VOLUME LXXVII NUMBER SIX

THE NATIONAL GEOGRAPHIC MAGAZINE

JUNE, 1940

Map Supplement of the Southwestern United States

Forty Pages of Illustrations in Full Color

PUBLISHED BY THE
NATIONAL GEOGRAPHIC SOCIETY
WASHINGTON, D.C.

$3.50 A YEAR 50c THE COPY

VOL. LXXVII, No. 6 WASHINGTON JUNE, 1940

THE NATIONAL GEOGRAPHIC MAGAZINE

SEEING OUR SPANISH SOUTHWEST

By FREDERICK SIMPICH

IN THIS eventful 1940, just 400 years behind the Spanish Conquerors, sightseers by millions are again "discovering" our Southwest.

Up to the strange Sky City of Acoma they scramble, to see where Oñate's men jumped off its steep heights when Indians beat them back; up to silent, long-abandoned cliff dwellings these panting visitors climb, and down into abysmal canyons and caverns; past dinosaur tracks and petrified forests; through wind-sculptured temples and over natural bridges to brooding Indian villages where pagan rituals have not changed in a thousand years.

In excited amazement these eager 1940 explorers *are* actually discovering this Southwest Wonderland, just as truly as did Coronado, Oñate, Father Kino, and all that gallant band of knights in armor, courageous padres, and rugged, audacious adventurers who saw it first, who "fell on their knees and then on the aborigines" and claimed it for the King of Spain—a claim that was to stick for nearly 300 years.

BOULDER DAM A NEW WORLD WONDER

Take any visitor at random—say a teacher from Plainfield or Pocatello: for the first time in *her* life, she, too, sees the Grand Canyon and rides a mule down Bright Angel Trail. She, too, gets saddlesore and weary, just as Cárdenas must have been when he came unexpectedly to the canyon brink that day in 1540; yet, just as truly as Cárdenas, she discovers it, and feels the same profound emotions of awe and amazement. Every normal human feels that way who stands for the first time at Grand Canyon and gazes in almost painful ecstasy at this sublimely incomparable earth sculpture.

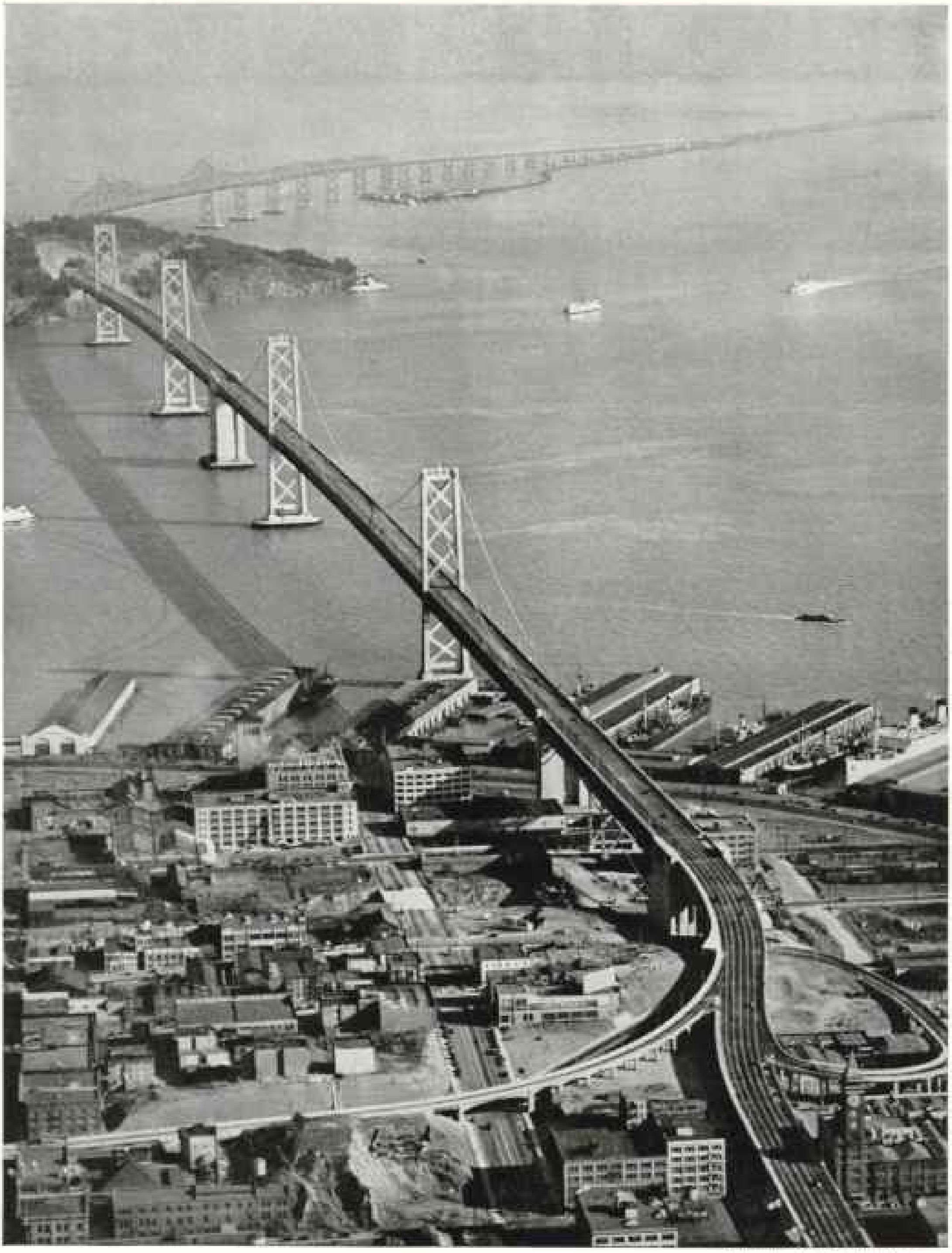
It's a strange, spectacular land, this American Southwest, which stretches west from Texas to the Colorado and lures all these visitors.* It even has its own new seven wonders of the world. Who can say that the Leaning Tower of Pisa, a wonder of the medieval world, is now more wonderful than Boulder Dam with 91 miles of water tunnels so big that steamboats might ply them?

Look over Southwest and adjacent wonders and make your own list: Carlsbad Caverns; Rainbow Bridge; Mesa Verde Cliff Dwellings; Petrified Forest; Giant Sequoias; Death Valley; Bryce Canyon; Meteor Crater; Inscription Rock; Grand Canyon; Yosemite Valley; White Sands; Great Salt Lake.

Or, if you think man's works more wonderful, there's new Lake Mead, dammed up in the Colorado—the world's largest man-made lake; there's the All-American Canal into the Imperial Valley, which carries more water than many a well-known river; there's the wholly man-made harbor of Los Angeles at San Pedro, crowded with more tonnage than any other United States Pacific port; there's Golden Gate and San Francisco-Oakland Bay Bridges; Palomar's 200-inch telescope; Colorado's Gunnison Tunnel, which swallows a whole river; or, if you *must*, there's always Hollywood, whose make-believe world makes the whole real world laugh, cry, and then laugh again.

