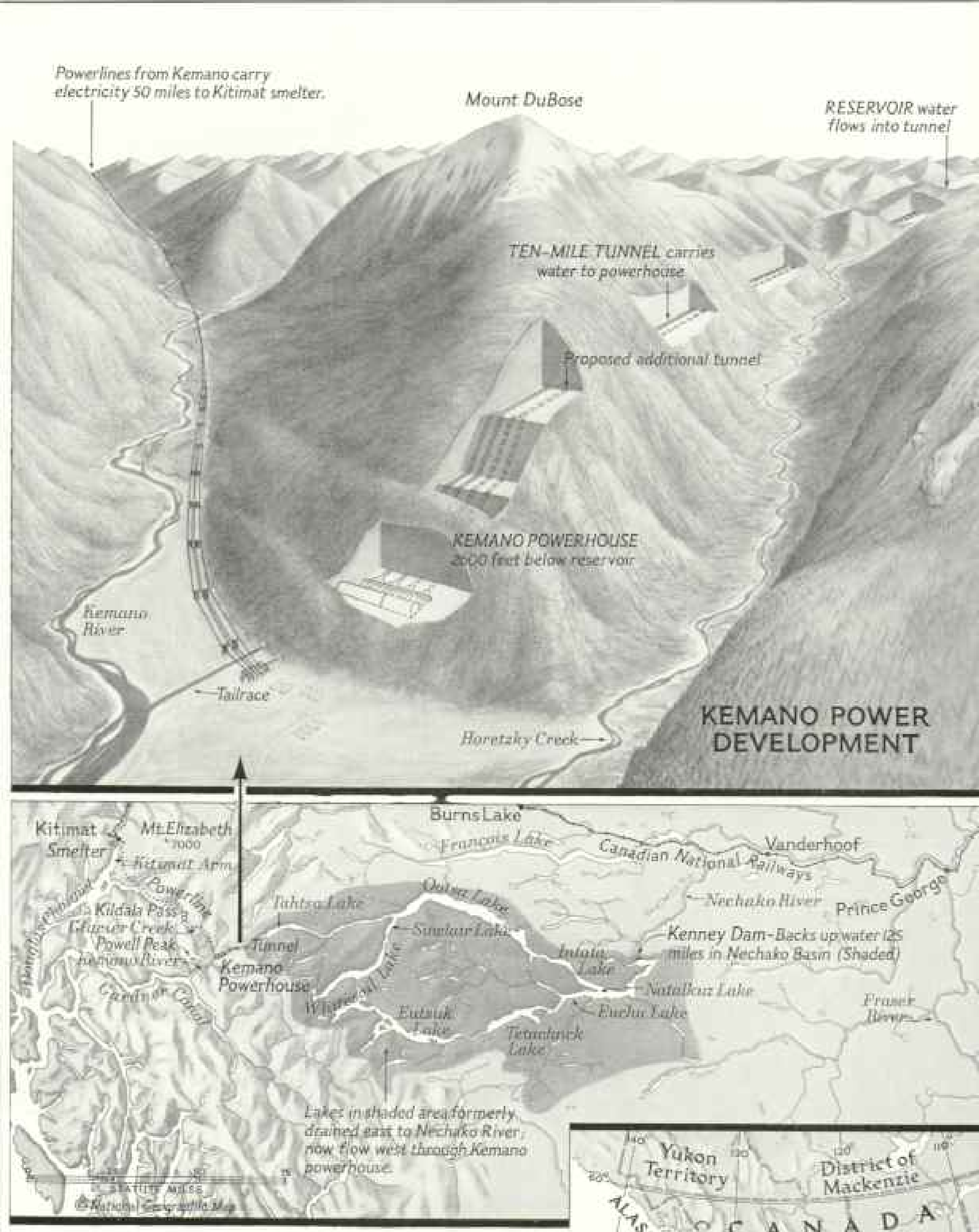
The Last Rail Is Laid: Kitimat Rejoices

Built in the British Columbia wilderness to use nature's prodigal gift of water power, Kitimat had one disadvantage: ravines, bogs, glacial gravel, and dense forests walled it off from the rest of Canada.

The Aluminum Company of Canada (Alcan), determined to be linked by rail with the world, pledged $1,000,000 annually in freight fees to Canadian National Railways for at least 10 years. With such assurance, CNR built the 43-mile spur from Terrace at $217,000 a mile.

Here a machine pounds home the ceremonial aluminum spike.

◂ Peggy Burbidge, Miss Kitimat of 1955, presents a souvenir spike to Robert MacKenzie, who drove the pioneer locomotive.



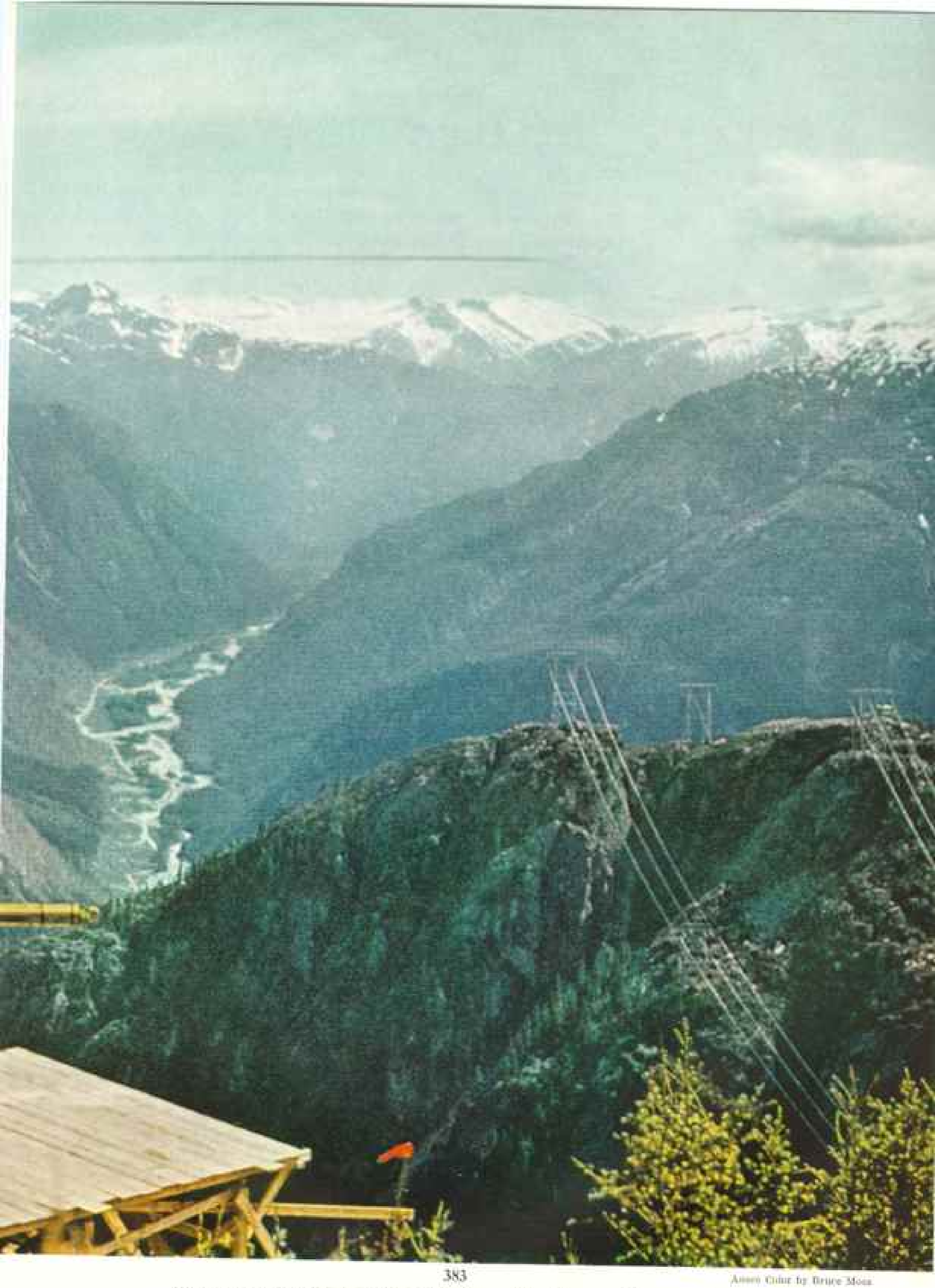
381

Cheap Power Turns a Wilderness into an Aluminum Colossus—Kitimat

Nature blessed mountainous British Columbia with ample rainfall and elevation, two valuable tools in the generation of hydroelectric power. Dammed and dropped half a mile, water turns Kitimat's electricity-producing generators at such low cost that refiners can afford to ship in ore mined on the other side of the continent. Deep channels from the sea admit ships.

Helicopter Crosses a Mile-deep Gorge with Flying Cargo in Its Grip

This Sikorsky S-55 prepares to drop two 400-pound steel anchor bolts onto a platform. Sunk into rocks, these bolts will secure cables supporting transmission lines high above snowslides, which snapped towers in 1955. Without helicopters, Kitimat engineers could never have maintained schedules. Kemano River races through the defile.



383

Artist's Color by Bruce Moss

High-tension Lines Leapfrog Ravines with Thousand-foot Strides

A chambered mountain in this wilderness conceals Kemano's atom-bomb-proof powerhouse, which feeds furnaces in Kitimat's smelter 50 miles away. Behind the range at left, a huge reservoir channels water into a tunnel for a 7,600-foot drop. This powerful flood turns generators that ultimately will produce 1,800,000 kilowatts.

Paradoxes at Kitimat were to startle me many times. The first was the two-toned current-model taxi waiting at the seaplane dock.

On a concrete highway we sped along a corridor cut through towering evergreens. The radio squawked and chattered as dispatchers sent pink Fords and vermilion Chevrolets scuttling through the forest.

Dynamite Rocks Kitimat

I tried to make some mental notes about the scenery, the trailer camps, the barrack buildings, the working crews we passed. But the taxi meter, clacking away at an alarming rate, made concentration impossible.

It rang a resounding $3.25 as we skidded to a halt beside an aluminum-trimmed, two-story building standing practically alone in a clearing—the Kitimat Hotel.

I paid the ransom, counted my camera cases onto the sidewalk, and stared up in amazement at two neon signs blazing away in broad daylight over two of the hotel's three doors. One said "Men," the other "Ladies."

"That's the men's and ladies' bar," the bellboy said, noting my startled expression. "British Columbia law, you know."

Suddenly, scarcely a hundred yards away, the earth began erupting like a battlefield under an artillery barrage.

"Just blowing up some tree stumps," the boy went on.

He staggered upstairs under a burden of photographic equipment and ushered me into a handsome room that might have belonged to a first-class hotel in Pasadena or Miami. Outside the window explosions continued to churn up the ground.

A train whistle shrieked. Out of the woods charged a diesel locomotive. A pair of prewar coaches rattling along behind, it wheezed to a stop before a white wooden shack. The Canadian National Railways, my oracle offered without any prompting, was debating whether to build the permanent passenger station of polished logs or aluminum.

The bellboy slipped out the door with his tip, then stuck his head back inside with a final bit of information. Tomorrow morning, if I wanted to make a photograph, the CNR was going to drive an aluminum spike to celebrate the formal opening of the 43-mile branch rail line from Terrace (page 380).

I hadn't been in Kitimat long before I realized that everyone, from bellboys with baggage to engineers dealing with new and secret methods of refining aluminum, was excited by what was going on around him.

In short order I became excited too.

Kitimat was a boom town. It was as if the old West had come to life—with taxis for horses, electrical engineers for cowboys, dynamite explosions for bullets, and aluminum ingots branded ALCAN for cattle.

Already 6,000 people were there, although the smelter was less than 20 percent complete. Most were men, but wives and sweethearts were moving in by train, plane, and boat.

British Columbians are frontiersmen by nature. Many move with the job and the season. In the summer they are fishermen or loggers or miners. In the winter they hibernate in the towns, spend their money, get reacquainted with their families.

Now Kitimat was offering the frontier on an aluminum platter—a year-round job, a three-bedroom house for the wife and children, salmon fishing within a couple of miles, and moose hunting on the week end. As a result, bulldozers and steam shovels couldn't level the forest fast enough, nor an army of carpenters build houses to meet the demand.

Church congregations were praying in schoolrooms. Ministers praised the Lord and after church service compared blueprints of steeples soon to rise amid the timber. Harassed school officials were throwing up temporary classrooms as hundreds of newly arrived children outran building calculations. Town planners, in fact, were about to advance the timetable for construction of a big aluminum-trimmed health center. Kitimat's hospital, still housed in a prefab, was recording 40 births a month.

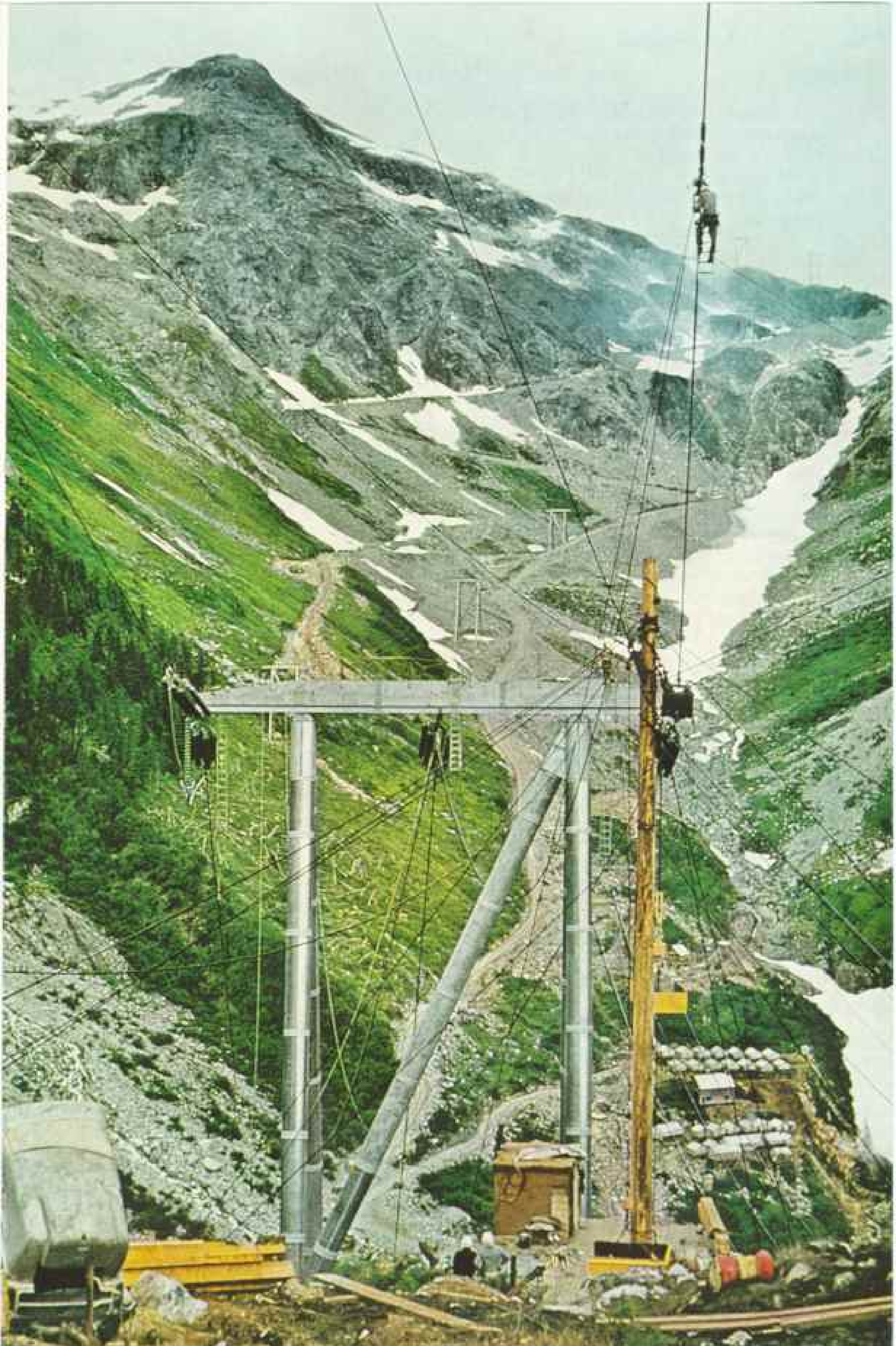
Page 385
Daring High-liners Ride Dizzy Cables → and Tread Lofty Catwalks

Glacier Creek Canyon's transmission lines pioneered the use of tubular aluminum towers. Lighter than steel and rust-free, the huge tubes enclose ladders giving repair crews access to the lines in any weather.

Workmen reached the tower sites by helicopter and winched heavy materials up by cable. Bulldozers scraped the zigzag road in dead of winter; some of the grades are so steep that vehicles rise one foot in every four.

Camp 10 (lower right) contains tents of the construction gang. Bears prowled its garbage dump until dynamite was exploded to frighten them.

In January, 1953, an avalanche poured out of a glacial cirque at upper left and smashed three towers.



Europeans have contributed heavily to Kitimat's rapid growth. Immigrants, pouring in from Europe, heard of jobs on roads, dams, powerhouses, and transmission lines. High wages and overtime pay lured them across the continent.

The fantastic days of rush construction are over now, but many immigrants are staying. The pay isn't as high as it used to be, but jobs are steady.

In his modern home of polished cedar logs I met Tony Heslenfeld, from the Netherlands. Tony used his first spoken English, outside grammar school, during World War II, when he helped smuggle downed U. S. flyers through occupied countries to freedom.

Later his Dutch battalion was attached to the U. S. Ninth Army, and Tony was bitten by the bug to get to America. U. S. visas were hard to get, so he sailed to Canada, migrated to Vancouver, then to Alcan's powerhouse at Kemano.

With overtime and double pay as a diesel-electric operator, Tony made $9,000 in 1953. In six months he sent for Josephine, who came from the Netherlands too. They bought a house trailer. Soon Vincent was born.

Today, as a technician in the electrical current control room at the smelter, Tony makes little more than half his 1953 salary. But he has a $14,000 home, and Josephine owns an electric washing machine, a vacuum cleaner, and a floor polisher (page 391).

She used them as a Dutch housewife should, a dozen times a day, or so it seemed to me when I went to tea and tiptoed gingerly across her gleaming floor.