Because of its dry, rugged nature, much of this geological jumble remains as empty

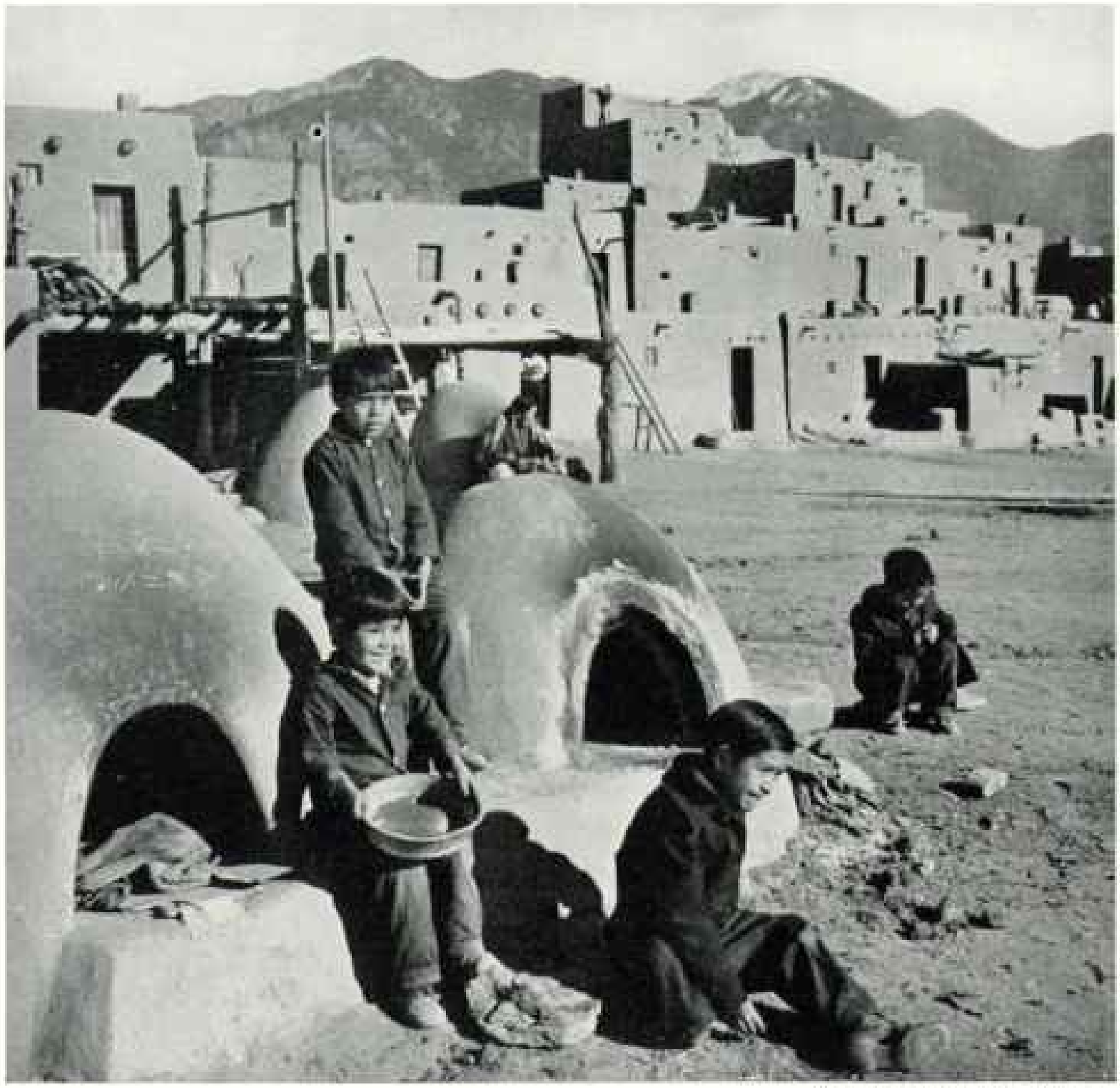
* See the National Geographic Society's new map, "The Southwestern United States," issued as a special supplement to this issue.



Photograph by P. M. Bruner

SINCE SAILING SHIP DAYS SAN FRANCISCO BAY, SPANNED NOW BY THIS 8½-MILE BRIDGE, HAS BEEN A GOAL FOR MIGRANT MILLIONS

Here came first whalers, square-riggers, and then steamers, from round the Horn; then transcontinental trains, bringing armies of visitors and home-seekers from the East; now come the flying Clippers, linking the Golden Gate to seaports far across the blue Pacific. Today thousands of cars roll over this breath-taking San Francisco-Oakland Bay Bridge, 216 feet above salt water. White lines mark six lanes for cars; another deck, below, carries trucks and electric trains. Berths for ocean-going ships lie far beneath, with a liner at right.



Photograph by André de Dienes

FRESH-BAKED CAKE SMELLS GOOD TO GRINNING INDIAN BOYS!

Taos Pueblo's famous Community House rises in the background. These Indians own and farm much near-by land, have their own herds, vehicles, and work animals; some pose for artists from Taos studios. Like all pueblos, Taos has its own governor, who regulates tribal affairs. To see this New Mexican village, visitors must now pay a dollar to the tribe.

as the world must have looked to Noah that day when the Flood left his Ark perched high up on Ararat. Yet, for many visitors, the more this wilderness "howls" the better they like it! To them the silent Painted Desert is above the voice of Hollywood; here, too, America's Sahara lures people who shun cold and snow, just as Egypt's resorts fill up in winter with sun-hunters from Europe.

There's nothing new or sensational about pleasure-seekers going to the Southwest. They've been going since stagecoach days. But it's the volume of travel that now challenges attention. Of this year's estimated 4,000,000 visitors from outside the area, some are here because they couldn't get to Europe; but, relatively, only a few. Last year also about that many visitors entered Colorado, Utah, Nevada, New Mexico, Arizona, and California. Millions rode motorcars or trains, and thousands flew.

Today's good roads, good cars, and planes make it easy to reach scenic wonders once hardly accessible. Increasing thousands also flock to the multiplying dude ranches, a social phenomenon worth later analysis. Then there's the always inscrutable Indian, proving Pope's words that man's most fascinating study is another man. Most significant, too, is our new, more friendly attitude toward deserts.

Photograph by Robert L. Voight

GUITARS AND GLAMOUR GIRLS GIVE ZEST TO LIFE IN THE SOUTHWEST

Recalling California's social gatherings described in Dana's *Two Years Before the Mast*, these singing sisters are among the entertainers at Santa Barbara's annual Spanish fiesta. In the Southwest you cannot give a good party without a guitar player.

How bitterly westbound immigrants hated the burning desert, on which so many left their bones! Now at swanky desert resorts visitors pay $10 or $20 a day and up, *to enjoy the same heat* on the same wilderness where pioneers cursed the cloudless skies and died of thirst! At cozy "auto courts" an even larger army has just as much fun, sees the same wilderness—but for only $2 a day.

Look at grim, bone-strewn Death Valley; it earned its ghastly name. Wary gold seekers came to shun it, just as pilgrims in Bible times fled from plague-ridden cities. But now winter guests swarm its fantastic, once-lethal depths, and ask, "Where are the Poison Springs? . . . Show us the exact spot where all those covered-wagon people perished."

On barren flats about Great Salt Lake many a weary Mormon sank to die. Now men come here all the way from London, bringing their costly racing cars with them to break still more speed records (page 752).

Where Mormon immigrants had to use long ropes to lower their prairie schooners down over steep cliffs, today's easy-graded highways allow motorcars to glide in safe comfort.

Much of Grand Canyon long remained unexplored; legend says one party of Spaniards got lost in it and was never heard from again. Excursion planes fly over it now. On the eastern stretch of Lake Mead, visitors in luxurious pleasure craft sail along on daily sight-seeing cruises under towering cliffs whereon few human eyes had ever rested until Boulder Dam backed this artificial lake up into the canyon.

TODAY'S "CONQUERORS" ARE ENGINEERS

No wheel had ever rolled across the Colorado River between Arizona and Nevada until Boulder Dam was built. Now motor parties drive easily from one State to the other, riding over the superbly scenic highway which crosses the Colorado on the crest of Boulder Dam (page 733).

How change has swept this land since the Spaniards conquered it! Now it is "conquered" again, this time by irrigation engineers whose armor is leather jackets and laced boots, and whose weapons are not the sword and blunderbuss but dynamite and steam shovels.

Physical geography itself takes new form under their assault. Millions of meat-bearing animals and infinite miles of useful plants and fruit trees flourish today in what once were wastes so arid that even Indians shunned them.

Some aspects of our Southwest are so unusual, so fantastic, that were they not proved by official maps, words, pictures, and ice-cold figures in Uncle Sam's archives, I should not dare print them here.

Only the miracle of heavy tropical rain storms could do here what puny, patient man is doing with dams and ditches. Farm science has helped to upset even the dismal theory of old Malthus himself; now food output on irrigation projects increases so much faster than people that even the annual hauling out of long yellow trains of iced fruits and vegetables leaves yet a superabundance—and a bewildered nation's nightmare of maldistribution.

Today there's more food in Phoenix alone than in the whole Southwest when Coronado's men fussed with Zuñi Indians over a skinny turkey or a bit of dried squash.

Once Imperial Valley was such a dry, blistering barrier that immigrants wanted Uncle Sam to turn the Colorado River into Salton Sink and make a big lake; so they could sail the rest of the way to California's beckoning hills!

In early days, an old cowman told me, he started to drive his cattle from Yuma west across the Imperial Valley, to a place called Campo. Days of hot winds came, and dust storms; some cattle stampeded, and, in the dark, choking Mexican cowboys lost the trail. More wind, more dust, till one after another his weary, scattered animals lay down. . . . Then a dawn broke, clear and calm, and showed most of his herd flat on sandy wastes; some were dead and stiff, each under its own mound of dust.

Now Imperial Valley, with adjacent Coachella, is a sea of verdure. It ships vegetables and melons by the trainload, and holds the homes of 75,000 to 100,000 people. Here are vast date groves, too, "their feet in water and their heads in Hell"—which is the Arab's way of saying that a date palm must have plenty of both water and heat. From Africa and the Near East came the parents of these trees which now yield millions of pounds of fruit in a region where once white explorers starved and Indians lived on rattlesnakes and jack rabbits.

Now Salton Sink has become a sea, formed when the flooded Colorado *did* break into it. Here speedboat builders test and race their craft, and overhead planes whiz west for Burbank Field and passengers look down and ask, "What is that? Water?" Just beyond, like an oasis in Arabia, lies opulent Palm Springs; in this desert resort, life is as lush, lazy, and luxurious as Nebuchadnezzar's in Babylon's bawdy days. So crowded it was this season with movie stars, drygoods kings, distillers, and sundry mink-and-monocle groups, that all rooms were sold out weeks in advance.

IT TOOK ENGINEERS 40 YEARS TO WHIP THE COLORADO

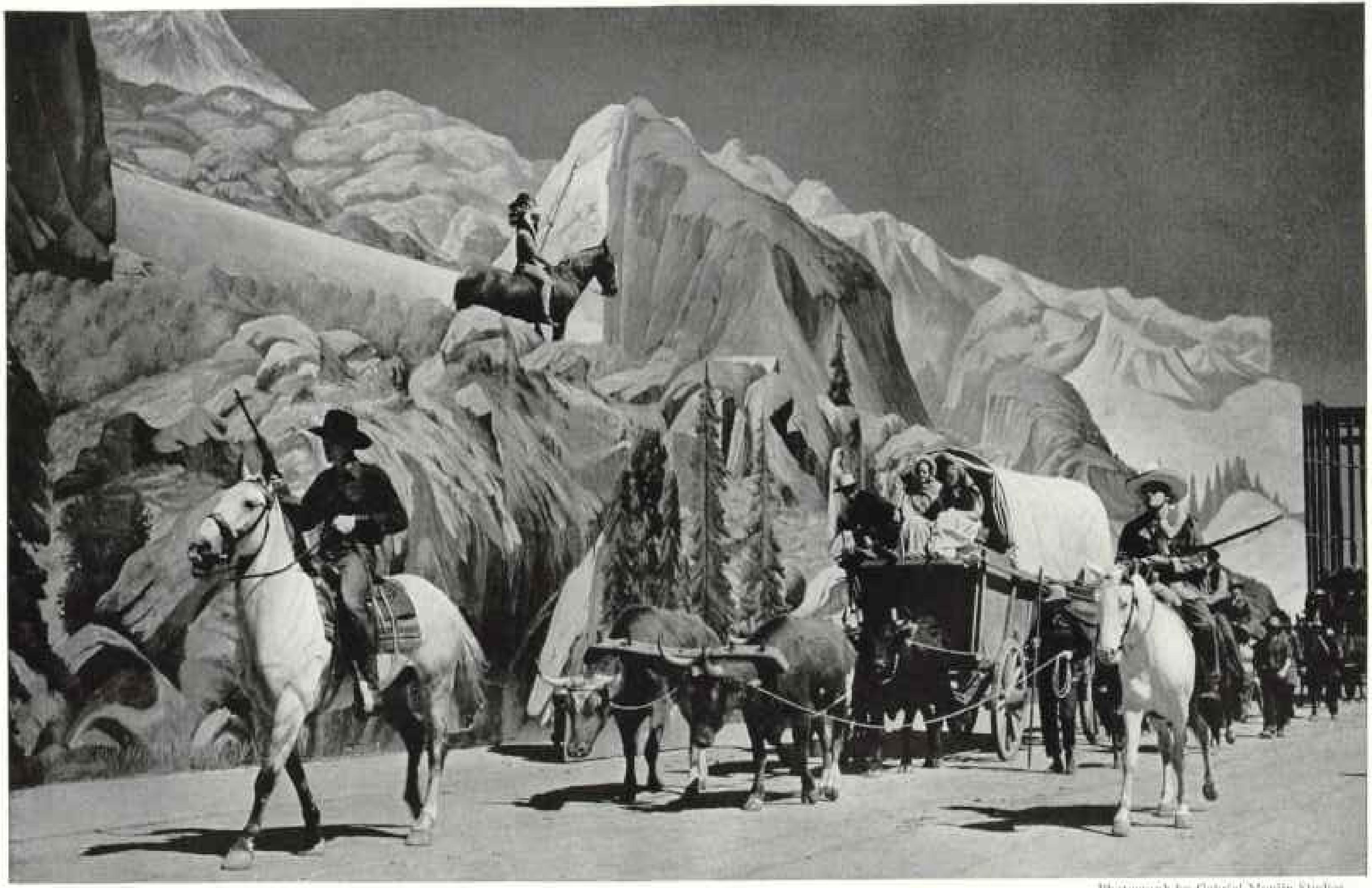
Salvation not only for Imperial Valley, but for most of the 4,000,000 people in southern California, depends now on Boulder Dam—with which man finally shackled the lawless Colorado.

What a truly devilish stream! Often only a bare creek; then in summer floods, a rushing volume of fifty or sixty times that much water. In the 283 miles of its lower gorges, from Marble to the end of Grand Canyon, its banks in places are 6,000 feet high and yet they squeeze the stream into a width of only 60 feet!

No wonder that this mad river proved a barrier to both Spanish and American explorers and dominated the whole history and destiny of the Southwest. For 350 years it was a worse enemy than Indians or waterless wastes to all who tried to invade its domain. "America's most dangerous river" it was long called. Toward its delta it ran wild.

Using silt cut from its canyons, it built for itself a high ridge, along which it still flows toward its mouth in the Gulf of California. This makes it higher than Imperial Valley, which is below sea level. Whenever the river, in flood, would slip off the grade down which it flows, it would sweep into these lowlands, there to cut new channels at frightful speed and drown out the settlers.

Geologists explain that once the Gulf of California extended as far inland as the foot



Photograph by Gabriel Moulin Studios

COVERED-WAGON PIONEERS OF GOLD RUSH DAYS—IN PAGEANTRY—FOR 1940'S GOLDEN GATE EXPOSITION AT SAN FRANCISCO

A mounted Indian lookout spies on the immigrant train as it files cautiously through a hostile mountain pass. This scene is from "America! Cavalcade of a Nation," in which various dramatic episodes trace American history from the arrival of Columbus to the gay nineties.

Photograph by J. Baylor Roberts

SPANIARDS LEFT THIS OXCART AND COAT OF MAIL

Preserved in the museum of the Texas School of Mines and Metallurgy at El Paso are many relics of early days when the Conquistadores held the "Pass of the North." It lies on the old trail between Santa Fe and Mexico City.