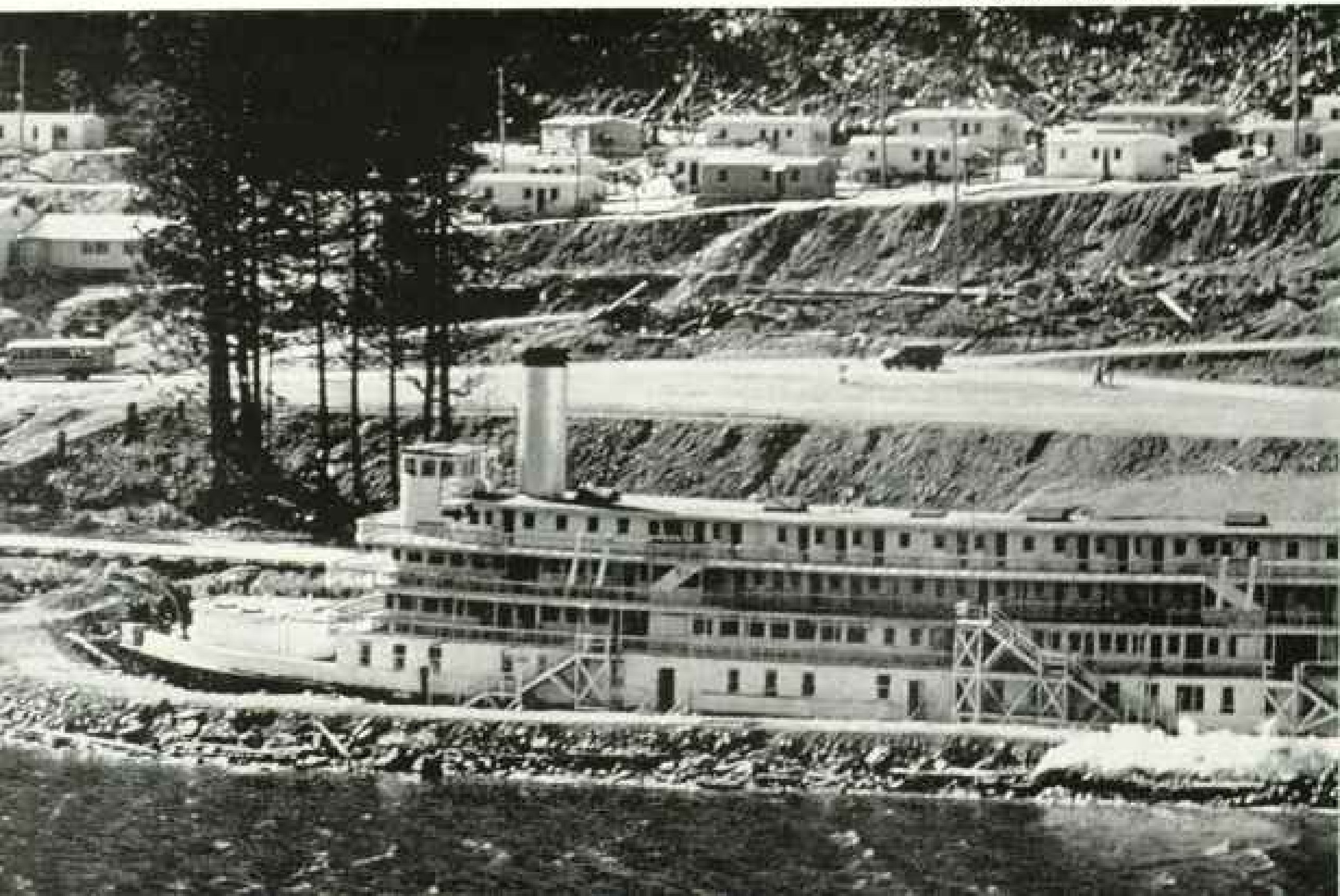
"Until the aluminum company put in our lawns, I really used them a dozen times a day," she told me. "You can't imagine how much rain we get here in the autumn, nor how deep the mud can be. But now the lawns are planted in neighborhood A-1, and in a few weeks the asphalt streets will be down. We'll be able to forget the mud and dust."

Neighborhood A-1, served by winding or dead-end access streets, is protected from any high-speed traffic. Householders step from their front doors onto a pathway that divides facing front yards, and they walk to school.

***Delta King*, Once a Proud River Packet, Now Houses Kitimat Workers**

Built in Scotland and assembled in California, the 250-foot stern-wheeler carried fun-seekers on Sacramento River excursions during the 1920's and '30's. In World War II she ferried soldiers to troopships in San Francisco Bay. Today *Delta King* sits in an earthen way protected from the sea by a coffer dam. Her boilers heat hospital, school, and other buildings on the shore. Some 200 men live aboard (page 390).

J. Baylor Roberts, National Geographic Staff



theater, or shopping center without crossing a major thoroughfare of any kind (page 390).

"That's one reason Kitimat is a good place to raise children," Josephine declared. "You can bring them up without automobiles striking them down."

Josephine and Tony and little Vincent are even more fortunate than most. Their home does not even face a neighbor's house. Instead, it looks out across one of the many grass-covered playgrounds for children.

Prefabs Came 500 Miles by Barge

Kitimat will be a city of 10 neighborhoods, each with its own shopping center and elementary school. As a nucleus there will be a city center, including office buildings, library, museum, auditorium, arena, hotels, and a home for the city, Provincial, and Federal Governments.

Near this prospective center I watched a village of temporary homes for carpenters and masons spring up almost overnight. These multicolored prefabs had been towed on barges more than 500 miles from Vancouver. Each arrived complete with plumbing, wiring, stove, and refrigerator, and workmen filled them as quickly as semitrailers could transport them from the harbor.

Like all the neighborhood shopping centers,

the city center will be for pedestrians only. Cars will park in peripheral lots, and shoppers will visit Hudson's Bay Company store, banks, dentists, hotels, and theaters without crossing streets. Wherever people shop, they will walk beneath arcades, among lawns and flower gardens. Even the parking lots are being divided by plots of grass and trees.

The lion's share of the taxes that pay for Kitimat schools and playgrounds, fire department and police, still comes from the aluminum company, as the largest property owner. But every homeowner and businessman is assessed by the elected municipal government for his fair portion—and there are now more than 100 private firms in operation.

Alcan is confident that private capital will take over in Kitimat once the city is established as a going concern. As soon as possible Alcan will sell out.

"We're in the aluminum business," one official told me. "We don't want to be real estate agents. Not any longer than necessary."

Another two-toned taxi whisked me one morning over to the aluminum-clad smelter. Here, accompanied by works manager A. C. "Dutch" Turney, I walked down long lines of furnaces, called "pots" by aluminum workers. It takes more than 100 pots to make a line, and one pot line requires two or three buildings to house it, each one almost as long as four football fields laid end to end.

Someday there will be 16 pot lines housed in 34 smelter buildings. Like regiments on review, this battery of pot lines will stand side by side on two and a half miles of former timberland. They will turn out about 550,000 tons of aluminum a year. When that time comes, Kitimat will surpass Alcan's Arvida plant in Quebec as the largest aluminum smelter in the world.

Enough Kilowatts to Light Manhattan

Magnetic fields charged the very air and smoke we walked through. The magnetic pull was strong enough, almost, to wrench a crowbar from your hands. Rectangular conductors the size of railroad ties conducted a fantastic stream of current to the furnaces. Ultimately enough kilowatts will course through Kitimat's pot lines to feed every electrical switch on Manhattan Island on a dark New York City winter afternoon.

Ranks of conductors to the carbon anodes, like rows of smokestacks over the pot lines,

↑ Alcan Smelter Workers Cast for Salmon Beside a Giant Concrete Wharf

Freighters come here from Jamaica, 5,600 miles away, to discharge alumina, an extract of bauxite ore.

↓ Three Pounds Separate the Top Entries in a Fishing Derby at Kemano

Ray Beck (right) is the winner with his 59¼-pound salmon. Bobby Sadgrove holds prize 19-ounce trout.

led into "baths" inside the furnaces. Each bath held molten alumina (extract of bauxite ore), mixed with cryolite and fluorspar.

From the positive-poled anodes, electricity pulses through the bath, seeking the negative pole, the cathode, or carbon lining of the furnace itself. Temperatures exceed 1,700° F. As the oxygen escapes from the alumina at this heat, pure aluminum is precipitated to the furnace floor.

Trucks moved up and down the pot line, adding alumina or other ingredients. When a whistle shrieked, we ducked the giant steel buckets swinging from overhead cranes. Smoke-begrimed potmen punched holes in the bath's crust. Into the flaming brew they thrust the snout of an aspirator, sucking the metal from the furnace into a bucket.

At collection furnaces I stood fascinated as silvery aluminum flowed into molds. The poured ingots traveled a conveyor belt to platforms for loading on trucks or railway cars.

Here 50-pound ingots, each branded ALCAN, represented the finished article, ready for delivery to manufacturers elsewhere. These chunks of refined aluminum, 99.5 percent pure, rolling away on a belt, are worth $12 each. One day they will justify an investment of more than half a billion dollars.

River Boat Houses Migrants

I left the smelter as the swing shift took over from the day shift, and found myself walking toward the Bank of Montreal with a young crane operator named Michael Price, from Brighton, England. He was working his way around the world. So was his machinist roommate, Terry Regan, from London.

These two young men had met at Kitimat. When their savings were large enough, they planned to take off for Australia. Kitimat, they felt, was a good place for a single man to get a stake.

We walked over for a chat in the men's quarters, and I found them installed, with private bath, in a one-time luxury river boat.

Delta King, sister ship of the *Delta Queen*, which still plies the Mississippi, was a U. S. Navy ferry in San Francisco Harbor until 1946. Alcan solved the problem of housing 200 of its men by towing this 30-year-old paddle-wheeler along the Pacific coast. Today, anchored in the sand of Kitimat Arm, *Delta King* still serves, and the steam from her boilers heats a hospital, school, recreation hall, and cafe (pages 386 and 390).

Not far from where *Delta King* does shore duty, I boarded another boat that once flew the U. S. naval ensign. This one was afloat, loading passengers and whistling imperiously about her departure.

Capt. Bill Cogswell twice a week shuttles Alcan's yacht *Nechako* 70 miles by water between Kitimat and the powerhouse at Kemano. "A milk run," he called it.

We steamed through deeply glaciated Gardner Canal, over quiet green water chalky with rock flour from grinding glacial ice, and beneath waterfalls that tumble from snow-capped mountains. I thought it must be the most beautiful milk run in the world.

Killer Whales Invade Gardner Canal

Bill is an old salt, though a young man. Ever since he fished for salmon as a boy on his father's boat sailing out of Vancouver, he has lived on the sea.

"It's amusing to meet these fellows from the prairie Provinces and the middle-western States," he told me.

"This inland tidewater channel is as close as lots of them have ever been to the ocean. I'll never forget that construction engineer from Alberta. He ordered some equipment-loaded barges tied up overnight. At 6 in the morning he was back with his crew. The tide was out, and the barges high and dry on the beach. He thought the ruddy lake had gone down!"

Bill's first mate, Red McKendry, piped up:

"How about that guy from Nebraska? He was wondering if the fishing boats were amphibious. He noticed they all had rubber tires hanging along the sides as bumpers and figured they must be spares for the wheels!"

Around us salmon were breaking water. For a mile or more a school of porpoises paced us at the bow.

Outporpoising the porpoises, a school of black killer whales broke water. These 30-foot giants must have spread terror underwater in Gardner Canal, but from our vantage point they were a picture of spectacular grace. Their dorsal fins were tall spines, and when these ebony monsters arched themselves out of the milky-green sea, they might have been submarines surfacing with periscopes riding high.

We docked at Kemano's beachhead Camp No. 1. Here, nearly five years earlier, a gang of miners had landed at the delta of the Kemano River and blown apart a moun-

Shirt-sleeved Kitimat Plays on Newly Planted Lawns Beneath a Snowy Peak

This brand-new town of more than 9,000 people is planned for a population of 50,000. When finished, Kitimat will be British Columbia's third largest city, outranked only by Vancouver and Victoria.

Front doors in this neighborhood open onto yards, not streets. Children walk to school on quiet paths, using underpasses to cross roads.

Fish and game abound only a few miles away. Bears occasionally visit Kitimat for a handout; the more timid can usually be routed by a barrage of stones.

Mount Elizabeth lifts its white head high above timbered peaks.

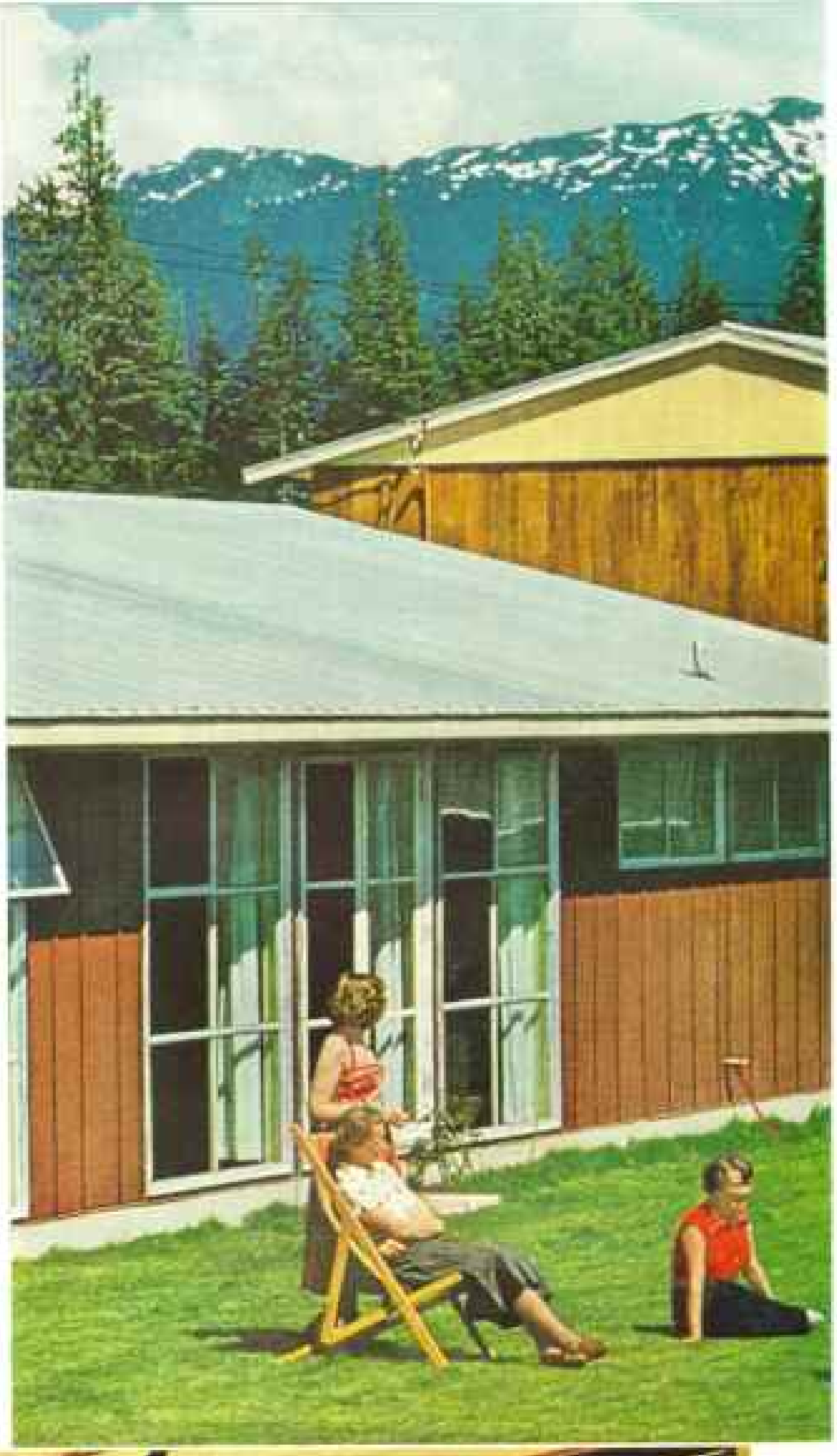
➔Page 391, lower: More than half of Alcan's labor force was born abroad. Tony Heslenfeld, reading a Dutch newspaper, and wife Josephine came from the Netherlands. Son Vincent is a native of Canada.

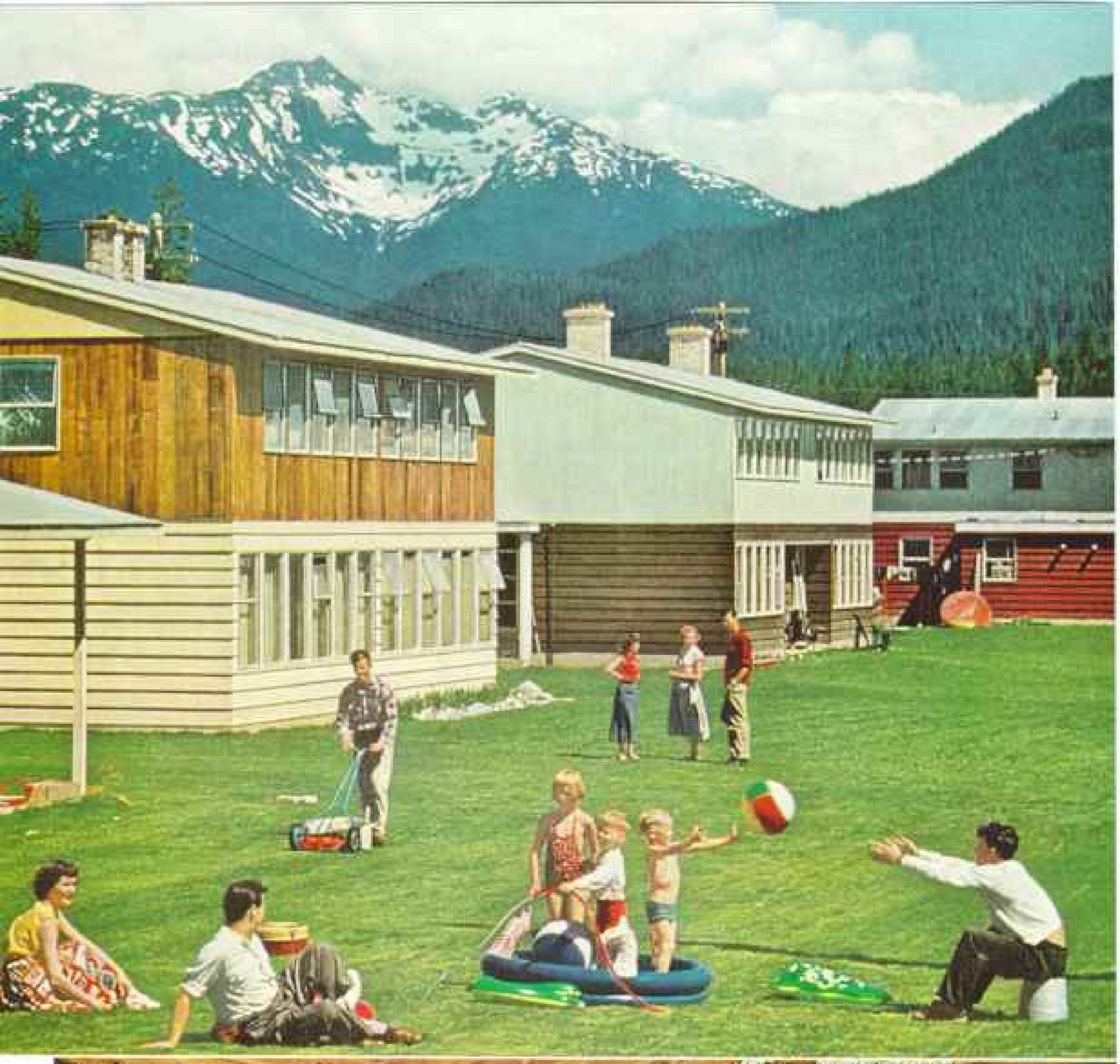
A bank holds the first mortgage to the cedar-log house. Alcan, holder of the second mortgage, is amortizing it under a bonus plan. By subsidizing homes the company helps employees to purchase $14,000 units for $10,000.