Photograph by B. Anthony Stewart

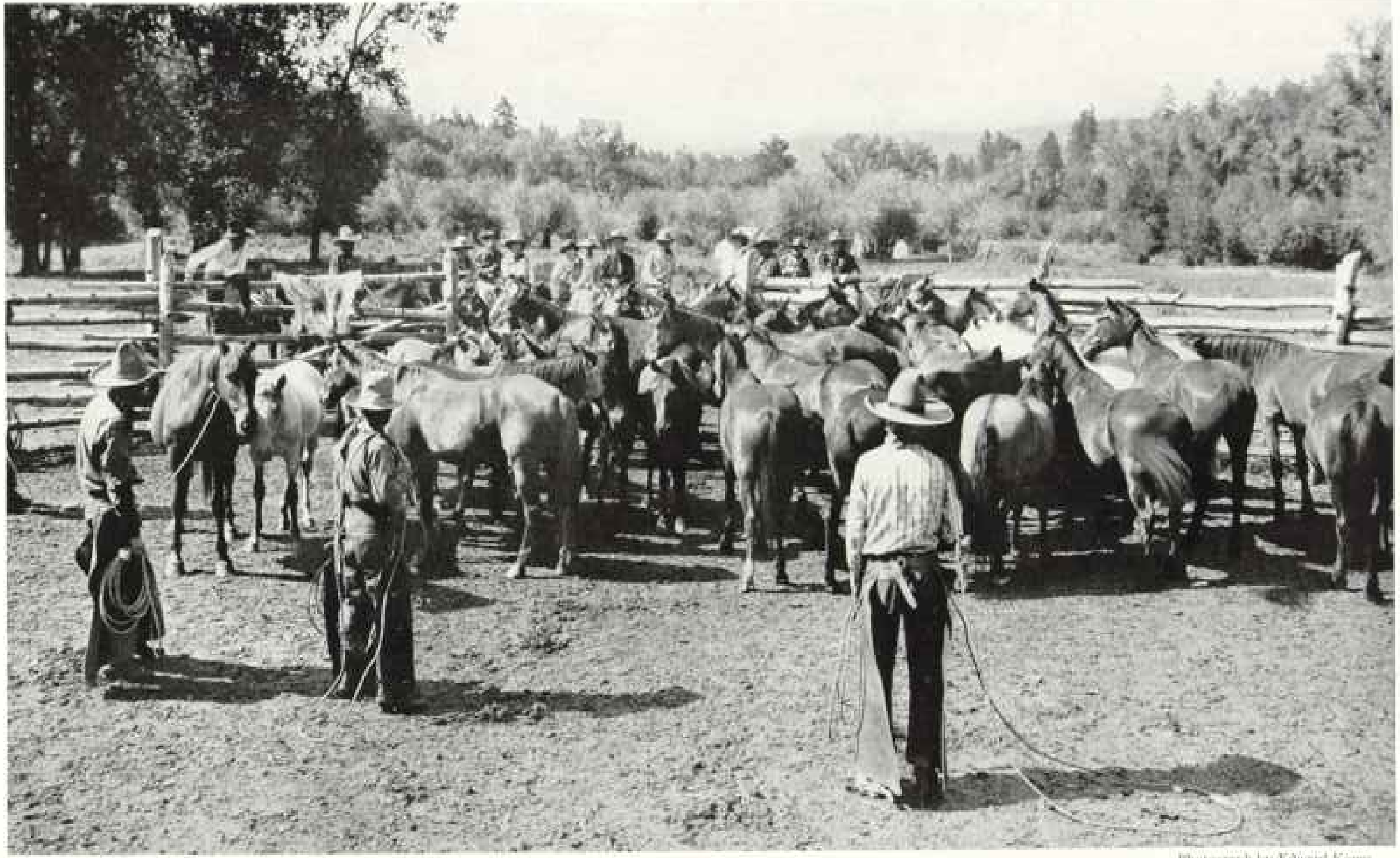
SOME 10-CENT "DIAMOND DICKS" ARE NOW WORTH $100

Robbers and rogues, heroes and horse thieves, fair women and foul fiends, all figured in Far West fiction. Crime was punished and virtue rewarded; but always with gunfire, slaughter, and noble deeds of derring-do.

Photograph courtesy Thomas Boles

MORE THAN 200,000 VISITORS A YEAR COME BY CAR AND BUS TO SEE COLOSSAL CARLSBAD CAVERNS

But for one lone cowboy's curiosity, this New World wonder might still remain unknown. Jim White saw what looked like smoke coming from a hole in the ground; he investigated and found the "smoke" to be a stream of bats—millions of bats. He got a rope, let himself down, and found the world's most beautiful and greatest system of caves. A National Geographic Society expedition led by Willis T. Lee was the first to explore and survey the caverns (page 724).



Photograph by Edward Kemp

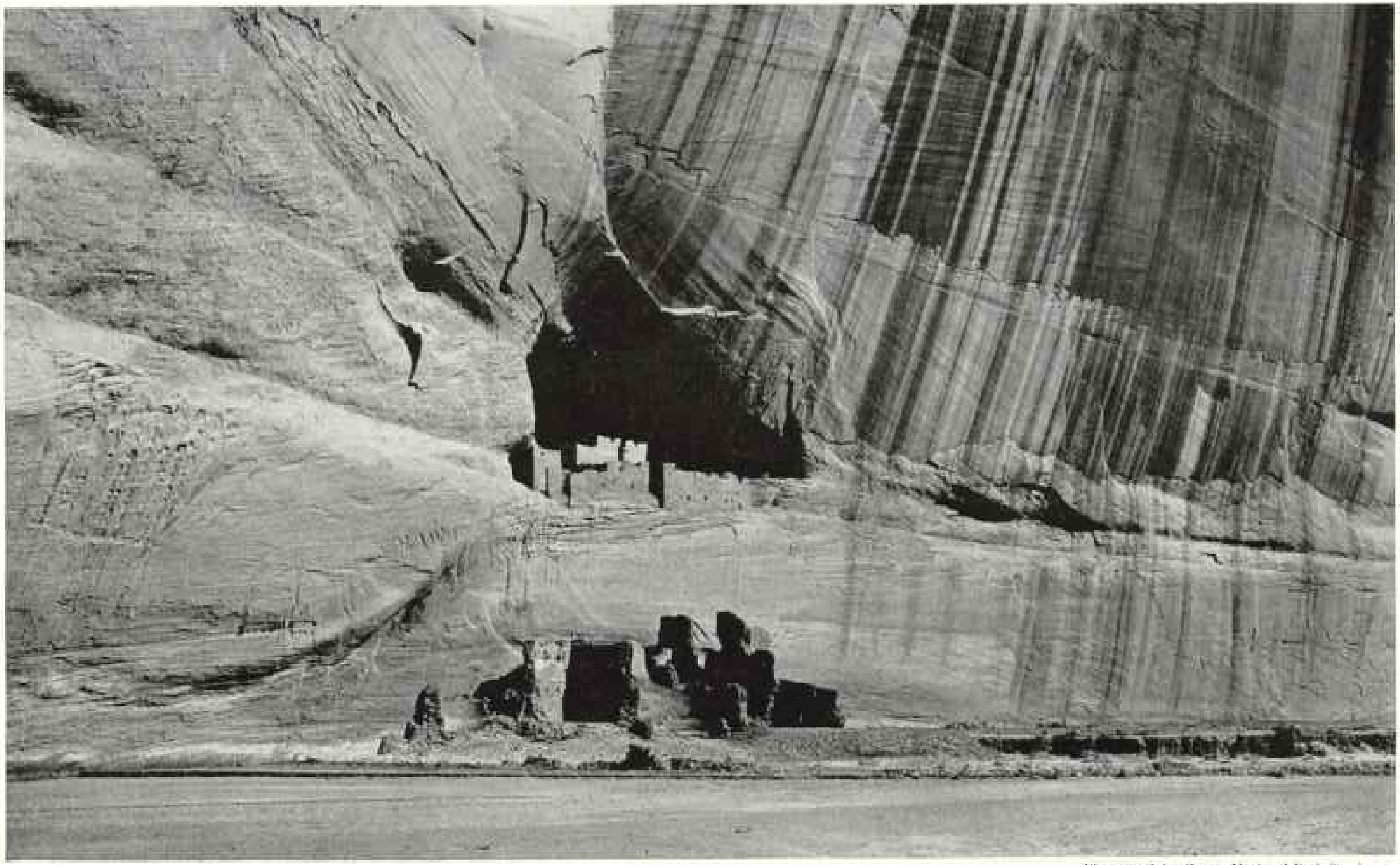
DUDES WAIT OUTSIDE THIS NEW MEXICAN CORRAL WHILE WRANGLERS ROPE THEIR MOUNTS—THE WHOLE WEST GOES HORSE CRAZY

From Montana to the Mexican border countless dude ranches have dusted off Old Dobbin and put him back in the pleasure hunters' picture. Arizona alone has more than 100 equine resorts. More boots, saddles, big hats, and cowboy breeches are sold now than ever in Western history.

Photograph by J. Baylor Roberts

TO PRAIRIE SCHOONER IMMIGRANT TRAINS ON THE SANTA FE TRAIL, WAGON MOUND, NEW MEXICO, WAS A WELCOME LANDMARK

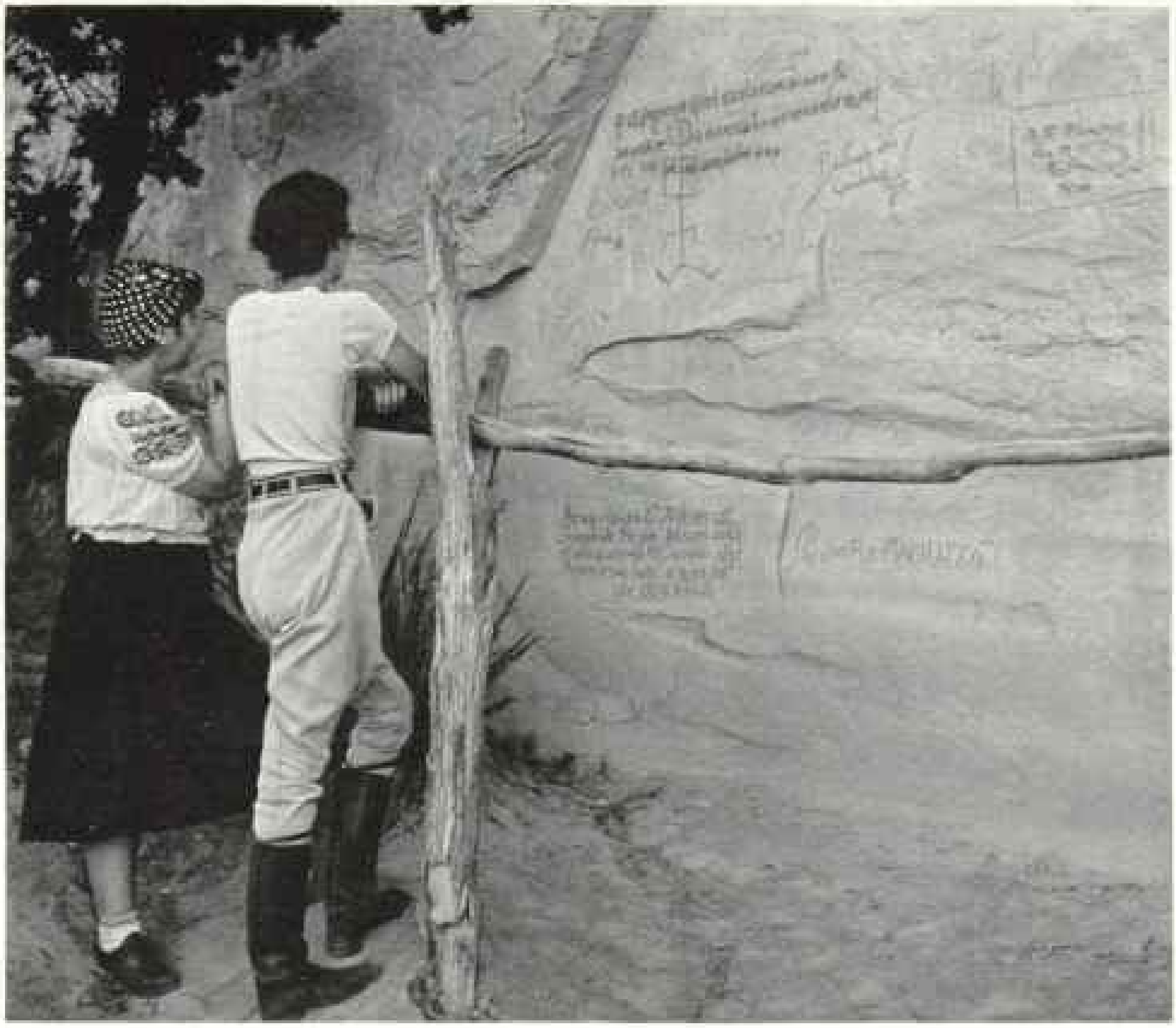
Looming bluish on the horizon 28 miles away, the big butte formed the junction of the "Desert Route" and the "Mountain Route" into Santa Fe, the latter coming south from Bent's Fort, Colorado. It received its name because its silhouette resembles a covered wagon and team seen from a distance.



Photograph by Grant, National Park Service

IN STEEP, SANDSTONE WALLS OF ARIZONA'S CANYON DE CHELLY WIND-CUT NICHES HOLD RUINED CLIFF DWELLINGS

So-called "White House," the upper edifice shown here, is easily reached. Others higher up are inaccessible, but for finger-and-toe holds cut in the rock by ancient Navajos, whose stronghold this was (page 744). In places these cliffs are almost as high as the Empire State Building. In January, 1864, Kit Carson's men corralled some 8,000 Navajos here and took them to a reservation; a few hundred still live in the canyon.



SPANIARDS CUT THEIR NAMES ON THIS NEW MEXICAN CLIFF NEARLY 400 YEARS AGO

"Passed here, 1605," says Oñate's message. De Vargas was here too, and many other pioneering Spaniards. Officially this Inscription Rock or "stone autograph album" is known as El Morro National Monument. It stands some 40 miles south of Gallup, New Mexico. In Gold Rush days, many passing American adventurers cut their names here; sometimes easterners come and scan all these names, looking for a clue to some relative who long ago disappeared "out west" (page 736).

of San Jacinto Peak, in California; and that the "Salton Sink" was formed when the Colorado River spilt enough silt around its mouth to form a dam. This cut off an inland body of salt water that finally evaporated and left a below-sea-level valley.

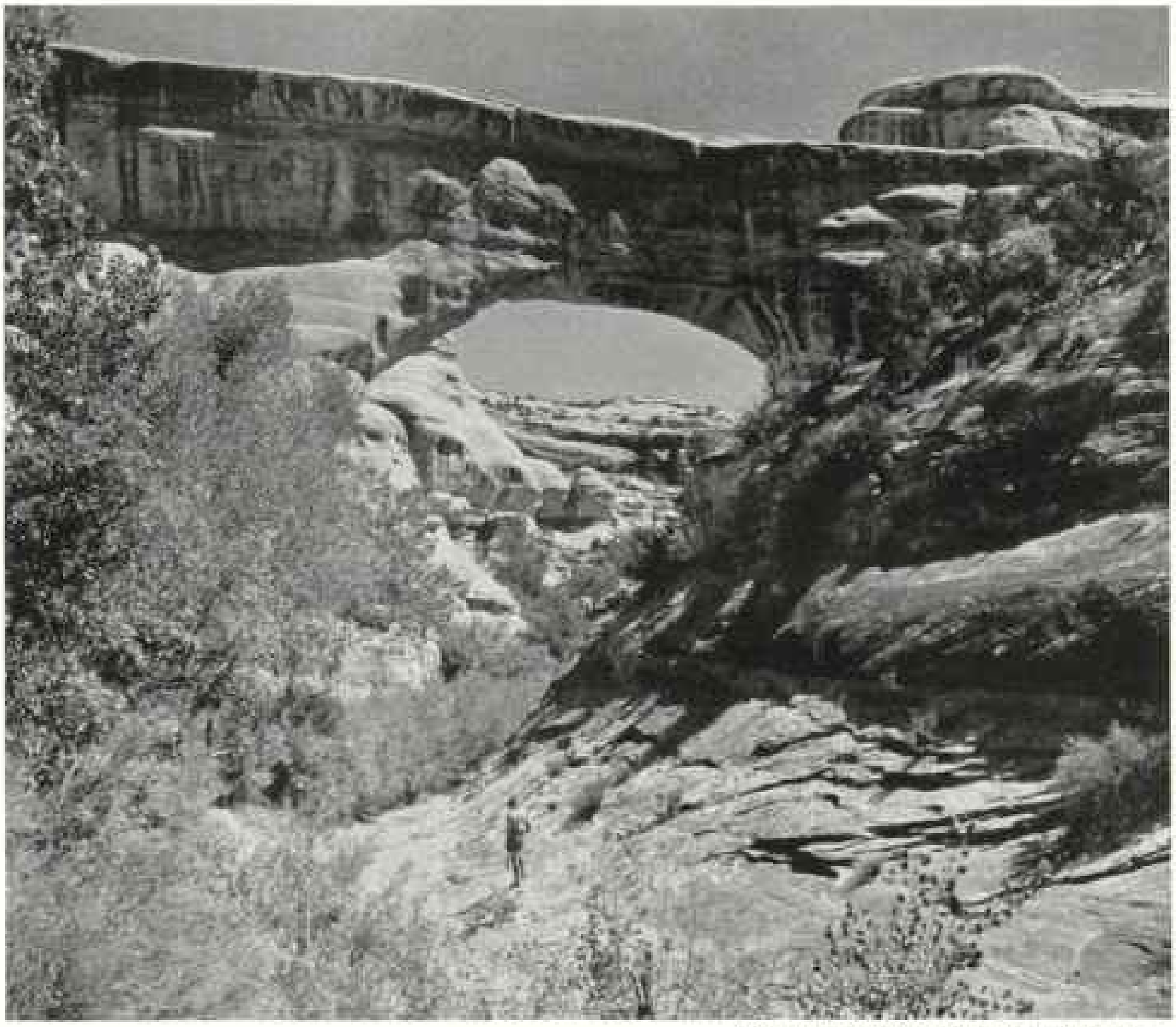
Now with Boulder Dam and all its water tunnels and spillways for regulating river flow, no floods can happen again. From the lower end of Grand Canyon to the river's mouth, 565 miles downstream, the dam completely tames this long, dangerous river; besides giving water to irrigate farms around Palo Verde, Yuma, and Imperial Valleys, the river now also sends water through mountain tunnels and giant aqueducts to Los Angeles and other cities 250 miles to the west (page 754).