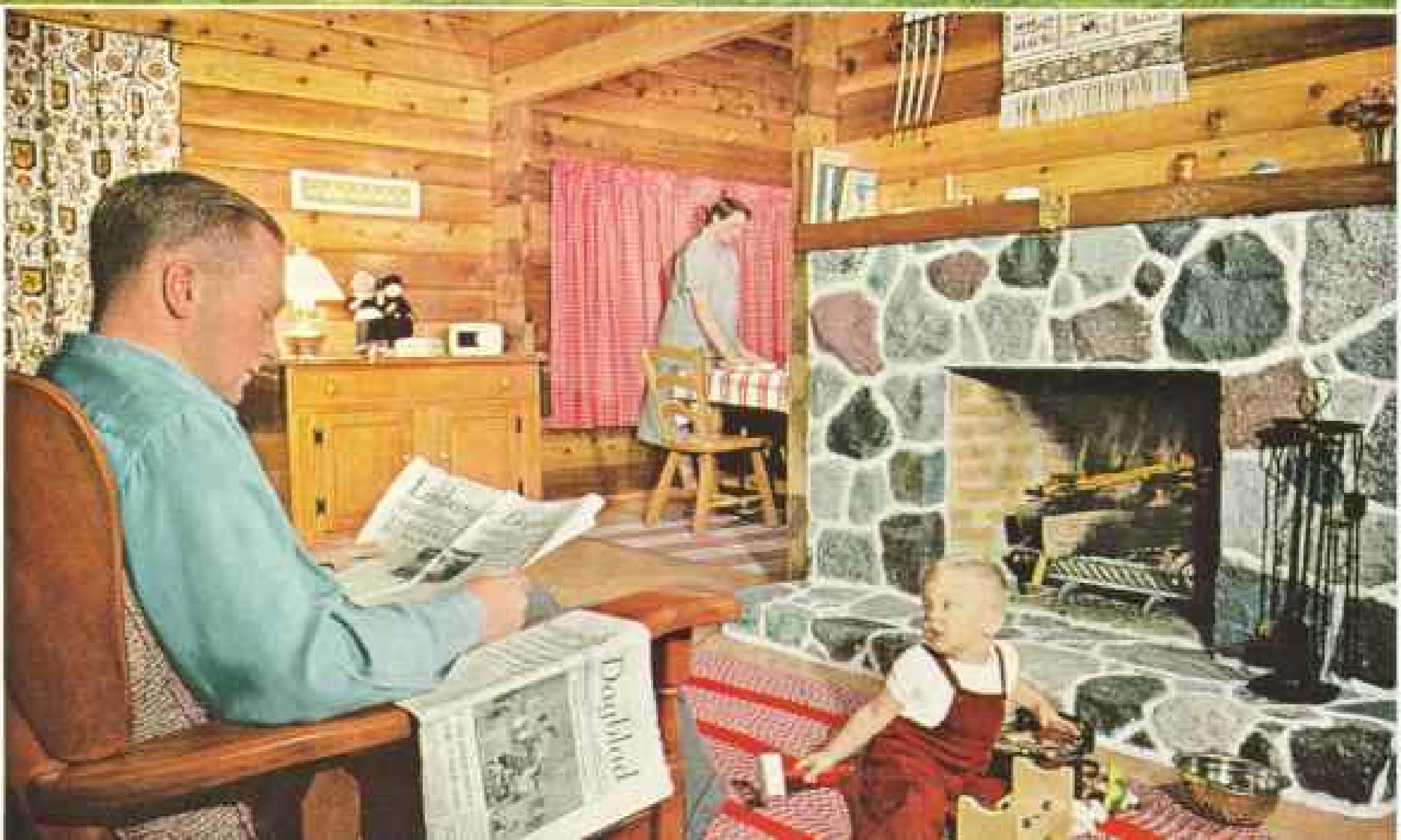
↓ Bachelors Bunk in a Dry-land Boat That Used to Sail the Sacramento

Michael Price (left) of Brighton, England, and Terry Regan, a Londoner, met at Kitimat while working their way around the world. They planned to go to Australia after earning a grubstake in Kitimat.

Delta King, anchored in the sand, is a sister to *Delta Queen*, which plies the Mississippi. This stateroom window frames the cranes on Alcan's wharf (page 388).






Deadhead

tainside to get rock for building a road and harbor. Since then more than 3,000 hard-rock miners and engineers have labored in the everlasting snows of Kemano. Drilling, blasting, they chiseled out a den where one day 16 generators will hum with 1,800,000 kilowatts—almost as much energy as the installed capacity at Grand Coulee Dam on the Columbia River.

At Grand Coulee, however, the water flow fluctuates. Kemano's water pressures will be constant. Result: Kemano will generate more "firm" energy than Grand Coulee or any other powerhouse in the world.

River Plunges Ten Miles Through Mount DuBose

Water backed up by the Kenney Dam, 125 miles eastward, spins Kemano's turbines. The water flows from Tahtsa Lake, the reservoir's western end, through a 10-mile tunnel into the granite heart of Mount DuBose. Then it dives through the powerhouse (map, page 381).

With superintendent E. W. "Red" McKernan, I drove to the powerhouse entrance. A simple doorway opening into Mount DuBose, it seemed less the threshold of an industrial giant than a likely place for the Pied Piper to have spirited away the children of Hamelin. Water was flowing quietly out through a tailrace to join the Kemano River. It had made its contribution to the production of aluminum (page 394).

"The water always looks tired after all its electricity has been taken out," Red remarked solemnly, without a glimmer of a smile.

I put on my visitor's badge and walked the eerie 1,400-foot access tunnel leading into the mountain.

To go underground at Kemano is to enter a world of make-believe. Its very magnitude overwhelms the imagination; hard fact takes on the shape of fantasy.

We paused at the brink of an excavation carved to house the most powerful impulse turbines ever built. Cut from solid rock, this cavern when finished will be more than 1,100 feet long and 130 feet wide (page 379).

Mining operations at Kemano were at a standstill when I arrived. Excavation for the first half of the project had been completed. Later, a second 10-mile tunnel is to be drilled from Tahtsa Lake, connecting with the final group of eight generators in the extended powerhouse.

Through mud and water we waded into the bowels of the mountain. Eight rough-hewn tunnels led away from the generator sites, converging into two tunnels suddenly rearing to the sharp angle of 48°. These tributary pipelines, or penstocks, joined the 10-mile tunnel from Tahtsa Lake 2,600 feet overhead.

I peered up through the murky penstock shaft. A ladder and a cable railway line climbed into the void (page 378). Somewhere in the lofty distance, like the halo of a lantern in a fog, twinkled a miner's lamp.

I wouldn't have joined him up there for all the aluminum in Canada!

Where I stood, feeling extremely insignificant, there would soon be a circular column of water 11 feet in diameter plunging at the rate of 2,000 cubic feet per second. And it would fall from a height higher by half than Upper Yosemite Fall, tallest free-falling cataract in North America.

Even at such a speed, however, the water would not actually be falling. In fact, falling, as the term is usually used, has nothing to do with generating electricity.

What turns turbines is pressure, and pressure is determined by density and height. Fresh-water density is 62.4 pounds per cubic foot. From a height of 2,600 feet, a column of fresh water produces a pressure of 1,126 pounds per square inch. That kind of pressure would soon fill every inch of the shaft I was occupying.

Staring up the somber chimney, I began at last to comprehend why these penstocks were installed inside the mountain. Pressure at 1,126 pounds, pressing outward every square inch as well as downward, requires enormous strength to confine it. Why not let the mountain do some of the holding?

That was exactly what the engineers and workmen under Red McKernan were doing. For nearly the entire distance, the penstock

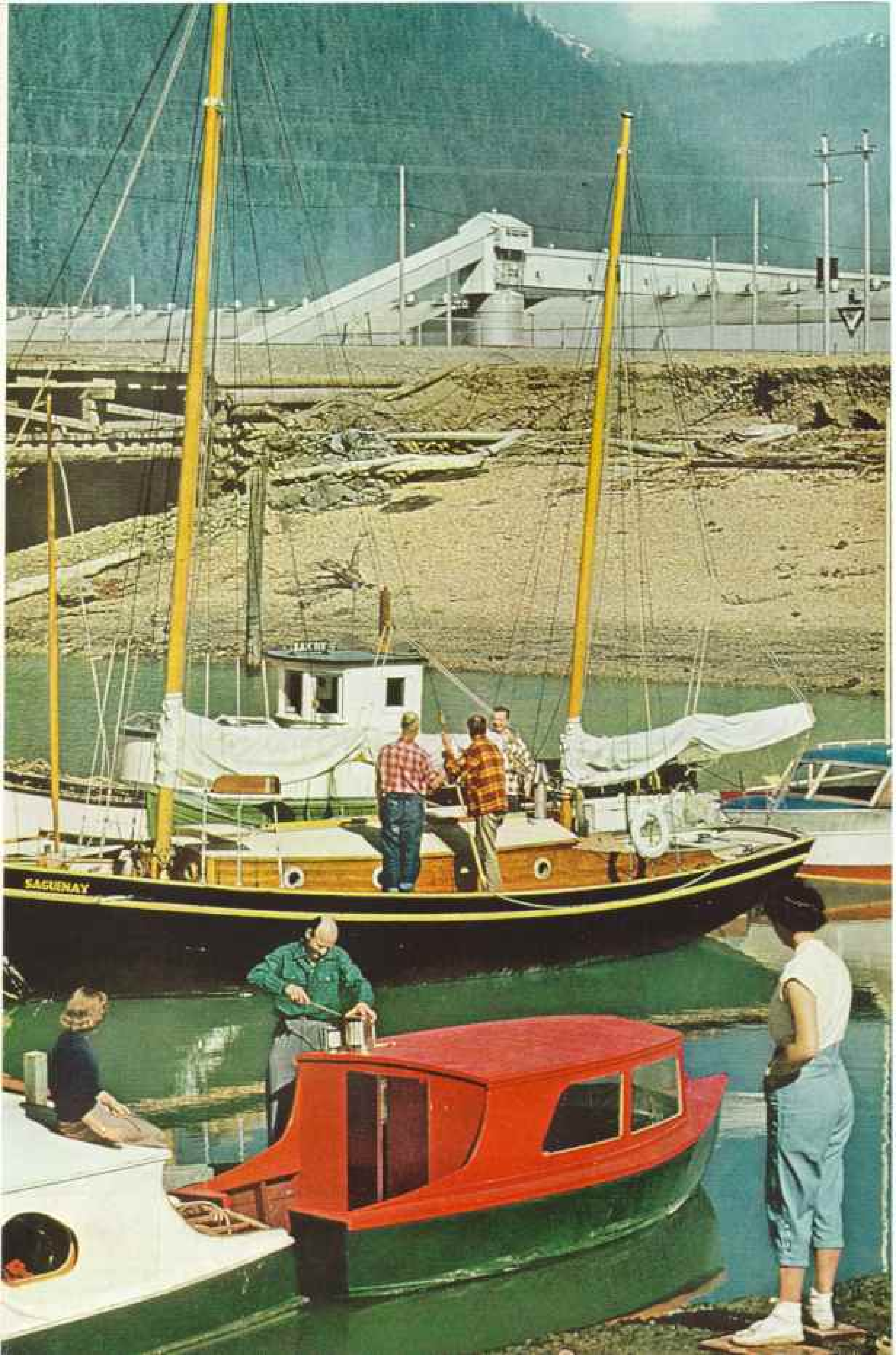
Page 393

Sailing Season Opens in the Fiords: Yachtsmen Scrape and Paint →

Kitimat's Yacht Club harbor came into being when engineers dredged a below-sea-level dry dock in which to construct concrete caissons for the company's wharf (page 388). When the dry dock was flooded, the caissons were floated into position and sunk.

Today the artificial harbor, a nook in the Kitimat Arm of Douglas Channel, provides a safe haven in all kinds of weather.

Moving belts climb the long elevated arcade, carrying alumina to the smelter beneath.


SAGUENAY

394

Aerial Tramway and Railroad Slash a Giant Figure 7 on Mount DuBose's Wooded Face

Kemano powerhouse lies deep inside the mountain (page 379). To help build it, steel cables hoisted men and machinery half a mile up the slope. A rail line to the powerhouse tunnel completes the head of the figure 7. Far below, a canal discharges water from the generators past the main construction camp and into Kemano River.

pipes are buttressed by concrete against the tunnel wall. To make sure the outer shell of rock is firm, workers force liquid concrete, under pressure, into breaks or cracks in the granite. Concrete men call the process "grouting."

I watched concrete crews preparing a bed for the fourth generator. Here also the strength of Mount DuBose was harnessed—this time to insure the stability of the machine with its 400 tons of whirling parts.

Near by, through double steel doors, we entered a chamber where the third generator screamed. Like its mates, it is 16 feet in diameter and produces 111,900 kilowatts at 327 revolutions per minute.

The roar of the Pelton wheel, spinning at 187 miles per hour, seemed to grow louder and louder. Before I left, I was pressing my hands against my ears.

This was the deafening focal point of power for Kitimat aluminum.

Helicopter Surveys Transmission Lines

Almost a relief was the suggestion that I take a helicopter trip to survey the power-transmission line, even though we should be darting from one perilous aerie to another among the crags of Kildala Pass.

The record of helicopter pilot E. W. Brooks reassured me—a little. In three years he had made 10,000 safe landings on the various tiny platforms perched among Kildala's peaks.

Up Kemano Valley we skimmed the transmission line. On either side of the singing aluminum strands the forest was prudently cut back. If a fire broke out, Bill told me, all hands would fight it. Nothing is so essential in aluminum production as an uninterrupted flow of electricity to the pot lines.

What happens when the current is cut off?

I could ask construction superintendent Bill Richards at Camp 10, Brooks said. He leveled a finger at spots of red and yellow in the snow a thousand feet below us.

"Those are bulldozers from Camp 10. They're reopening the road over Kildala for some permanent repair work. In January, 1955, a snowslide came out of that glacial cirque over there and knocked down three transmission-line towers. It put Kitimat out of business for 10 days.

"Talk to Bill Richards," he repeated. "He knows what happened. He's sinking anchor bolts into the mountains. They're going to string the whole power line from cables that will swing clear across the canyon. That way, the line will be out of reach of any avalanche, no matter how big."

Bill Richards was waiting at the helicopter platform near Camp 10's cluster of shacks. Permanent buildings were sheeted with aluminum, and heavy cables helped keep the winter gales from tumbling them down precipitous Glacier Creek Canyon.

Richards is a Canadian with a very slow drawl (I thought he must have come from Canada's "deep south"), but he is a fast operator. In 10 minutes the pair of us had been helicoptered 800 vertical feet to a steep snow field overlooking the canyon, and our whirlybird was dismissed to return to Kemano.

We would either climb down hand over hand to Camp 10 or be the object of a rescue party. I sank my mountain-climbing cleats into the snow and decided that sending them airfreight from Washington, D. C., had been nothing short of an inspiration.

"We couldn't have begun to build this transmission line without helicopters," Bill was saying. "They carry men, supplies, tools, mail—everything" (page 382).

Far below us the transmission towers trudged over a ridge and up Glacier Creek Canyon. Not long ago, geologically speaking, the canyon had been a cuplike cirque itself. As the glaciers receded, first those of Glacier Creek and finally the large glacier that cut the U-shaped Kemano River gorge, it had become a hanging valley. Then Glacier Creek had eroded a deep cut to the floor of the Kemano Valley (page 385).

Ten Anxious Days

We looked across the great bowl. In its center, still partly covered by snow, lay the crumpled ruins of the three towers.

"The whirlybirds found the break in the line within a few hours," Bill said. "They brought in repairmen and supplies, and the big Sikorskys dropped sections of new tower on the summit of the pass. We sledded them down. In 10 days the new towers were up and the lines spliced."

Those 10 days, I learned, were an anxious trial for Alcan. When the electricity went out, Kitimat's pot lines froze. Solid aluminum stuck to the sides of furnaces. When the power came back on, some of the frozen baths would not properly conduct the current. Long weeks went by before the furnaces were operating correctly again.

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Gigantic Kenney Dam Bottles Up the Nechako River and Reverses Its Flow

Until five years ago the stream flowed eastward. Engineers sealed this canyon with a dam (opposite) and created a reservoir 135 miles long. Water now escapes through the Mount DuBose tunnel (page 378).

Bill began making readings from a hand transit. We were dug in on one of the sites where his crew would anchor the two cross-canyon support cables. They would be of three-inch steel, 4,000 feet long, and weigh more than 60,000 pounds each.

"We advertised for men with no fear of height to do this job," he said. Then, grinning, "You know who showed up? A couple of circus performers!

"One of the daredevils is pretty good with a lariat as well. The other night he lassoed a grizzly cub and tied him up to the kitchen shack. I don't know whether it has anything to do with our getting a new cook or not."

Bill was hunting a suitable route over which to rope a compressed-air line up the cliffs to power his rock drills. When we finally found a harrowing way down for ourselves, he was satisfied. If we could make it, he concluded, the circus men could.

Before I left Kitimat, I wanted to see Kenney Dam, Tahtsa Lake, and Ootsa Lake and the rest of the rambling Nechako watershed that provides the water reservoir for this largest aluminum project in the world.

Resident engineer Harry Jomini popped up with the opportunity. He had watched the building of Kenney Dam and was still busy on the last of nine auxiliary, or saddle,

dams. Harry had to visit his saddle dam soon, for the reservoir was nearly full, and water was lapping at the base of this last high-level closure.

Once again we boarded a seaplane and circled over Douglas Channel, Gardner Canal, and the Coast Mountains. From the air, Gardner Canal and its arms extending up the valleys meandered like serpents. Milky-green water followed the long, winding, U-shaped bathtubs scoured out of the mountains by Ice Age glaciers.

Over the top of Mount DuBose we flew. The plane skidded like a duck onto the blue water of Tahtsa Lake, and the pilot tied up near the tunnel inlet. Out to greet us came Herb and Helen Skuce, who tend the machinery at the inlet. They sported full Wild West regalia, including Stetson hats and rifles.

"We're always having to chase bears off the place," Helen explained, "and sometimes shoot one. But Herb doesn't like to fire on one unless it's fairly close to the front porch. Otherwise, we have to lug the meat too far."

Once there were 600 workers camped on this beach, all brought in by motor barge. Now Herb and Helen were the only souls on the lake. They fished and hunted for amusement and liked living alone.

In two weeks they were going on a vacation. Where? Up north into the wilds somewhere. They wanted to get some "real" fishing and hunting!