Today land and sky lanes bring visitors from everywhere to see Boulder Dam and to ride on its artificial Lake Mead.

Imagine what it means to arid Death Valley, Nevada, Utah, and Arizona, suddenly to find themselves next door to a deep fresh-water lake 115 miles long, a lake already full of fish, rapidly filling with pleasure craft and beach resorts, and drawing free-spending guests at the rate of 600,000 or 700,000 a year!

"Even the cowboys," said one wag, "are trading their ponies for powerboats. They've traded lassos for fishing tackle and practice casting by 'plugging' at jack rabbits."

Spaniards named "Colorado" River because it was so colored with red mud. A dam site wisecrack is that "It's too thin to plow and too thick to drink."



Photograph by Grant, National Park Service

SIPAPU BRIDGE, SCULPTURED FROM UTAH ROCKS BY WIND-SHOT SANDS

In the Hopi tongue Sipapu means "Portal of Life." Pueblo Indians believe they ascend to this world through a hole and that death takes them back through that hole to a lower world. So beautifully proportioned is this span in the Natural Bridges National Monument, Utah, that visitors can hardly realize it rises as high as a 22-story building above the stream bed.

Engineers say that every 24 hours mud enough to fill 500,000 one-ton trucks is dumped into this lake by the dirty Colorado. That's 347 truckloads a minute!

From the air you see Lake Mead not as a symmetrical body, like Huron or Erie, but as a series of basins, connected by straits. The 500 miles of barren wastes about its empty shores made me think of the Dead Sea. When the lake began to fill, it drowned out St. Thomas, an old Mormon settlement at the north end of Virgin Basin. Near here, too, it swamped so-called "Lost City," a prehistoric town whose archeological treasures repose now in a museum at Overton, Nevada.

Some sight-seeing planes land on a high, flat-topped mesa near Pierce's Ferry, so much higher than Lake Mead and surrounding country that pilots must climb to get to it! In a canyon near this landing field, National Park geologists found a cave containing several hundred bones, red hair, and wagonloads of dung, all property of the prehistoric ground sloth. He was an herbivorous giant who lived here some 15,000 years ago. In Boulder City's museum you see his shiny bones.

EXPLORING THE WORLD'S MOST POWERFUL HYDROELECTRIC PLANT

More sight-seers come here than visit any other Southwestern area controlled by the National Park Service. Summer is the favorite season.

Exploring the colossal dam itself seems the chief attraction. More than 700,000 are expected to see it this season. First you simply drive on to the dam, park your car, and look. On each side of the canyon,

upstream from the dam, is a spillway. Each, full of water, would float a battleship.

Buy a ticket, get in an elevator, and you drop dizzily down, down through the dam itself to the powerhouse.

It's all so stupendous, says Reg Manning in his *Cartoon Guide of the Boulder Dam Country*, that when you get down to the bottom, "you feel so puny and shrunken you hope an ant will not suddenly appear and step on you. . . . To an insect blown through the radiator, the engine of your car must appear about as impressive as the machinery in the powerhouse."

TEXAS OWNS A PRICELESS LIBRARY OF EARLY SPANISH WRITINGS

Many sight-seers start their explorations at Austin, Texas. Here in the Statehouse is the original letter written by Colonel Travis, asking for reinforcements, just before the Mexican General Santa Anna stormed San Antonio's Alamo and massacred the whole Texas garrison, including Davy Crockett.

Students and writers come here to see the famous Garcia collection in the University Library. It includes a letter written by Cortez to the King of Spain in 1524, and so much romantic writing about adventures in early Texas that Hollywood picture-play authors hunt here for fresh story material.

Here also is that great assembly of books, the Mirabeau Lamar Library of more than 620,000 volumes. It draws scholars from Europe and Latin America.

"Our University's rare book collection," says Librarian Donald Coney, "is built around the Wrenn, Aitken, and Stark collections, and is internationally known, especially in Byron, Shelley, Dickens, Dryden, Pope, and other major writers of the Dryden-Pope period, the drama, and 17th- and 18th-century newspapers. A British scholar has said that no one can hope to write authoritatively on the scope of English literature without coming or sending to Austin for material."

Symbol of Texas freedom, the Alamo at San Antonio has become a historical shrine significant throughout the Union. Here 4,000 Mexicans besieged and massacred 187 Texans. But Sam Houston avenged them six weeks later at the Battle of San Jacinto, in that war which freed Texas from Mexico and made it a republic (page 742).

Better to entertain its winter guests, San Antonio is restoring the "Villita," its pioneer Mexican quarter, after the manner of Williamsburg, Virginia. Also, it is making parks along the banks of the San Antonio River, which flows through its business center, and turning it into a Venetian canal, with gondolas and mandolin players. What would Sam Houston or Davy Crockett say to that?

Fine roads lead west from "San Antone"; one skirts the ever-romantic border. You may go by Laredo, if you wish, and watch the long line of motor tourists coming back from Mexico. From here south runs the projected Inter-American Highway, part of the Pan-American system; this section stretches for 5,250 miles through Mexico, Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica to Panama. Much of it is open.

From Laredo lovers of wild life ride up the Rio Grande to famed "Big Bend Country." Lions killing horses; eagles eating goats; last survivors of old-time two-gun men fighting it out now with cow thieves and smugglers along the lonely, canyon-cut international border—a geological cataclysm of mastodon teeth and petrified clams four feet wide, besides botanical curiosities—all belong to mysterious Big Bend.

West through Marathon goes now the open road, through pleasant Alpine city, past a huge herd of tame antelope, across high, rolling Mongolianlike plains, then down into the irrigated Rio Grande Valley again, and so to El Paso. Another international bridge is here, and all the bedlam of Juárez, that Mexican border town where bulls fight, dice roll, and dance halls reek.

212,348 VISITORS WALKED THROUGH CARLSBAD CAVERNS LAST YEAR

For convenience, most Carlsbad sight-seers leave from El Paso, going east past towering Guadalupe Peak.

First introduced to the world by the NATIONAL GEOGRAPHIC MAGAZINE for January, 1924,* these caverns are the largest known subterranean labyrinth.

Jim White, a cowboy, in 1901 saw what he thought was smoke coming out of a hole in the ground. Investigating, he saw the "smoke" was bats. With a rope he let

* See "Visit to Carlsbad Cavern," January, 1924, and "New Discoveries in Carlsbad Cavern," September, 1933, by Willis T. Lee, NATIONAL GEOGRAPHIC MAGAZINE.

Photograph by Chuck Abbott

"MY HORSE WANTS A ROOM AND BATH—AND A PLATE OF OATS"

Arriving from Hollywood for a Wild West show, Montie Montana registers his trick horse "Rex" at a Tucson hotel. To keep from slipping and falling on marble floors in such indoor stunts, the pony wears special rubber shoes. Here, he stands on only one foot.

himself down the hole and found these astounding caverns. Jim is still here, after all these years, still enthralled by the grandeur, fantastic forms, and exquisite coloring of this colossal underground sculpture.

More than a million persons have seen this world wonder since first its story was told. Last season over 200,000 went down the elevators and through some seven miles of mysterious chambers glistening with stalagmites and stalactites. School children come in busloads to look, to wonder, and to sing "Rock of Ages." Lodges meet here, preachers pray, and Rotarians eat lunch (page 718).

North over fine roads that pass ruined churches built 100 years before California missions were begun, you come to Santa Fe. Some visitors go on to Taos, to see its famous art colony, Kit Carson's old home, and one of America's oldest apartment houses.

PARADISE FOR ANTHROPOLOGISTS

The first human voices ever heard in this country echoed in our West when, long ago,

Asian tribes crossed Bering Strait and drifted south.

From their graves, their ruined homes, their pottery and other possessions left here and there, science has slowly built up parts of their story. In various museums these objects are shown, and about them many books have been written. No other section of the United States has yielded so much evidence and information about America's early inhabitants as has the Southwest.

Surviving tribes make the Southwest still of utmost importance to American anthropologists. Here "you can catch your archeology alive," meaning that present-day Indians behave much as their ancestors did centuries ago.

"A trained anthropologist," says Neil M. Judd, of the Smithsonian Institution, "can see right through a modern Pueblo Indian's thin veneer of Caucasian culture. More nomadic tribes, such as the Ute, Apache, and Navajo retain fewer material possessions than the house-building Pueblo; but their social organization, economy, and religion are equally fascinating. Thus study of living Indians helps us recover something of that distant past from which we inherited no written record. Nowhere else, outside our Southwest, do we find this opportunity."

Drawing still more thousands to the Southwest this summer is its celebration of the 400th anniversary of Coronado's march. In magnificent pageantry and folk festivals involving soldiers, priests, immigrants, Indians, horses, this great adventure is being re-enacted. Early in July, 1540, Coronado, sent here by the Viceroy of Mexico to find the Seven Golden Cities of Cibola, had a fight with the Zuñis at Hawikuh. That was the first battle in the Southwest between Europeans and Indians. They nearly killed Coronado, who, of course, found no Golden Cities, but he made an extraordinary march of exploration.

Congress voted funds to help stage this rare spectacle, and celebrations are being held in various cities along Coronado's supposed route.

Striking to visitors coming on it unexpectedly is the Spanish-Pueblo architecture at the University of New Mexico, near Albuquerque. Noted for its beauty and simplicity, it hints at the history and progress of the State.

Visiting architects study with interest the plans and forms of Southwest houses, as developed from Spanish and Pueblo Indian origins. In Santa Fe both private homes and public buildings follow this distinctive style.

Albuquerque, on the natural path for all forms of transcontinental travel, is another scattering point for sight-seers.

White Sands, Colorado's Mesa Verde cliff dwellings, the great Navajo Reservation and its towering Ship Rock, Painted Desert, with Rainbow Bridge beyond, the "Indian Detour" motor trips to Frijoles Canyon, Pueblo Bonito, Aztec, etc., all lure their share of travelers.

There's also Inscription Rock, west of Albuquerque; the road to it is rough going, but this "stone autograph album" is worth the effort. Early Spaniards began cutting their names and messages on it. Later, many American names were added, including some of forty-niner parties who passed here in Gold Rush days. Sometimes people come here hunting names that might be clues to relatives who "went west" long ago and were never heard from (page 722).

THE INDIAN IS STILL "EXHIBIT A"

Every August at Gallup is held an Inter-tribal Indian Ceremonial, in whose races, dances, bucking contests, and other sports the best talent from Hopi, Apache, Navajo, and other tribes takes part. Cameramen and painters say this is by far the Southwest's best Indian show (page 745).

"Apaches Kill L. B. Wooster."

"Indians Attack Stage, Shoot Driver, Kill Horses."

"Riders with Eastern Mail Attacked by Indians Near Sulphur Springs."

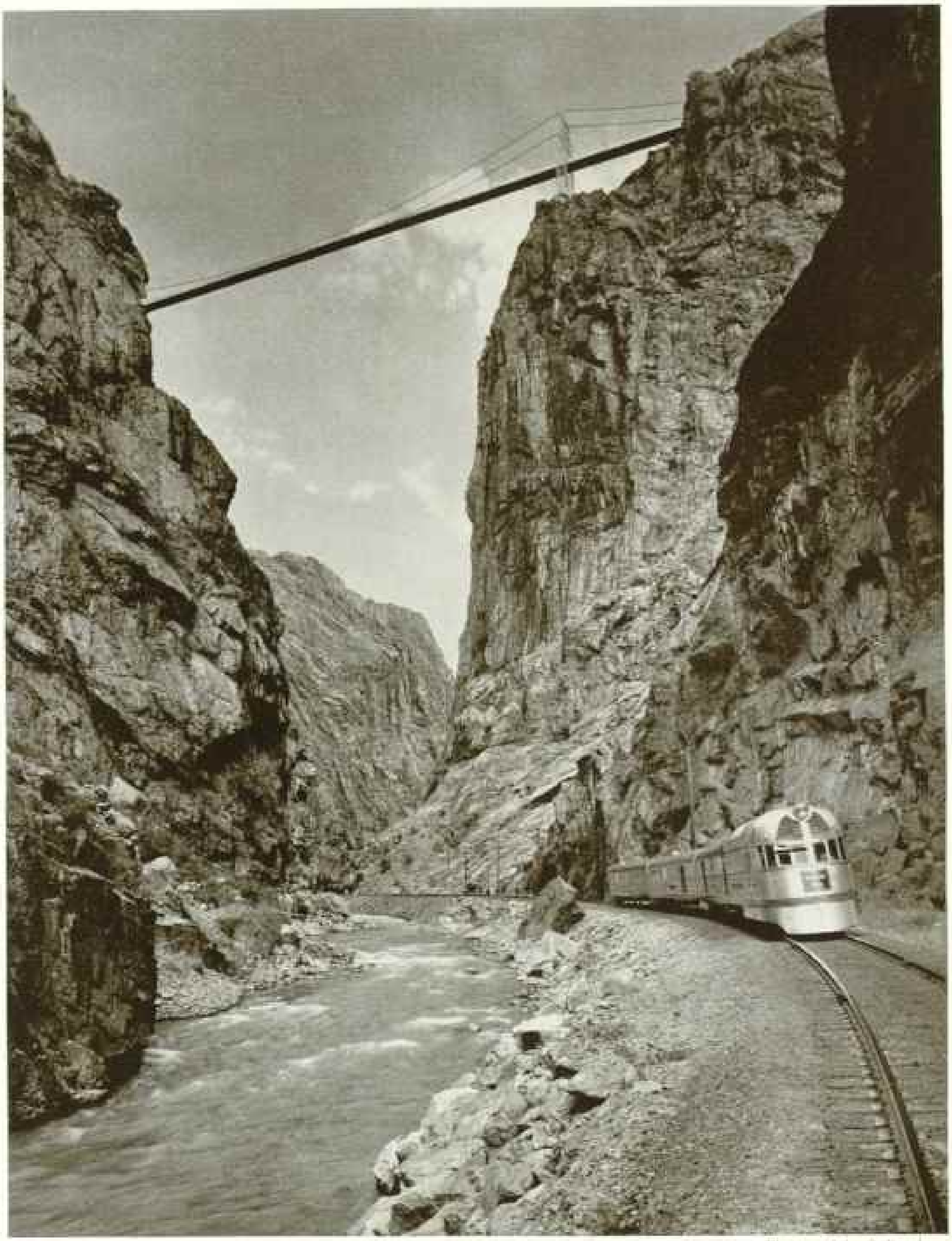
"Army Officers Play Billiards at Fort While Outrages Go On."

"Will Indians Take the Country?"

These scareheads are from the *Tucson Citizen* of 1870. More Indians still live here than in any other part of our country, and they still head the list of tourist attractions. "We sell more picture postcards of Indians than of any other subject," venders tell you.

Guides say the first thing visitors ask about is Indians. "Not alone because some of them eat prairie dogs and worship pagan gods. Indians are just as interesting when they go to Mass and drive Buicks and speak good English.