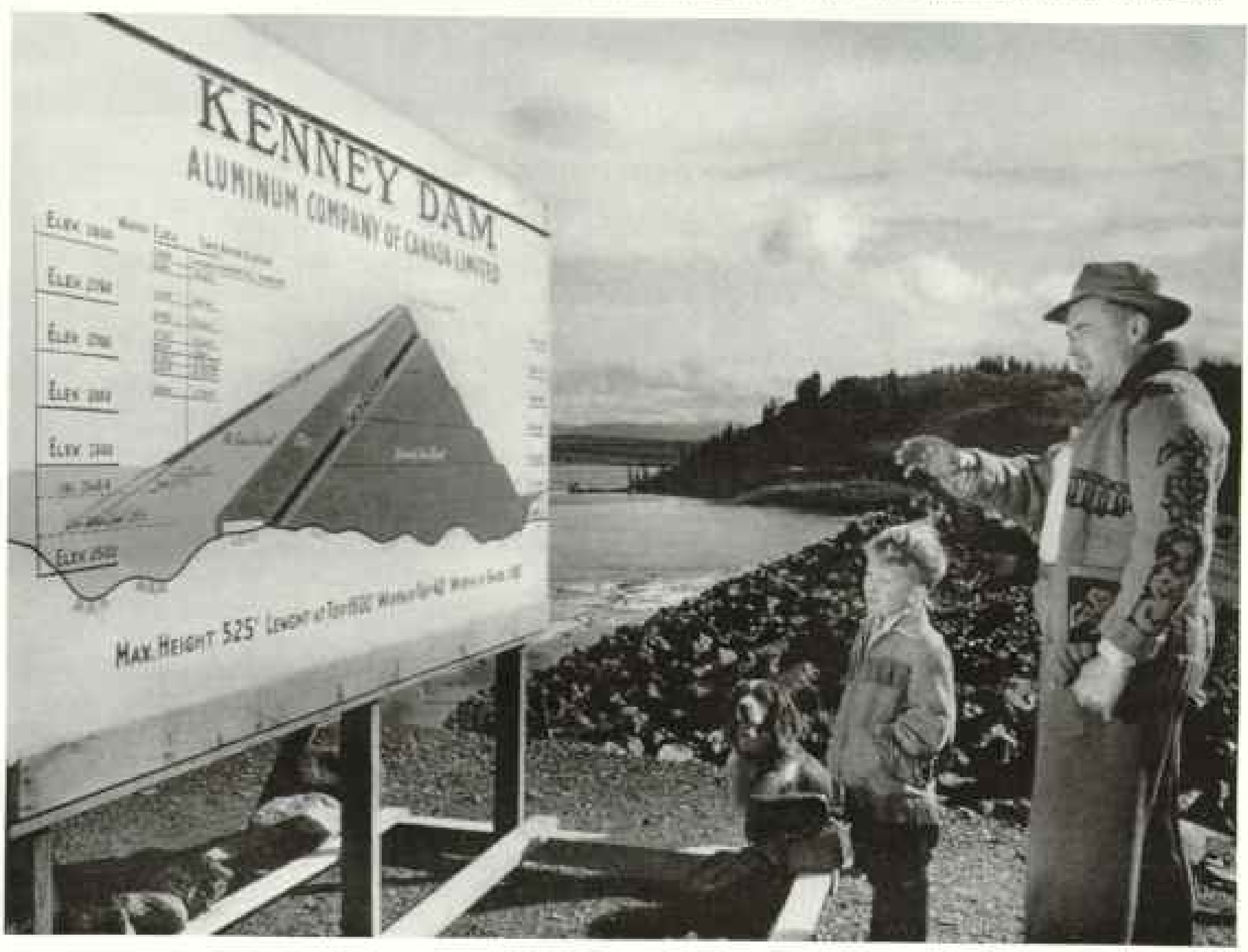
From Tahtsa we flew over water for 125 miles to Kenney Dam. The fingerlike lakes of Tahtsa, Ootsa, Eutsuk, Tetachuck, Natalkuz, Intata, Whitesail, Sinclair, and others pushed back the forest as they rose to join into one huge reservoir.

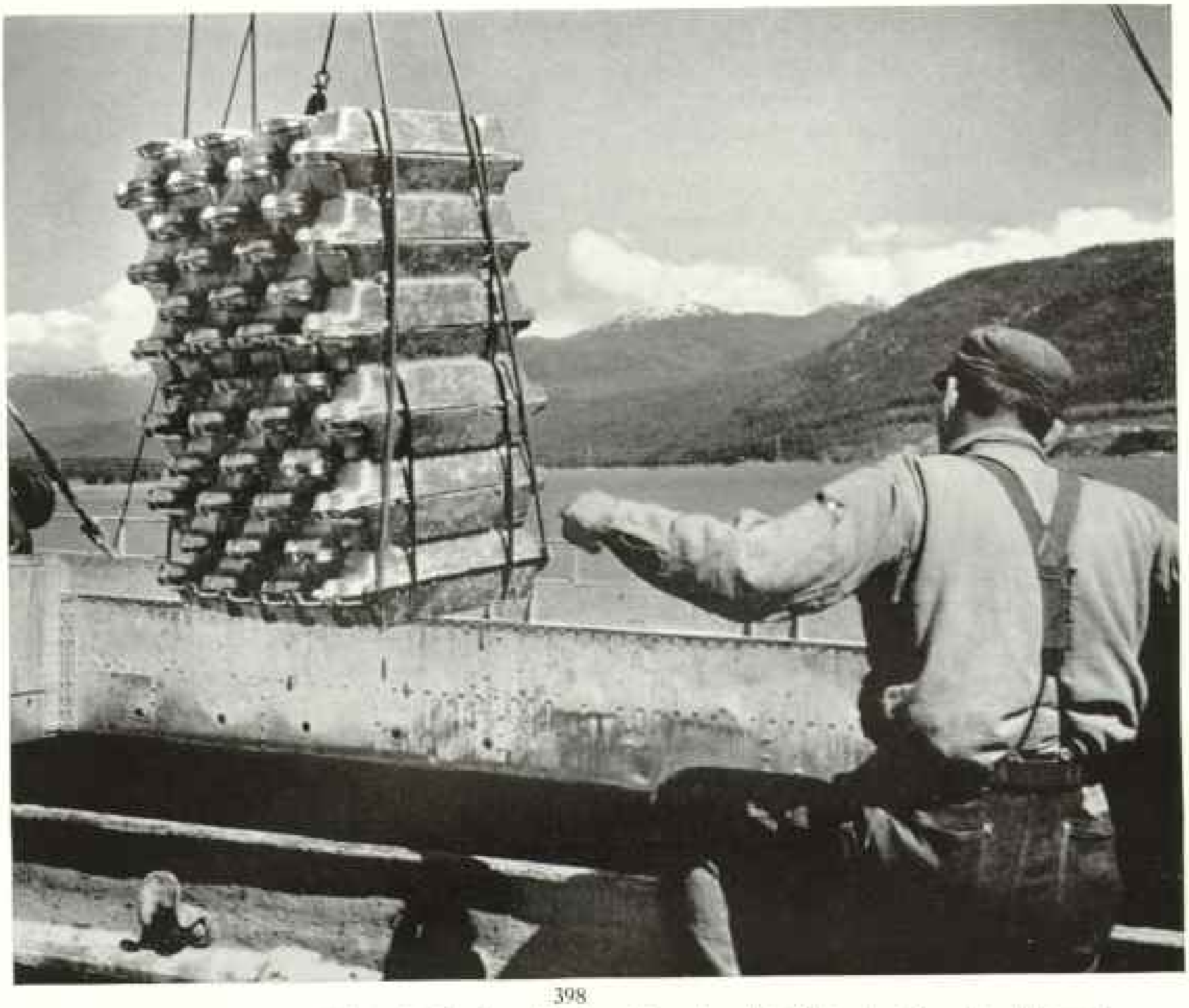
The new reservoir is brimming with trout, and the woods and meadows of the country that falls away into the flat Fraser Valley are alive with game. Our engines scared up groups of deer and mountain sheep.

"Hunters took 110 moose off the 60-mile Alcan road to the dam last year," Harry

A Dream Accomplished, Engineer Harry Jomini Stands atop Kenney Dam

Workmen took a granite mountain apart, truckload by truckload, and dumped it into the world's largest sloping, rock-filled, clay-core dam. Mr. Jomini, resident engineer, points out construction details to his son.





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Aluminum Ingots from Kitimat's Smelter Swing Aboard a Freighter in Douglas Channel

Cargo boats exchange ore from Jamaica for top-grade aluminum. Annual production nears 180,000 tons.

claimed. He added: "Mine was the 110th."

We banked over Kenney Dam. In this expanse of wilderness and against the vista of lakes, it looked rather unimposing. But it is the largest sloping, rock-filled, clay-core dam in the world. Its cubic content exceeds that of Egypt's Great Pyramid (page 396).

To build it, men and machines displaced a mountain. They dumped a truckload of fill on the average of every 45 seconds, 24 hours a day.

"If you could load enough 12-yard dump trucks with what there is in that dam," said Harry, who had a genius for comparisons, "they would make a line, bumper to bumper, from Miami to Montreal."

We landed at Vanderhoof and taxied to Prince George. At the Prince George airport Harry introduced me to E. T. Kenney, former Minister of Lands and Forests for British Columbia.

It was largely through Kenney's efforts that farmers and ranchers of the Nechako watershed were finally convinced of the desirability of the new reservoir, even though it would encroach on their lands.

"But Alcan wanted to make friends in British Columbia," Mr. Kenney told me. "The assessed value of reservoir shoreline that would be flooded was $67,000. Alcan paid the owners $1,600,000. And in addition to cash payments, they gave life pensions to two widows who had to move."

Harry and Mr. Kenney helped me on the plane with all my cameras.

"Don't forget to send us some pictures," Harry called after the goodbyes were said.

I certainly won't.

I like these Canadians.

I admire them for the way they shovel up mountains and throw the map all around the place and dam up rivers to make them run backwards through a mountain—to make aluminum.

Philmont Scout Ranch Helps Boys Grow Up

On the High Plains and Piny Peaks of New Mexico, Explorer Groups Meet the Tests of Trail and Saddle and of Youthful Fellowship

By Andrew H. Brown

National Geographic Magazine Staff

With Illustrations from Photographs by the Author

TOUGH as rawhide and quick as mountain cats, the scouts and pioneer explorers of the old West won fame as guides and guardians of the covered-wagon trails. Many of these saddle-bred frontiersmen led caravans through the dust of the Santa Fe Trail as it skirts the peaks and mesas of northeastern New Mexico, where the Great Plains break like a golden wave against the Rocky Mountains.

Today, more than a century later, scouts and explorers in ever greater numbers range this same spacious and rugged area—Explorers of the Boy Scouts of America, who camp, hike, and ride, learn the ways of outdoor living, and relish the zest of outdoor fun on the 127,000 acres of Philmont Scout Ranch.

An Empire for the Nation's Youth

Lying along the Santa Fe Trail and nurturing the vigorous traditions of that long-abandoned track, Philmont is the largest camp of its kind in the world (map, page 405).

When I went West last summer to spend three weeks with Philmont's Explorers in camp and on the trail, I learned of the happy stroke of fortune by which the Boy Scouts fell heir to this outdoor empire.

In 1922-23 Mr. Waite Phillips, developer of oil properties in the West, bought a third of a million acres in the vicinity of Cimarron, New Mexico, for a cattle ranch. Through the mountainous back country he strung a chain of fishing and hunting camps for himself and his guests.

Later, recognizing scouting as an outstanding boon to the youth of America, Mr. Phillips in two gifts—in 1938 and 1941—gave more than a third of his broad domain to the Boy Scouts. The balance, mostly rangeland, he sold.

As an endowment to help run the ranch Mr. Phillips in 1941 also presented the Philtower Building in Tulsa, Oklahoma. The "Phil" in Philmont and Philtower is, of course, the first syllable of Phillips.

The National Council of the Boy Scouts of America promptly set aside the New Mexico windfall as the national camping area for Explorers, who are the oldest group of Scouts, youths between 14 and 18.

Since 1938 nearly 75,000 boys and young men have profited from Philmont's training-by-doing programs. At the same time they have enjoyed a rare experience of western high adventure.

Philmont remains even today an operating ranch, with 1,000 Hereford cattle, and some 1,100 acres of cultivated land under irrigation.

But most of the property is lofty and rough—a wild land of mountain and mesa, here stark and arid, there lush and verdant with moss-draped evergreen forests, banks of fern, and dense brush cover.

Cold brawling streams lace the hills, and the air is aromatic with sage and pine. Unsullied skies arch high and blue in the still mornings and mount black turbulent thunderheads in dramatic panoply during the windy afternoons.

Summer storms send flash floods racing down streams in the thinly vegetated northern sector of the ranch. Of Ponil Creek I heard a Scout say, "After a rain the crick gets so silted up the fish swim backwards to keep the mud out of their eyes."

To Reach Hudson Bay, Climb a Mile

Philmont's western boundary follows the backbone of the Cimarron and Agua Fria Mountains, offshoots of the Sangre de Cristo range. Here Clear Creek Mountain, highest on the ranch, humps up to 11,600 feet.

"You can walk out of Camping Headquarters in the morning," Felix Knauth, a Philmont program counselor, told me, "and reach the subarctic regions by late afternoon. You simply go a mile up instead of thousands of miles north. Clear Creek Mountain's plant and animal life are similar to Hudson Bay's."

On almost any summer day as many as

"Welcome to Philmont!" Boy Scouts Enter a Gateway to Adventure

Philmont Scout Ranch, nestled in the Rockies near Cimarron, New Mexico, is a boy's dream of the Wild West come true.

Its eastern fringe cut by the historic Santa Fe Trail, the 127,000-acre ranch is rich in the lore of Indians, conquistadors, and frontiersmen. Buffalo, elk, and deer roam the plains. Mountain lions prowl lonely canyons. Trout abound in crystal streams.

Nearly 8,000 Explorer Scouts, aged 14 to 18, roll in to this largest Scout camp in the world each summer from all parts of the Nation. Hiking, riding, and sleeping under the stars, they taste the thrill of outdoor living. Cost for a 12-day stay is $38.

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♠ European "Cowboys" Saddle Up for a 5-Day, 80-mile Trip

Guests of the Boy Scouts of America, 16 Scouts from eight European countries camped at Philmont in July, 1955. Eager to be taken for western wranglers, they adopted blue jeans and wide-brimmed hats. Here Klaus Weinert (left), a Senior Scout from Germany, swaps impressions with Spyros Amourgis, a Greek Sea Scout.

♠ Philmont, a vacation mecca for Scouts, is also an operating ranch with some 1,000 Hereford cattle, 300 saddle horses, 250 burros, and more than 1,100 acres under cultivation. It takes its name from donor Waite Phillips, an Oklahoma oilman.

Wives and daughters of Scout leaders make up this riding party. Cottonwoods and grasslands flank the Camping Headquarters, a onetime ranch house and its outbuildings. Urraca Mesa rises across the valley.

1,800 to 2,000 boys and leaders may be scattered throughout the ranch, populating a network of trails and camps that blend unobtrusively into the rumpled landscape.

Last year Philmont received 7,900 Explorers, the largest season's total yet. From the National Capital Area Council of Washington, D. C., alone came 231 boys, more than from any other single council in the United States. To accommodate this legion of Explorers, more than 1,000 tents are erected in June and struck in September.

Tenderfeet Whistle for Long-eared Bellhops

Philmont maintains the largest remuda of saddle horses—nearly 300—of any ranch in New Mexico. And a pack string of 250 burros (locally, "Rocky Mountain canaries") carries the duffel on many trips.

Such facilities give some lads the wrong idea. Jack Rhea, director of camping, frequently has had to disabuse boys of the mistaken notion that Philmont offers resort-type services.

"Why, some of these fellows," he says, "seem to think we're running a chain of canvas motels with long-eared bellhops galloping back and forth between."

The morning after I reached Philmont I stood in the sun-baked parking area and watched the buses roll into Camping Headquarters. The big highway Pullmans, silver, red, and blue, came in from New York and California, from Georgia and Idaho, from Mississippi and Minnesota. Out of them tumbled excited boys, bowed under bedrolls and pack sacks (page 400).

The buses unloaded Explorer groups of 10 to 35 boys from Scout councils in every section of the United States. Each busload was shepherded by two or three adult leaders: Scoutmasters or simply men interested enough in youth to sign up as Explorer advisors.

Perhaps a little shy at first, the boys of different groups quickly became acquainted—white and colored, Chinese and German, Spanish and Scottish, *Mayflower* descendants and first-generation immigrants. Working and playing together, and imbued with the common purpose of living up to the Scout oath and law, the boys would quickly overcome barriers of false distinction. At Philmont the emphasis is on what a boy is and does.

Any Explorer who can meet the basic requirements of health and adaptability can sign up with his local council for a Philmont trip. The cost is nominal; in the past it has averaged one to three dollars a day, depending on the schedule selected. This year each 12-day program unit cost $38. That sum paid all expenses except personal equipment and transportation to and from the ranch.

Even from most points on the east coast $150 paid an Explorer's round-trip bus fare, all his fees at Philmont, and left a few dollars for souvenirs and gifts.

At Camping Headquarters or Carson-Maxwell Base Camp, each newly arrived group gets a medical recheck and visits the quartermaster to draw tentage and other trail gear. Then they board a bus for the short haul to whichever base camp is the jump-off point for their chosen Philmont adventure.

Newcomers receive primary instruction in axmanship, foot care, fire building, and Dutch oven cooking; in map and compass, burro loading, throwing the diamond hitch, and back-packing (opposite). At last the group is knit and ready for the hills.

Before riders set out from the corrals, however, veteran wranglers explain how to saddle, mount, and control a horse, to some city-bred boys a creature familiar only from television and movie screens.

How to Tell a Horse's North End

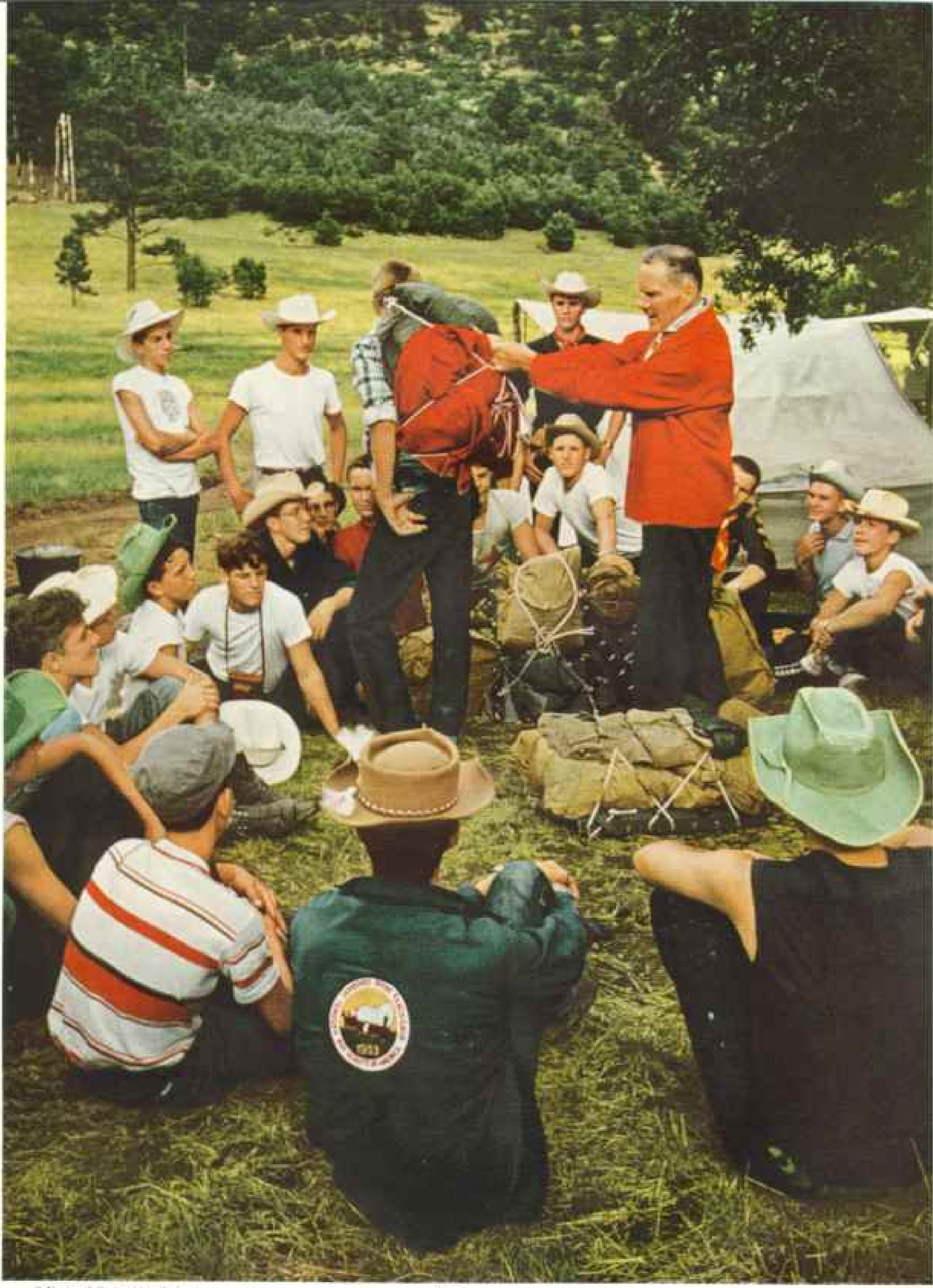
"Always walk round the north end of a horse," I heard John Stokes, the head wrangler, say. "And ef yuh don't know which the north end is, jist remember it's allus the end futherest away from them hair-trigger hind laigs."

While waiting to move out from Camping Headquarters, or at the end of trail trips, boys frequently must spend a night or two in the hollow-square adobe lean-tos called Rocky Mountain shelters.

I watched a group from Ohio flop down on the double-deck bunks (each shelter holds 50 of them) and lie silent a few minutes. The place sized up, the youths eased into the typical dialogue of away-from-home teenagers: a curious blend of insult, bragging, experimental man-talk, comic-book slang, and loyal tribute to mom and pop.

Standing in shadow, talking to their leader, I overheard two boys sprawled on a near-by bunk playing a game that started with one or the other giving clues to an imaginary identity and ending up with the question, "Who am I?"

After they had been successfully spotted



"Keep It Light and Pack It Tight. You're the One Who's Going to Carry It, Brother"

A compact back-pack holds 18 to 20 pounds. Felix Knauth, Philmont program counselor, gives parting advice to these trail-bound Scouts. This year uniforms will replace informal garb on the trail.

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Hay Rewards Philmont's Hard-working Burros at Trail's End

in turn as Ted Williams and John Wayne, one boy began a new round, particularizing: "I'm five foot two, a redhead, weigh 112 pounds, stretch the tape at 36, 23, 34, and have gray eyes and dimples. Who am I?"

"Who cares?" came back the other with a sigh. "Kiss me."

With 81 miles of main trail, 23 trail camps, and hundreds of miles of side paths, the trips that consume most of an Explorer's time at Philmont offer varied experiences, afoot and on horseback. But everywhere is the same intimacy with the great outdoors, the same challenge of teamwork, and the same revelation of nature's big and little wonders.

Any hour of any day can be memorable where new trees and flowers and animals are continually discovered.

Philmont maintains a herd of pronghorn antelope that share pasture with 50 shaggy, broad-shouldered buffalo (American bison). Mountain lion and bear lurk in the hills. Wild turkey and grouse abound. Beavers build dams, and rainbow trout swirl saucily in many streams.

But it is the mule deer that catch every eye; they graze as thick as cows when the light of dawn or dusk slants across the meadows. The Philmont census counts 3,000; near some camps the deer are almost tame enough to chuck under the chin.

At Ponil Base Camp one evening a score of boys and wranglers spread out across a hillside to drive several runaway burros down to the corral. When at last the animals were rounded up, there were seven burros—and five deer.

The long list of lesser mammals found on the ranch includes nine species of squirrels, a dozen of mice, and 16 of bats. No one

Explorer, of course, is likely to see more than a fraction of these creatures, or of the 29 different snakes and 177 birds known to frequent this wildlife paradise.

Philmont's buffalo herd, apart from its value as a picturesque reminder of the old days, serves a practical purpose, too. One or two buffalo are killed each week to furnish steaks for banquets, festive occasions that climax the Philmont experience for certain Explorer groups.

Jack Rhea, when new at the ranch, rode along one day with Bob Lee, the staff buffalo hunter, as he drove his pickup truck into the pasture to "crop" one of the herd.

Bob pushed his truck among the burly animals, which always come a-running because he baits them to draw them in. He himself stayed behind the wheel to let the buffalo, which are dangerous because unpredictable, get used to the human intruders.

But Jack jumped out and found a big bull so close that he could almost reach out and stroke his beard. Seeing some menace in the animal's cold and steady stare, Jack called out, "Say, Bob, is this buffalo safe?"

"He's a durned sight safer than you are!" Bob replied.

At Philmont history speaks to anyone who listens with even half an ear.

At the Carson-Maxwell Base Camp, in the southeast corner of the ranch, I visited two landmarks that Explorers and casual visitors continually seek out: the old homes of pioneer mountain man Lucien B. Maxwell and of that hero of so many boyhoods, the frontier scout and guide, trapper, trader, and marksman, Christopher ("Kit") Carson.

Early last century the Mexican Government awarded two fur traders, Charles Beaubien and Guadalupe Miranda, a vast land grant that included all of present-day Philmont. Maxwell married one of the Beaubien daughters and eventually came into possession of the land grant.

About 1849 he and Kit Carson built homes where the Santa Fe Trail crossed the Rayado River, established a trading post there, and took up farming.

After this part of the Southwest became a territory of the United States in 1850, surveyors and land-grant recorders rode in to

© National Geographic Map
Drawn by Gilbert H. Emerson and Victor J. Kelley

Scouts in a Rangeland Grandstand Watch Ranch Hands Round Up Cows and Calves

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Wranglers Drive Herefords Across the Parched Plain. They Follow an Irrigation Ditch

check the ownership of Maxwell's property.

The men asked Maxwell how much land he had.

"Well, I have the old Beaubien-Miranda grant," Mr. Maxwell replied, as the story has it, "which was supposed to be 96,000 acres, according to the old Spanish records, but I know I have more land than that. If you want to put me down for a couple of hundred thousand acres, that should be pretty close to it."

When a survey team finally staked out the Maxwell land grant in detail, they found it measured more than 1,714,000 acres. From that time on Lucien Maxwell was called the Baron of the Old West.

Of the home that Maxwell built on the Rayado, two wings remain. Their wide porches and yellow adobe walls recall the gracious era when riders from all over the West found hospitable refuge at this ranch.

Kit Carson Slept Here

Kit Carson's home is an adobe building of the Spanish type, the outfacing walls almost devoid of openings, but with many thickset windows looking inward on the flower-bright patio. A loopholed watchtower rises at one corner.

Today's visitors find Carson's home intact, but except for one portion it is a restoration faithfully executed in 1949 (a century after its original construction) by the Boy Scouts of America. Groups of Explorers helped, even to making adobe brick.

Men who rode with Kit Carson declared that he never let himself be seen in the glare of a campfire. The only time he could be picked out of the shadows was when he lit his pipe. Indians kept their distance from Carson, who was a dead shot and the only white man they knew who, riding at full speed, could reach down and pick a silver dollar off the ground.

Carson's home is now a museum. The big double bed, bought for Carson and his third wife, proved too luxurious for a man of his Spartan tastes. He allegedly slept in it only twice, then moved to a hard adobe couch in the corner, which he spread with buffalo robes.

I saw, hung on a wall, Carson's ramrod-type rifle. Into the butt and forestock Kit, according to legend, stuck a brass tack for every man, white or Indian, he killed. I counted 87 tacks.

Other relics included a 16-pound hand pressing iron. Then there was a curled-tip branding iron called a "running iron," or "rustler's delight." It was used by cattle thieves to alter brands on stolen cattle; a man caught possessing one of these pieces of hardware was likely to be hanged at once, and no questions asked.

By good luck, my time at Philmont coincided with the visit of a delegation of European Senior Scouts. This was the continuation of an annual transatlantic exchange of selected older Scouts (page 401).

Two boys had come from each of eight countries—Turkey, Greece, Italy, France, Great Britain, Sweden, Germany, and Finland. The Senior leader was Robert S. Thomas from England.

Bob Thomas pointed up the difficulties they faced in adapting to the States by telling a story on himself.

Soon after he reached New Mexico, he said, he was drawn into a conversation, completely puzzling to him, in which the central subject was some person or creature identified by two low-pitched syllables somewhat explosively issued through pursed lips.

He never had heard the word before, but at last he narrowed it down to something that sounded like "burro," but it still was some time before he grasped what the talk was all about.

The other foreign Scout leader, Edouard Mazé from France, described the group's Americanization: "Las' night, some of the leaders laid on for us real United States food—hot tamales, watermelon, and Coca-Cola."

One of the Greek boys, Spyros Amourgis, said to me, "Today we 'av—what you call eet?—a 'nose-bag' lawnch: meat from a tin, bread, cheese, and choc-o-late bars."

European Scouts "Hit the Leather"

The boys were eager to be mistaken for cowboys. Many wore wide-brimmed hats, blue jeans, and loud shirts. They all spoke English and were not averse to displaying their special talents: Kilted troop leader William Donald of Aberdeen, Scotland, was the group's whipcracking song master and its most dashing dancer. Lyly Teppo of Finland played the piano with a professional flourish. Each one was a colorful, alert, and friendly junior ambassador from his homeland.

It was with the foreign Scouts that I first explored the back country of Philmont. We rode a truck to Beaubien Camp, which is

"Watch That Saw—It's Buckling!" Scouts Turned Lumberjacks Fell a Diseased Pine

Campers learn modern methods of conservation. Some of these Scouts are delegates from Europe. The boy at left wields a crosscut saw for the first time. "Don't push, just pull," his partner urges.

cradled in a grassy hollow fenced with evergreens high in the rugged southwest sector of the ranch.

When we "hit the leather," Jack Rhea was mounted on Doughbelly. Ray Bryan, director of Philmont properties, rode Hungry. Ed Mazé sat astride Red Cap, Bob Thomas straddled Little Beaver, and I perched precariously on Farm Colt, which fortunately turned out to be a very docile beast. I had not been on a horse for 18 years.

We stumbled and slipped down wet Apache Creek canyon to Rayado Camp and a hot lunch. Afternoon sunlight filtered through the aspens along the rippling Rayado River as we left the valley for the steep climb to Webster and Fowler Passes.

The foreign Scouts let loose with familiar American songs that echoed with strange accents from the wooded heights. "Dah-vee, Dah-vee Craw-kit, keeng of de wa-a-a-ld frawnteer!" was followed with gay abandon and not too scrupulous adherence to the original by "The eyes of Ta-ax-as are abo-o-ve you, all de livelong da-ay. . . ."

Our little cavalcade pitched steeply downhill over the shoulder of Trail Peak to Crater Lodge Camp beside its round blue pond. As evening came on, five, seven, a dozen deer emerged from cover, cautiously drifting down to slake their thirst.

The lads from overseas pulled up at Crater for the night; the rest of us clopped on down between Urraca Mesa and Shaefer's Peak, past the vertical cliff of Lovers Leap to Philmont's best-known landmark, the white shaft of the Tooth of Time (page 415).

At the foot of this gleaming crag lies the camp called the Stockade. I had heard Francis ("Ben") Bennett, in charge there, rout out his campers early one morning with this jovial bellow:

"Okay, you cactus cowboys, take these kitchen brushes and run up there and scrub the Tooth of Time. Grab up a bucket of Tide for toothpaste!"

Back at Camping Headquarters and pried loose from Farm Colt, I had for several hours a very professional, stiff-jointed, bowlegged cowboy swagger. But by morning, fortu-

nately, my running gear had sprung back into amateur position.

At the nightly campfires, even along the roughest trails, wherever boys feel the need for companionship, song is the Explorer's common denominator.

Staying at Beaubien, I went to my tent one night while the glow from the hot embers of several fires still tinted the dark trees. A soft breeze fanned the loose tent flaps, and desultory snatches of song hung on the night air as I drowsed off:

> We're tenting tonight on the old campground,
> Give us a song to cheer
> Our weary hearts, a song of home
> And friends we love so dear . . .

Muffled by distance came the response of another outfit, lines from the Philmont Hymn:

> Silver on the sage
> Starlit skies above
> Aspen covered hills
> Country that I love
> Philmont, here's to thee . . .

Then, reverently but clear, from a cluster of tents close by:

> Dear Lord and Father of mankind,
> Forgive our feverish ways . . .
> Where Jesus knelt to share with Thee
> The silence of eternity
> Interpreted by love.

My alarm clock next morning was a medley of the rustling of squirrels in the pine needles, a loud groan from the next tent in answer to "Hey, grab your socks, sack rat!" and the smell of frying bacon. Getting breakfast at three separate campsites, I ate hot cakes cooked by boys from Pennsylvania, downed eggs fried by a red-haired Californian, and gulped coffee brewed by a Negro lad from Alabama.

Philmont helps boys grow up. On the stony trails of the ranch they strengthen wind and muscles, build initiative, independence, and self-respect. Important, too, are the social discipline and sense of comradeship they learn. Habits of personal and group responsibility become ingrained.

Adult supervision is never relaxed, with the result that crises seldom develop. But minor emergencies breed the little acts of heroism that instill confidence and help boys over the often troublous threshold from youth to manhood.

Camp's Goal: Boy Meets Challenge

In 1954 the first mixed group of white and Negro Explorers went to Philmont from Washington, D. C.

One of the colored boys was 14-year-old Arthur Weiseger, nicknamed "Pill" because he carried a kit of home remedies and prescribed for the real and fancied ills of his pals.

The trail between the camps at Harlan and Dean is steep and rough. Pill twisted a leg. The other boys took turns helping him uphill to Dean.

After a 24-hour rest, his leg seemed fully restored, and the group set out for Ponil Base Camp over a washboard trail. Suddenly the leg gave out completely; Pill was unable to put weight on it.

Spontaneously, without direction, five boys formed a team to take turns carrying him pickaback. While one boy shouldered Pill, two others doubled their loads with his pack and that of the lad who was portaging the casualty. The team switched loads from time to time.

Climbing down the clifflike bluff into Ponil, the injured boy rode his friends' backs without a slip. Reported the group's leader: "It was a fine display of the unselfishness, initiative, and consideration for others that Philmont strives to instill. Those boys showed citizenship at its best."

At every base camp Explorers enjoy tests of skill that provide a welcome change from trail routine. There are rifle and Moskeet ranges, the latter a form of skeet using lightweight clay pigeons and 22-caliber rifles that fire pellet-loaded cartridges. The boys practice fly casting and play Skish, a game that calls for casting a hookless plug into target rings laid on the ground.

A favorite after-hours pastime is trading shoulder patches. These colorful devices, woven in silk of many hues, identify Scout troops, jamborees, individual councils, and Scout training camps.

"How many Scout patches?" Patch-banker

Page 410

← **Growing Boys and Outdoor Living Spell Keen Appetites**

Upper: Philmont provides food for the trail, but Scouts must be their own chefs. R. C. ("Doc") Loomis, who teaches cookery, axmanship, and other camp crafts, uses the trunk of a 1935 Chevrolet as a field kitchen at Zastro Camp. His charges, who have been selected as Junior Leaders, wear uniforms for testing under trail conditions.

Lower: Youthful cooks, appreciative of their own talents, find this cake good to the last fingerful.

412

Happy Scouts Fill the Campfire-lit Night with Song

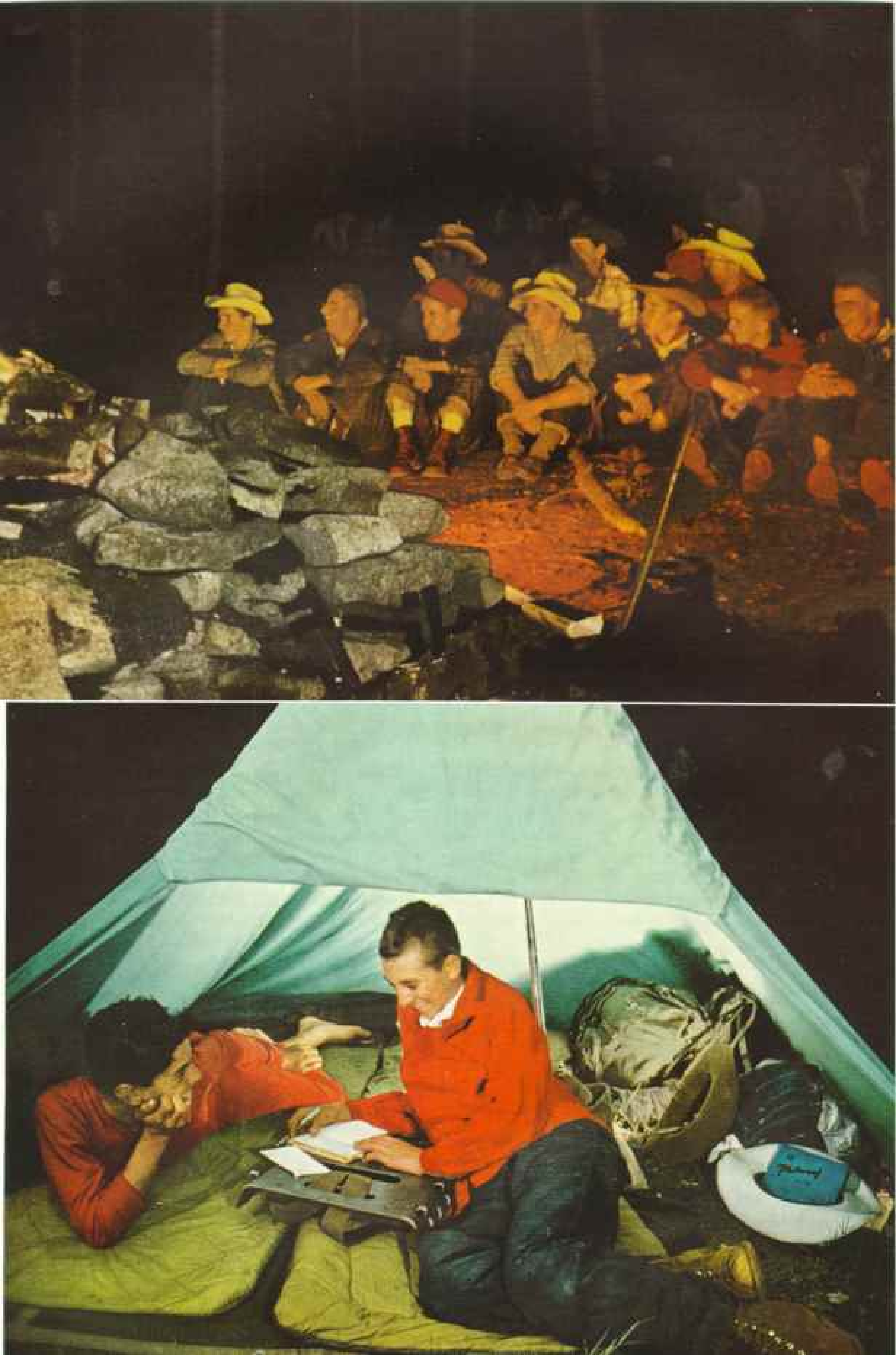
At the ranch or on the trail, no day is complete at Philmont without the traditional campfire.

Jokes and skits enliven the evening festivities at Cimarroncito. Then someone unleashes a guitar, and strong young voices send ballads and hymns rolling out across the piny hills.

With the singing of taps or Scout vespers, followed by a benediction, the boys head quietly for their tents. Tomorrow will bring new sights, new adventures.

➔Page 413. An Explorer tries to ignore the banter of his red-flanneled tentmate as he writes a letter home. Heavyweight muslin tent is waterproof.

➔Explorers make ready for breakfast beside the narrow, fast-flowing Cimarron River. Pines and blue spruces edge the stream.



Sam Kelsall repeated my question. "Hundreds. One boy I know has a long coat completely covered, front and back, with patches."

A single extra-special patch, Sam explained, may be worth six or eight common, garden-variety ones.

Boys prepare elaborate skits to amuse their buddies around the evening campfire (page 413). One night, at the conclusion of a mock mystery play, I heard the youthful master of ceremonies enjoin the audience: "Let's give 'em our seal of approval." Whereupon all present grunted in unison in imitation of a seal's bark.

Scouts Learn to Live off Land

Outstanding in Philmont's teaching effort is the Junior Leader Training program. Dedicated to perfection of scouting skills, this project prepares selected young men to train boys for leadership back in their home councils.

A high point of Junior Leader Training is the survival course.* Along Agua Fria Creek, near Rayado Camp, leaders instruct each JLT group in making fire with flint and steel and in recognizing edible and poisonous plants. They teach how to improvise snares for trapping rabbits, squirrels, and chipmunks, and they show the youths the proper way to build a shelter.

Split up in teams of three, the boys scatter through the hills. Each team is allowed one ax, half a cup of sugar, and a third of a cup of salt. Each member may wear his usual trail clothes, plus a jacket. He also may retain his pocket knife and belt, but no other equipment or supplies—no matches, no fishing tackle, no tent, no food, no cooking gear, not even a canteen.

I followed along with a team—Bill, Jim, and Paul—that speedily demonstrated how ingenuity abets instruction in meeting the test. The boys first built a shelter of stones and boughs. Using dry moss and the fibrous inner bark from a dead aspen for tinder, and striking sparks from flints that lay about, they got a fire going—after nearly an hour of frustrated attempts.

Thorn on Yucca Line Hooks Trout

Bill then split the fibers of a yucca plant, twisting them together for a fishing line. For a hook he bound a thorn to a twig. Minutes later he was knee-deep in Agua Fria Creek, snaking out fat rainbow trout with bait of grasshoppers and grubs he found in the brush.

Paul and Jim, meanwhile, chopped out a chunk of green log and hollowed one side. They filled the hollow with water, then heated several fist-size stones in the fire. The hot stones were popped in the water, which boiled almost instantly. Into it Jim tossed some root bulbs he had cleaned.

Bill grilled his catch of rainbow trout on a flat rock tilted toward the flames.

Soon the triumphant threesome was happily enjoying the frugal meal, finding it especially satisfying, I felt sure, for having been scraped together by a little knowledge powered by wit.

I crossed a spur and joined another team. One boy had skinned a squirrel and was impaling the morsel of meat on a forked stick. But his teammates still were striking futile steel on stubborn flint.

"Hurry up, you guys!" the successful hunter taunted his pals. "Meat's ready. Where's the fire?"

As I roamed the hillside, I met leaders who were keeping unobtrusive watch on the young men to be sure that none suffered from exposure and that no team got panicked by the frustrations inherent in this rigorous two-day discipline.

Some Prefer Broiled Rattlesnake

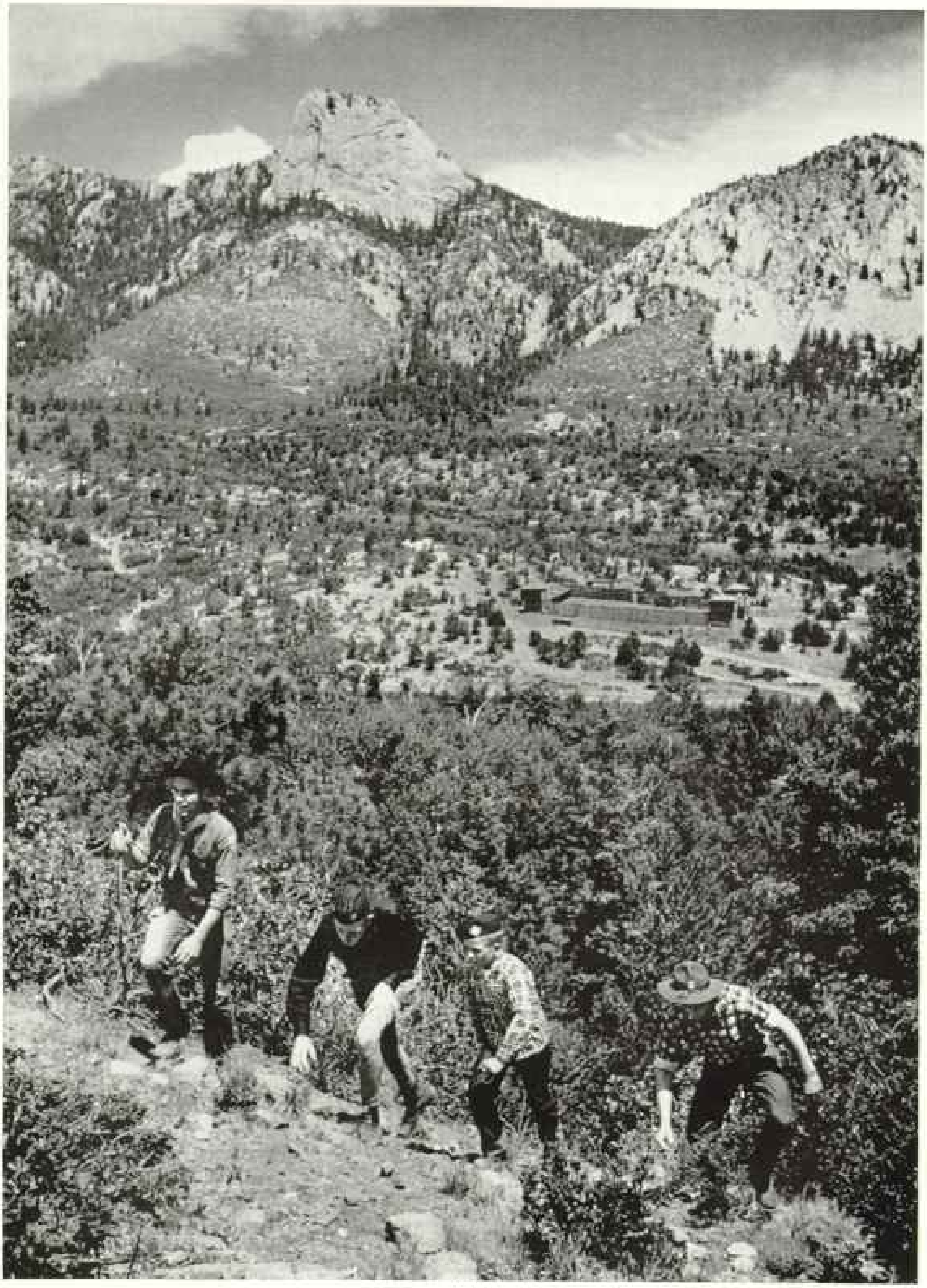
Explorers "on survival" have driven trout into traps of stones in shallow water. Teams have made fishing lines from shredded bark and from unraveled web belts. One, unsuccessful in fire making, lived solely on gooseberries, thistle blossoms, and dandelion plants. Roast porcupine and broiled rattlesnake have sustained many a trainee.

A story persists of a Philmont leader who took his boys by a lengthy detour around a bull pasture on the way to a survival training area. He was afraid of what the bull might do to the youngsters. On the hungry return march from survival, two days later, the leader again avoided the grazing bull—this time for fear of what the boys might do to the bull.

"Survival is the one achievement the boys are proudest of," Felix Knauth told me. "That experience sticks with them vividly when other memories fade."

Work projects develop interest in conservation. Everywhere on the ranch I saw gullies

* See "School for Survival," by Curtis E. LeMay, National Geographic Magazine, May, 1953.



415

Tooth of Time, Philmont's Best-known Landmark, Juts Above the Stockade Camp

Practical jokers sometimes hand out brushes and tell campers to "run up there and scrub the shaft." Stockade's pine-log walls and blockhouses re-create the atmosphere of frontier days.

stoppered with check dams made of brush, stones, and logs, built to slow down rushing rainwater and hold the topsoil. In an area near Cimarroncito Base Camp, Ray Sadler of Mississippi had constructed shelters for birds. Sadler in 1955 received the Hornaday Award, highest honor in scouting for work in conservation and wildlife.

Food for Half a Million Meals

Philmont's main commissary—food lockers, butcher shop, and chill rooms—would serve a large town.

"We distribute about $200,000 worth of food a season," Dale Olsen, assistant director, told me. "Daily shipments of perishables go to all base camps. The trucks are loading right now."

Out on the platform boys were stowing cartons and bags of staples, topping off with wire baskets brimful of tomatoes, lettuce, carrots, cabbages, oranges, and grapefruit.

"Every day except Sunday," Mr. Olsen said, "we send out about four tons of food to five base camps for their use and for further distribution by jeep and truck along the trail. Over the whole season we'll use 70,000 to 80,000 loaves of bread, 80,000 half pints and 8,000 quarts of milk.

"We'll have to supply food for half a million meals and for as many as 1,000 meals in a single dining hall in one day."

Apart from its programs for boys, Philmont offers adult instruction in all aspects of Scout leadership. I attended a number of the classes, which are held in the handsome Villa Philmonte, Waite Phillips's onetime home.

Most men trainees bring along their wives and children, often combining a tour of the West with a training course at Philmont. Families are accommodated in tents close to cafeteria, assembly hall, and classrooms. Supervised play for children releases mothers to study handicrafts, ride horseback, and tour the ranch (page 401).

Two miles south of Philmont Camping Headquarters, ruts of the Santa Fe Trail still are visible in thick turf beside the road. I parked my car there one moonlit night and got out to marvel, as I had before, at that durable autograph of times past. I called to mind what I knew of its history.*

Long before there was any trail here, Coronado and his conquistadors passed this way. Then came the fur traders. The wagons started to roll over the Santa Fe Trail after 1822, coming west from Missouri by way of Fort Bent and Raton Pass.

The mountain men—Bridger, Maxwell, Wootton, Fitzpatrick—watched over the route, and later on Kit Carson and Lucien Maxwell built their trading post four miles south of this spot.

Suddenly the glare of headlights broke into my musings. A Philmont bus swept around the curve behind me, rolled down the grade, and pulled off at a wide place near by.

The driver flicked off the headlights and a somewhat travel-worn gang of Explorers stumbled out and clustered around their two adult leaders.

"What're we getting out for?" one asked. "I'm ready for the sack."

"I thought the trip was over," said another. "What is there to see here?"

"I know you're tired," one of the leaders said. "It's been a hard 10 days, and we're late getting back to Camping Headquarters. But the road crosses the old Santa Fe Trail here. We thought you'd like to see it. Look down the hillside there."

The boys fell silent and peered intently over the wire cattle fence. Light of the full moon silvered the slope. Insect noises stitched together the star-sequined veil of night.

"See those long shadows in the grass? Those are ruts made more than a hundred years ago by covered wagons bound West to Santa Fe and the Pacific."

Whips Crack Again on Santa Fe Trail

Eyes on the historic tracks, the boys soaked up the meaning of what they saw. I had no doubt most of them were attuned to the same ghostly presences that crowded in on me—the thud of hoofs and the creaking of wheels and harness as drivers urged their teams up the slope, a child's sob of fright when a coyote screamed close by, the muted birdcall warning of an Indian sentry far up the ridge.

As the leaders herded their charges back into the bus, I heard a boy's voice, anxious for reassurance, ask, "Are those *really* the old ruts the covered wagons made?"

"Yes."

"Goll-ee!"

In his delight and his awe, I think he spoke for all of us.

* See "Santa Fe Trail, Path to Empire," by Frederick Simpich, NATIONAL GEOGRAPHIC MAGAZINE, August, 1929.

National Geographic Map Portrays the United States on the Move

ACROSS the face of the National Geographic Society's new map of the United States runs a significant network of fine scarlet veins. These double red lines represent the more than 2,200 miles of high-speed, nonstop expressways built since The Society's previous general map of the Nation appeared in 1951.

Over these impressive superhighways and their auxiliary road grid some 62,000,000 cars and trucks are rolling this year. Another 960 miles of throughway are under construction, and a highway bill passed by Congress on June 26 projects a gigantic long-range program. During the next 13 years 41,000 miles of expressway are to be added, at a cost of about $700,000 a mile. They will connect 209 major cities in all 48 States.

Newest of the superroads is the cross-State Indiana Toll Road, opening this autumn. Linked with turnpikes in Ohio, Pennsylvania, and New Jersey, it will permit motorists to drive between North America's two largest cities, New York and Chicago, without meeting a single traffic light, grade crossing, sharp curve, or steep hill.

Many of the expressways are self-financing toll roads. To attract vehicles, private and commercial, some advertise special services. The new Ohio Turnpike, which stretches across the map from Youngstown to Toledo and the Indiana border, boasts eight microwave radio towers along its 241 miles to speed help to

Buffalo's Skyway Soars Free of Streets and Tracks

Spanning Buffalo River, a new 100-foot-high bridge swings past Municipal Auditorium at roof level and descends near the 32-story City Hall. The $12,000,000 Skyway, shown under construction, connects with the New York Thruway, one of a complex of expressways being laid down across the country.

Robert F. Sisson, National Geographic staff

travelers with flat tires, empty gas tanks, or other troubles. The same radio system also notifies operators of 16 wayside restaurants when busloads of hungry travelers are coming for lunch or dinner.

To carry these and other new roads across rivers, lakes, and bays, engineers have built some remarkable bridges. On the map a red highway line leading south into New Orleans is drawn straight across 24-mile Lake Pontchartrain. No draftsman's error, the line marks the longest bridge in the world—a driver moving over its central eight miles cannot see the shore at all. To open in the fall, the bridge has been erected on an assembly-line basis, as much as 3,000 feet a week.

Another engineering feat, shown by a dashed line on the map, is the bridge now reaching out across the Straits of Mackinac to connect Michigan's two lake-bound peninsulas. Five miles in over-all length, it will boast the world's longest suspension span—8,614 feet between cable anchors.

Canada expects to have by 1960 a tremendous 5,000-mile highway arcing across the continent from St. John's, Newfoundland, on the Atlantic to Vancouver on the Pacific. As the solid red lines indicate, nearly two-thirds of it is already paved. Toughest unfinished link occurs in Ontario's Laurentian Shield, where outcroppings of bedrock alternate with deep muskeg swamps.

Guide to U. S. and Canadian Parks

The new map is drawn on a scale of 72 miles to the inch, larger than any previous National Geographic map of the whole United States; for easier legibility, its type is darker and 38 percent larger. Insets show the Territories of Alaska and Hawaii, an enlargement of New York City and surrounding area, and New Brunswick and Nova Scotia.*

More than 100 U. S. National Parks and Monuments are located on the map; 29 parks are shown in southern Canada. An index on the right lists them alphabetically.

A thin ribbon of land in eastern North Carolina marks a new and unique summer playground for Americans, the Cape Hatteras National Seashore Recreational Area. The only national seashore park in the United States, it stretches 80 miles along the coast and includes nearly 28,500 acres of primitive beach, dunes, marshland, and forest. It surrounds famous Cape Hatteras Light, tallest in the country, and faces treacherous Diamond Shoals, the "Graveyard of the Atlantic."†

In the map's western half, engineers have changed the shape of the Missouri River as it flows through Montana and the Dakotas. Six giant dams—four completed, one still under construction, and one planned—are turning this 1,000-mile ribbon of water into a series of huge man-made lakes. These are spectacular units in the elaborate Pick-Sloan Plan, the biggest watershed control program ever attempted.

Seaway to Let Big "Salties" Enter Lakes

Near the top of the map a different kind of engineering project is changing geography. Between Lake Ontario and Montreal 8,000 men and some of the world's biggest earth-moving equipment are cutting canals, building locks and dams, dredging channels, and erecting power stations for the billion-dollar St. Lawrence Seaway project.

Turbulent rapids in this 180-mile stretch of the St. Lawrence River bar big seagoing vessels from the Great Lakes. Around the torrent Canadian and U. S. crews are rushing —to meet a spring 1959 deadline—a waterway that will take ships 700 feet long with a 75-foot beam and 25-foot draft.

When finished, the Seaway will more firmly link cities like Duluth, Milwaukee, Chicago, Toledo, Cleveland, Buffalo, Hamilton, Toronto, and Rochester to the Atlantic. Planners expect 50,000,000 tons of cargo a year to float through the Seaway. Ship tolls and huge hydroelectric generators will help pay the cost of the project.

The new highways, bridges, and canals all knit more closely together the 3,022,387 square miles and 168,500,000 people that make up the United States. So, also, do the growing fleets of airliners that fly the unmarked routes across its skies.

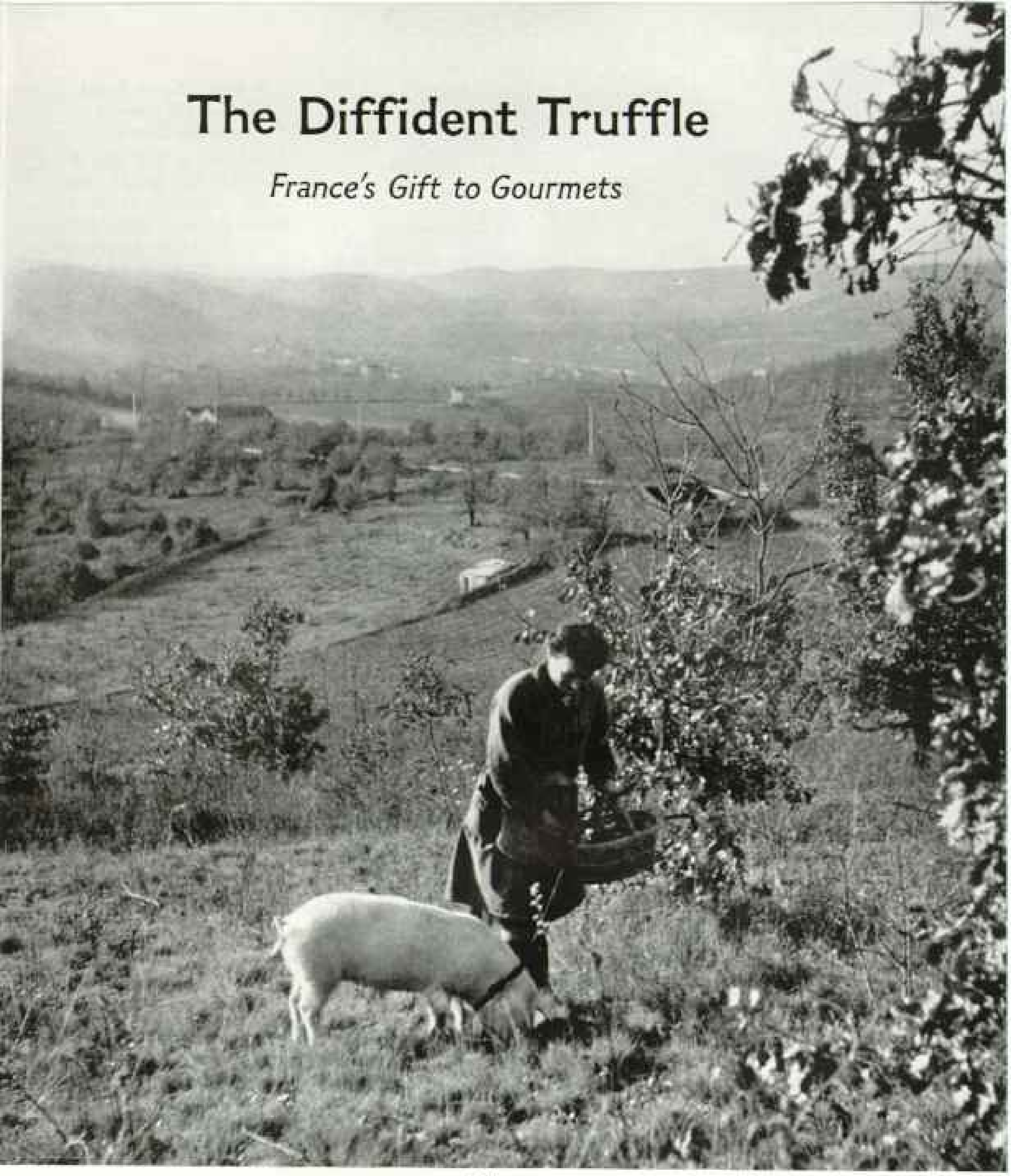
From 542 commercial airports (marked by red stars on the map), 31 domestic airlines this year will fly more than 21 billion passenger-miles—125 miles for every man, woman, and child in the country.

* Members may obtain additional copies of the map of the United States (and of all standard maps published by The Society) by writing to the National Geographic Society, Washington 6, D. C. Prices, in the United States and elsewhere, 50¢ each on paper; $1 on fabric. **Indexes to place names, available for this and most other maps, 25¢ each.** All remittances payable in U. S. funds. Postpaid.

† See "October Holiday on the Outer Banks," by Nike Anderson, National Geographic Magazine, October, 1955.

The Diffident Truffle

France's Gift to Gourmets

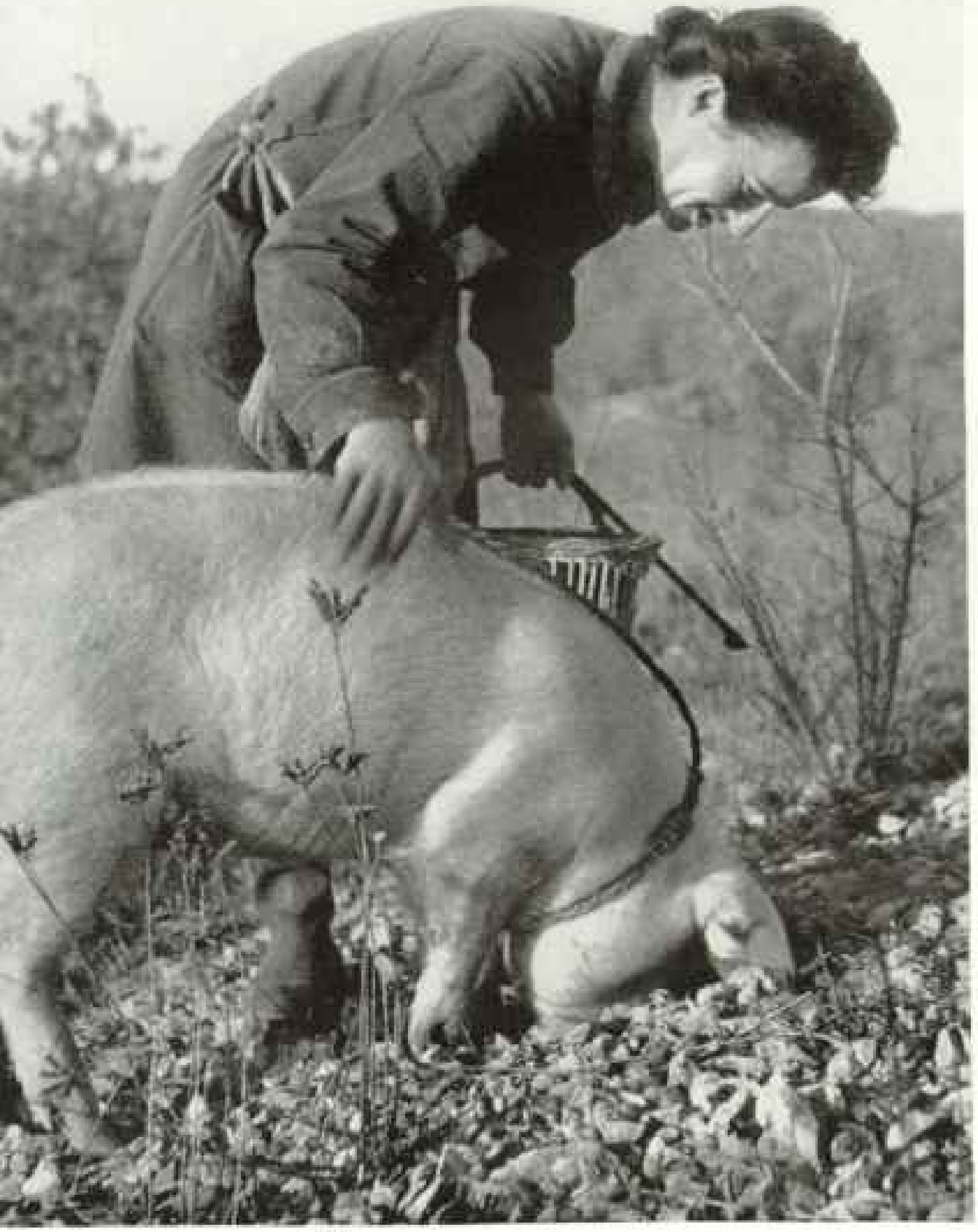


A WINTRY sun smiles wanly on a farmer's wife and her sow as they roam the hills above Souillac in southwestern France. Together they search for truffles, a fungus fruit prized by gourmets the world over.

Tugging at the leash and sniffing like a foxhound closing on its quarry, the sow suddenly halts beside an oak. She grunts loudly and rubs her snout in the soil.

Hastily the woman tosses a few kernels of corn to divert the animal's attention; then she bends and scoops up the earth with a trowel-like utensil. Several inches below the surface she uncovers a small, black, warty tuber—the elusive truffle, whose flavor long has made it popular in sauces, stuffings, and garnishes.

Human sense of smell can rarely detect the piquant perfume of the buried fungus. Most French truffle seekers hunt with pigs. In Italy dogs lead the search. Sardinians use goats.



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A Sow's Keen Scent Detects Treasure in the Earth

Not every pig can be trained to be a good hunter. The female's sense of smell is more acute than the male's. French farmers test the females in each litter by offering them truffle tidbits; the animals that display the most avidity receive field training around the age of two.

Truffles are gathered in winter. During autumn the pigs are taken into the fields for trial runs. An occasional taste of truffles sharpens their ambition.

Working against the wind, a pig can smell a truffle 20 feet away. Each discovery offers temptation. Gently the owner raps the pig's nose with a stick, lest it dig deeper and damage the tuber. But a reward of acorns, beans, or corn goes to the pig for each find.

Swarms of small yellow flies sometimes point the way to a ripe truffle. Attracted by the aroma, they hover close to the ground. Occasionally, too, cracks in the surface alert the hunter to large specimens in shallow cover.

Dolmaya, Rapho-Guillumette

Black Strawberries? Not So. Truffles! →

Members of the genus *Tuber*, class Ascomycetes, truffles are related to edible mushrooms and to less appetizing fungi such as molds, yeasts, and mildews. They grow a few inches to a foot deep. Microscopic filaments attached to the roots of trees, usually oaks, may supply nourishment.

Some truffles are pea-size; others are as large as oranges. Italy exports a white species.

The flesh spoils on exposure, so most specimens are rushed to canning factories (page 424). A 16-ounce can sells for more than $20 in the United States.

Feher

421

Fifi: Geiger Counter on Four Legs

Dogs do not naturally seek out truffles, but they can be trained to track them down. Truffle shavings mixed with the dog's food familiarize the animal with the scent.

Although canines lack the pigs' keen nose for detecting the fungus, they are more obedient and tire less quickly. Curiously, they can sniff a trove when snow or ice covers the ground, a talent lacking in swine.

Alba, a town in northwestern Italy, boasts a school for training truffle hounds. A few American enthusiasts have imported trained dogs but have turned up few edible truffles.

Fifi works near Souillac, France.

Delaunay, Rapho-Guillumette

422 Dufrénoy, Rapho-Guillumette

Buyers and Sellers at Market in Cahors Keep Sharp Watch on the Scales

Representatives from canneries throughout France compete at this open-air exchange. Truffles are sold by weight while still encrusted with dirt. Buyers pay $5 to $14 a pound.

French Farmer Sniffs a Prize; Its Earthy Aroma Earns a Smile

Truffles dominate a pastoral region known as Périgord. During harvest season, December to March, their subtle scent pervades the land. Here good cooking and good eating are prized among life's richest rewards. Truffle recipes are passed down for generations.

During World War I prices in Périgord fell to an all-time low, about 35 cents a pound. Scores of landowners chopped down their oaks, plowed up the fungus grounds, and cultivated more profitable vineyards and potatoes.

Prices have since skyrocketed, and demand far outstrips supply. Many repentant Périgourdins have now planted new groves of oak trees.

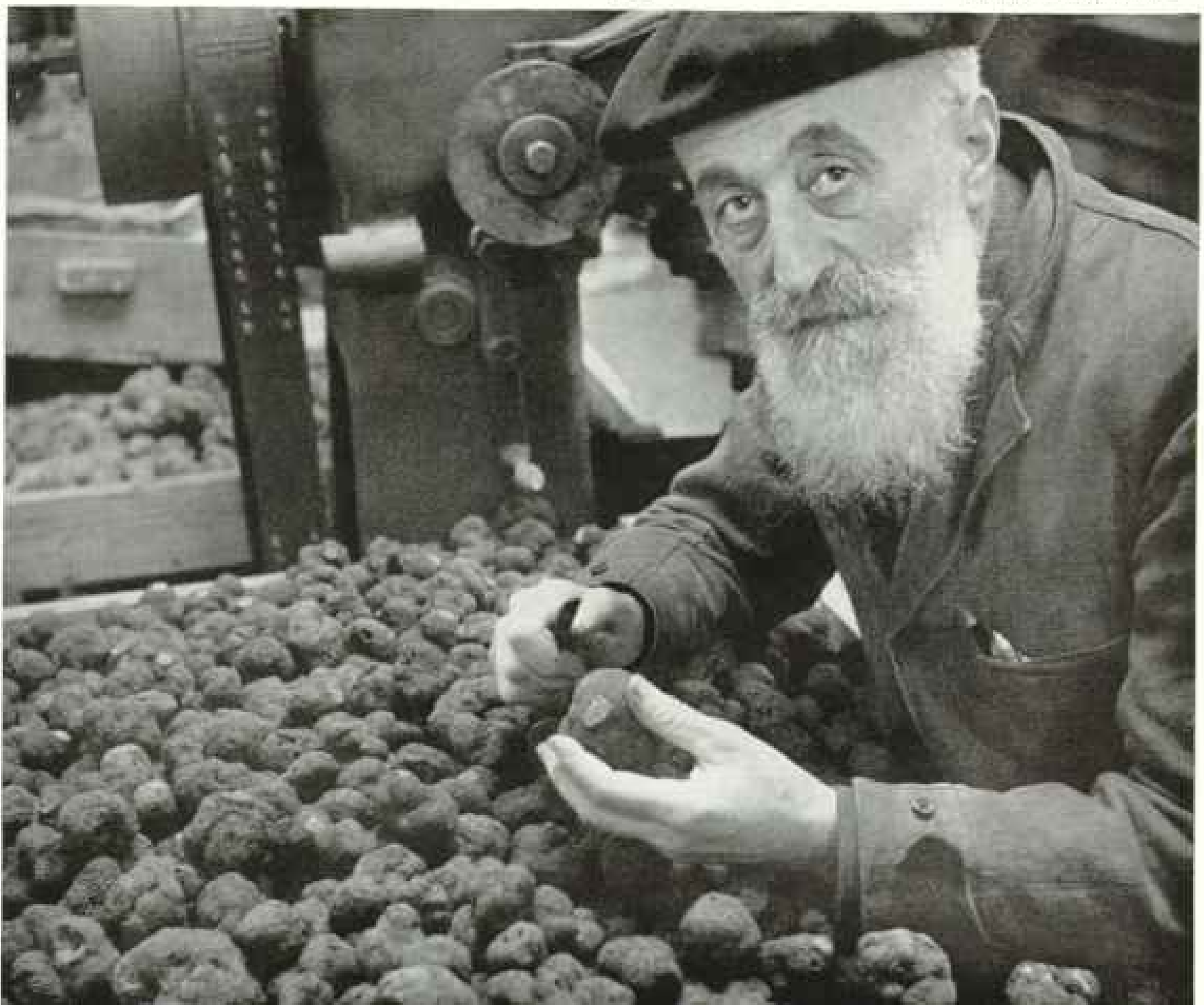
Mystery, however, surrounds the truffle's growth. Cultivation is difficult and unpredictable. A particular spot may yield a fine crop of truffles one year, yet be quite barren the next. In a single oak grove the tubers may appear among the roots of some 5-year-old trees; they may not show up among others until the trees are 20 years old; and some trees nourish no truffles during a lifetime.

Feher

Alain Pebeyre, a Wholesaler in Cahors, Is Known as the French Truffle King

France, largest producer of truffles, unearths 300 to 500 tons a year. The black diamonds of the kitchen bring in millions of dollars. Bearded, bereted Monsieur Pebeyre processes 50 tons or more a season. Here he scrapes and cleans a trayload headed for the canning machines.

Delpech, Raffo Guillumette



Cannery Workers Manicure Truffles in Limoges

Truffles wear a coating of their native soil on arrival at a cannery. Aproned women wash them in cold water, scrub with soft brushes, and dry carefully. Appraisers grade according to size and quality.

Workers peel the delicacies with razor-sharp knives and pack them in wine or cognac to intensify the aroma.

No part is wasted; paper-thin parings are tinned separately. Used in omelets and stuffings, they sell for much less than the whole fruit.

Cans are sterilized in vats under steam pressure. Shrinking during the process: the flesh loses as much as 30 percent of its weight.

Truffles Weigh In: Four Large Ones Make a Pound

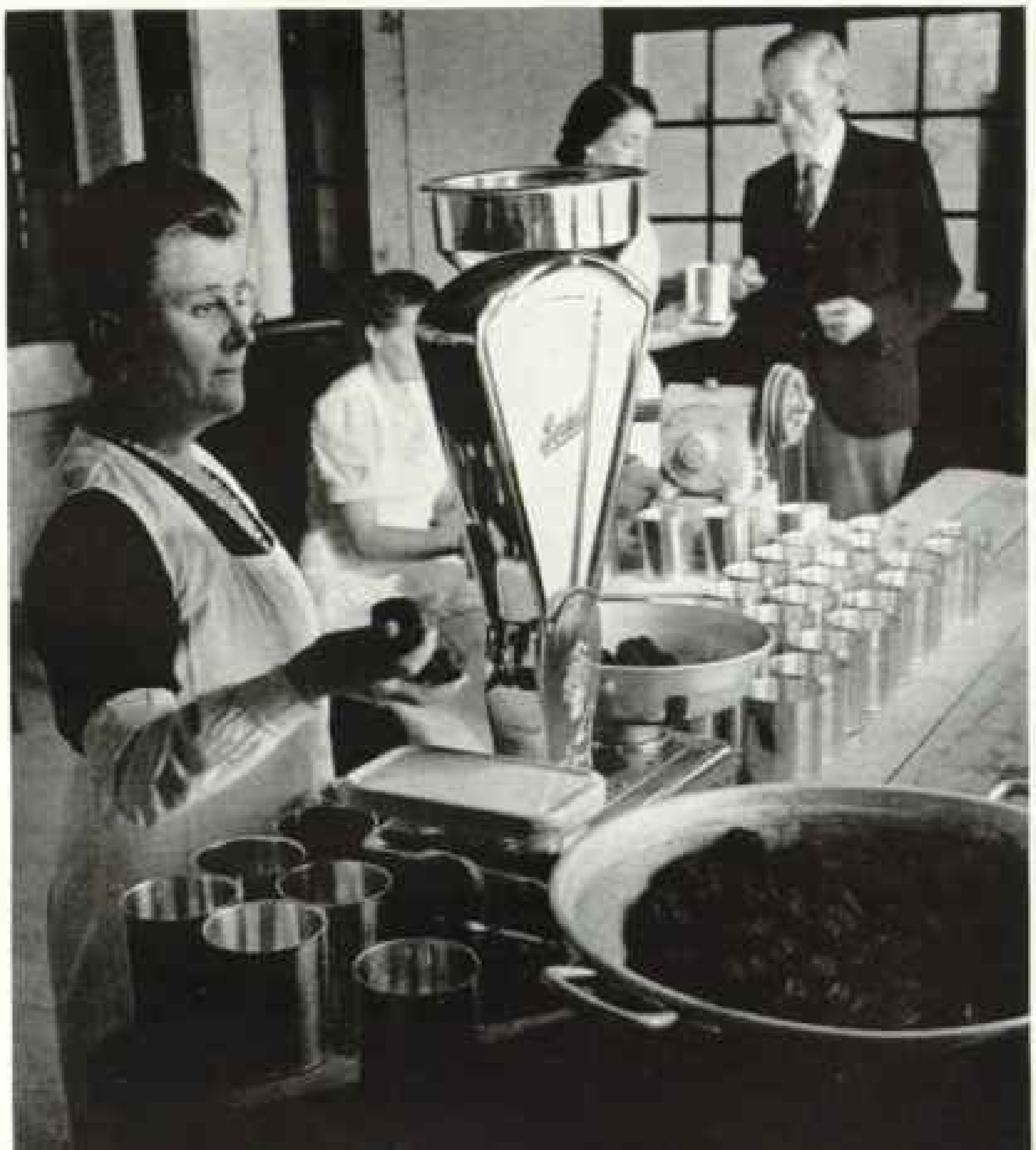
The truffle is roughly comparable to the oyster in composition: about 71 percent water, 10.4 protein, 15 carbohydrate, 2.6 mineral, and 0.4 fat.

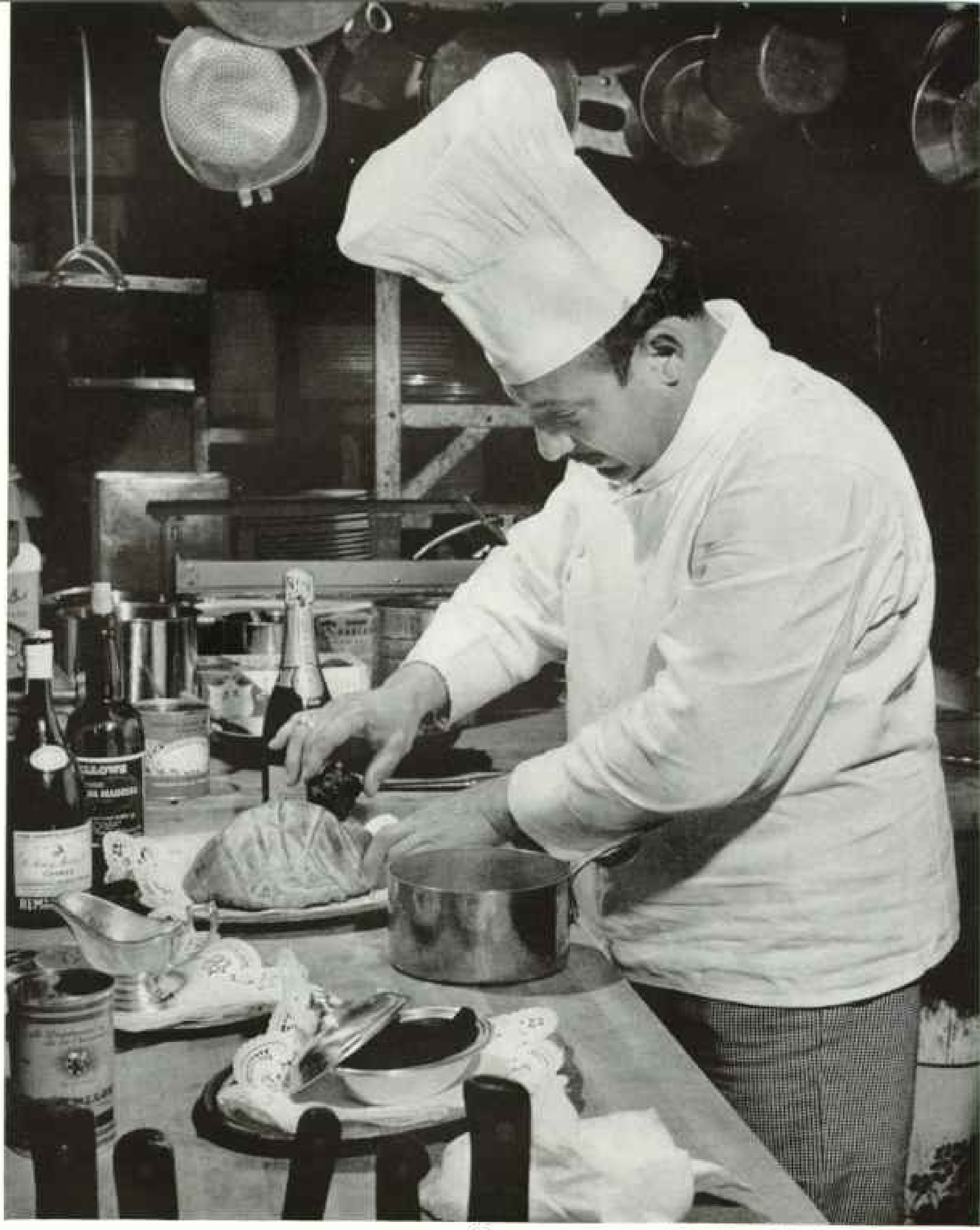
Fresh harvests are rarely exported, though an air shipment occasionally goes to New York.

At Christmas fresh tubers are in demand in French cities. Roast duck garnished or stuffed with truffles is traditional.

Several factories pack both truffles and *pâté de foie gras*, or fat goose liver. Slices inserted in the liver heighten the flavor.

Futur





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J. Baylor Roberts, National Geographic Staff

An Artist in His Kitchen Adds the Final Touch to a Culinary Masterpiece

Truffles are used mainly as a seasoner. More subtle than onions, wholesome and easily digested, they impart their flavor to all foods. Gourmets use them in many other ways: baked whole amid hot coals, steeped in cream or wine, grated in omelets, sliced and tossed in salads.

Here Gus Diamant, head chef at the Restaurant Place Vendôme in Washington, D. C., prepares *le coq en pâté*. He has stuffed a tender young chicken with sliced truffles and foie gras and baked it in a shell of short, flaky pastry. He decorates it with a whole truffle. Serving dish in foreground contains others sautéed in butter and simmered in champagne and spiced cognac.

J. Baylor Roberts, National Geographic Staff

"Ah, C'est Magnifique!" Washington, D. C., Diners Admire the Pièce de Résistance

Truffles were prized by the Greeks and Romans, but the plant's origin and manner of growth long puzzled scholars. Cicero thought them daughters of the earth conceived by the sun. Porphyrius considered them children of the gods. Plutarch asserted they were produced by the conjoined action of lightning, warmth, and water on the soil. Pliny called them nature's most wonderful creations.

The ancients dedicated the black fungus to Venus, in the belief that it stimulated love. The legend still survives. Anthelme Brillat-Savarin, 18th-century French gourmet, declared in *The Physiology of Taste* that truffles make women more tender and men more affectionate.

Perhaps someday truffles will be as popular on American dining tables as they are in Europe. At its Agricultural Research Center in Beltsville, Maryland, the United States Department of Agriculture is conducting experiments in truffle raising.

Test beds, now five years old, are still not sufficiently mature to indicate whether or not truffles can be domesticated successfully.

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LONG AGO
IS NEVER FAR AWAY IN **VIRGINIA**

Round the corner from your modern motel or hotel in Fredericksburg, you'll find Monroe's law office, the desk on which he wrote the Monroe Doctrine. Stroll to homes of Washington's mother and sister, or drive to neighboring plantations where Lee and Washington were born. Visit old Alexandria. And remember, early autumn swimming is fine at Tidewater beaches. So plan soon to mix *fun and history in Virginia!*

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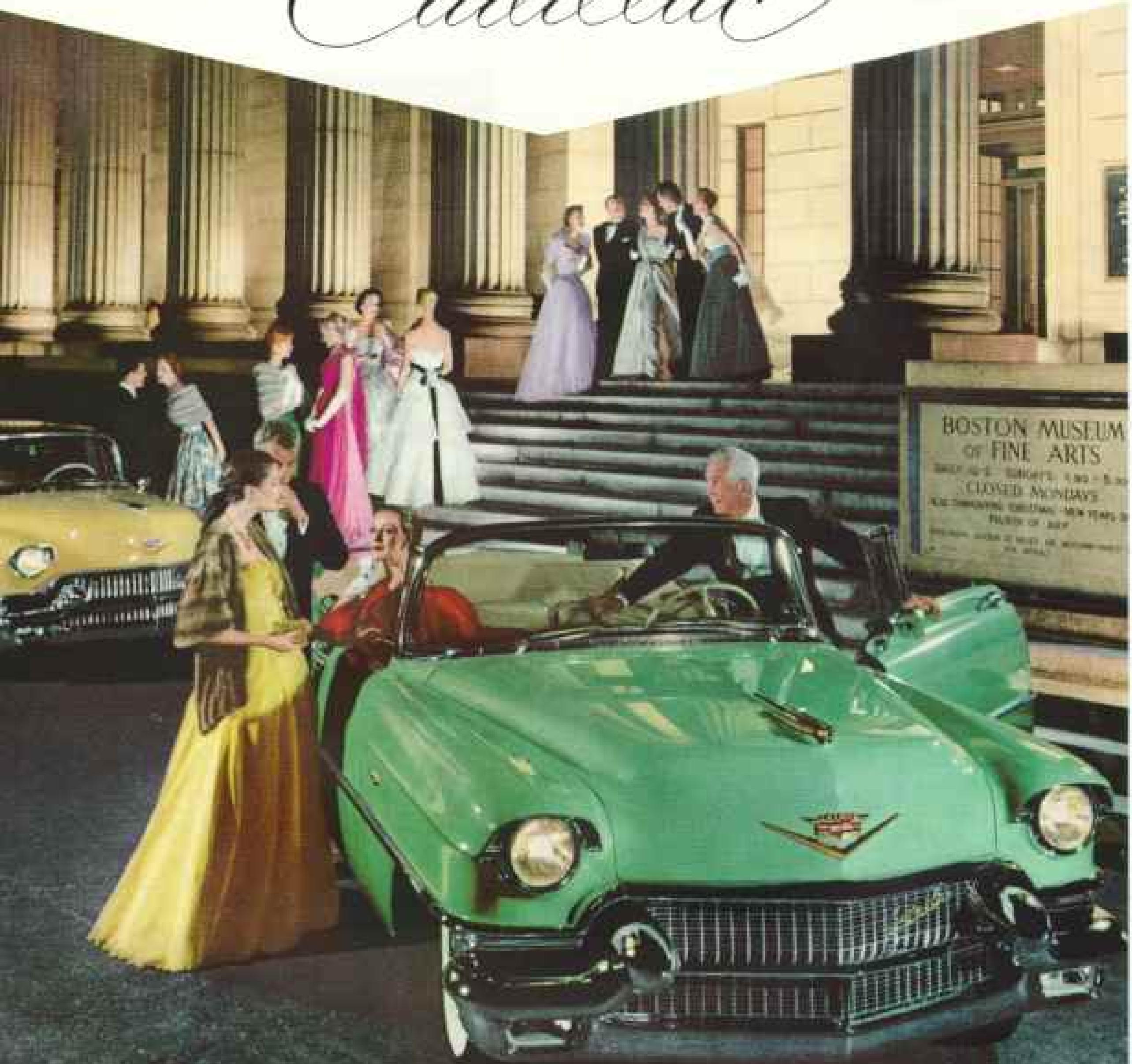

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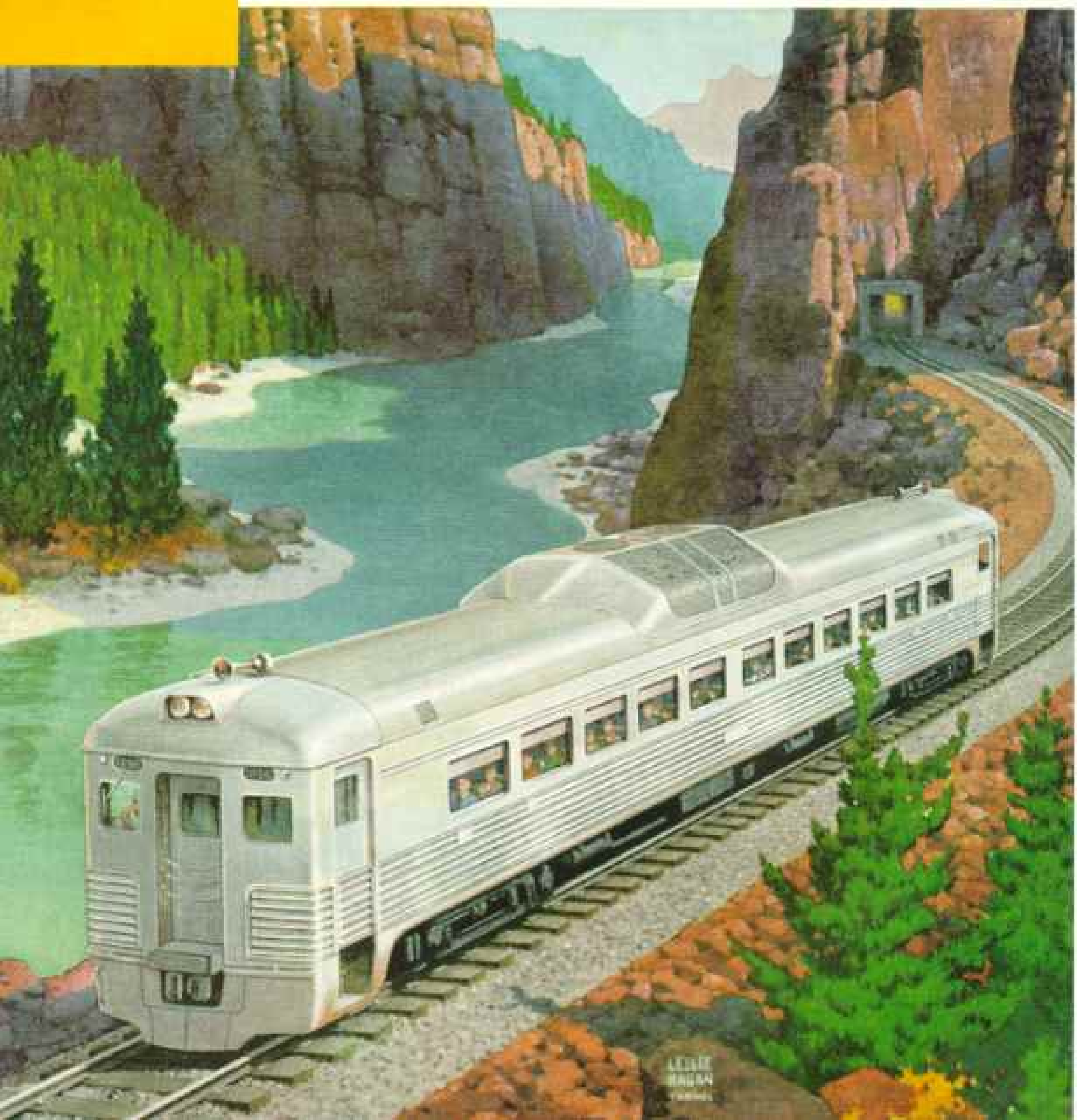

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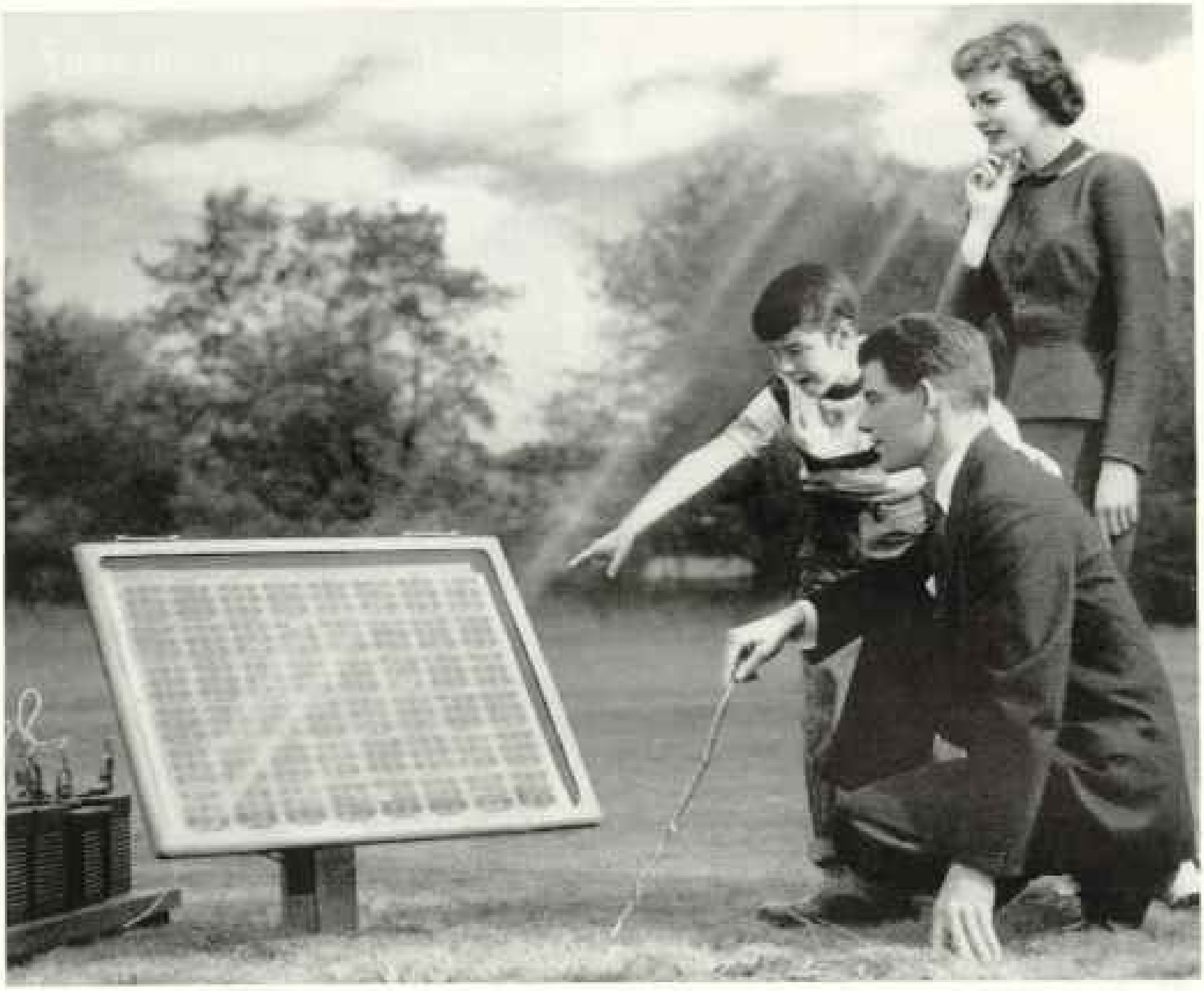

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