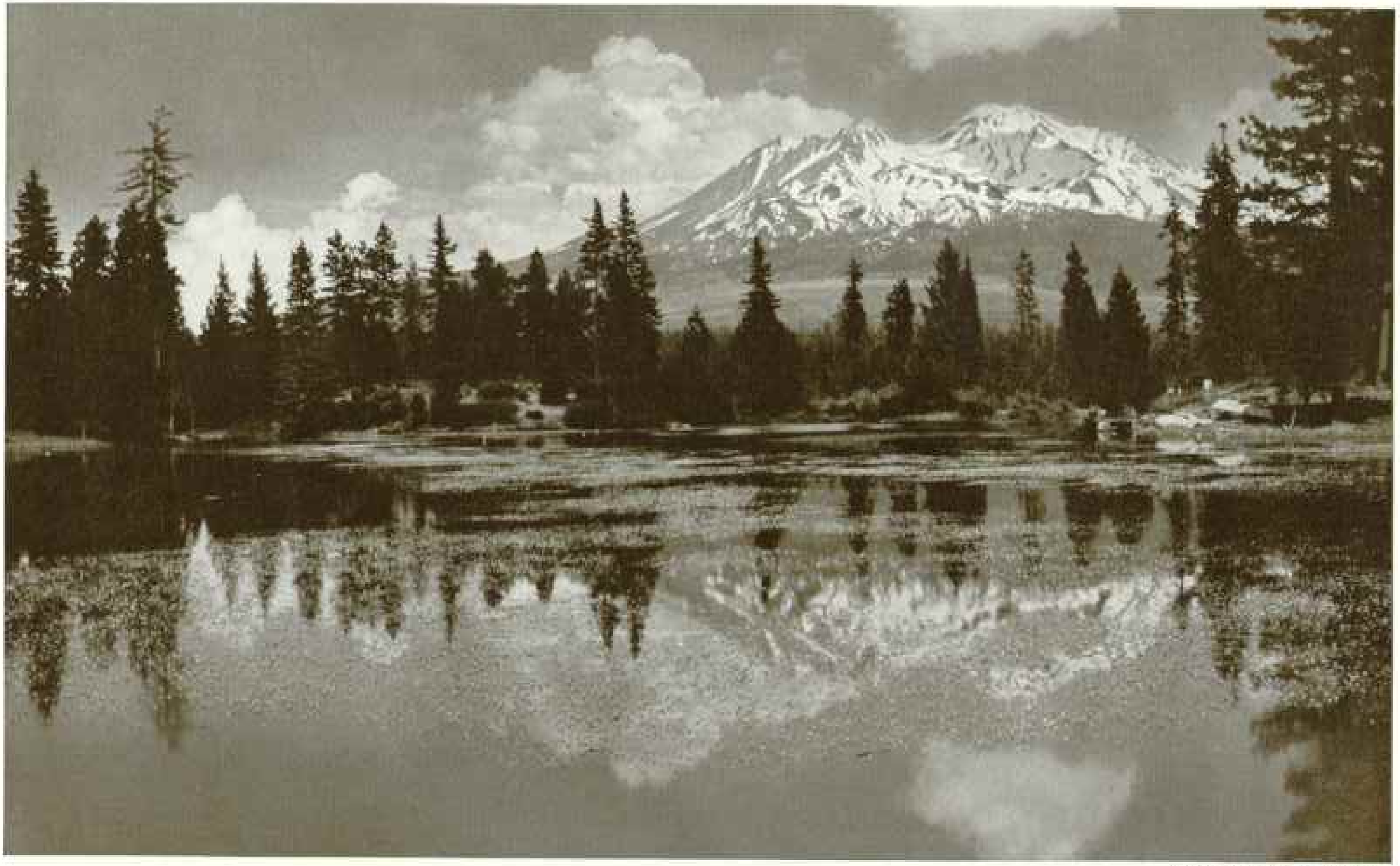
"But a white man never knows what they're thinking; these moderns are just as unpredictable as old Powhatan was in the



Photograph by O. Rouch

THE BURLINGTON'S "PIONEER ZEPHYR" WHIZZES THROUGH COLORADO'S ROYAL GORGE, ON ITS TRANSCONTINENTAL EXHIBITION TOUR IN 1934

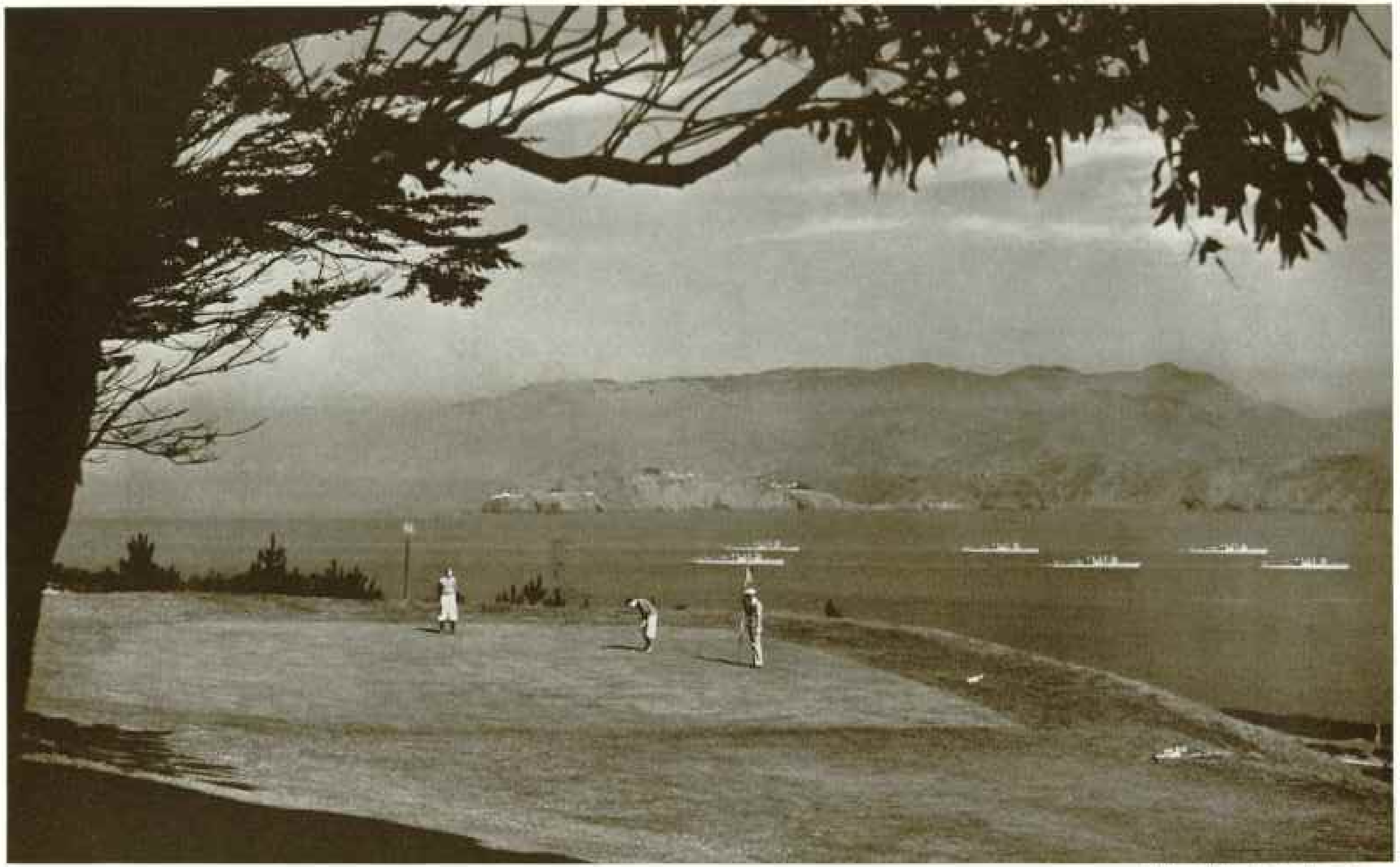
Nature opened an easy way from Denver west toward Salt Lake City when she cut this chasm. Sight-seers on U. S. 50 get a fine view of the gorge from the bridge, which swings 1053 feet above it. The stream is the Arkansas River, at a point near Canon City, Colorado.



Photograph by J. D. Goodrich

"LONELY AS GOD, AND WHITE AS A WINTER MOON, MOUNT SHASTA STARTS UP SUDDEN AND SOLITARY"

So wrote Joaquin Miller of this 14,161-foot peak in northern California, built up by successive volcanic eruptions and sculptured by later glaciers. From its five glaciers and melting snows come scores of springs and one source of the Sacramento River. Shasta is often climbed, and thousands camp each summer on its cool, forested lower slopes.



Photograph from Californians, Inc.

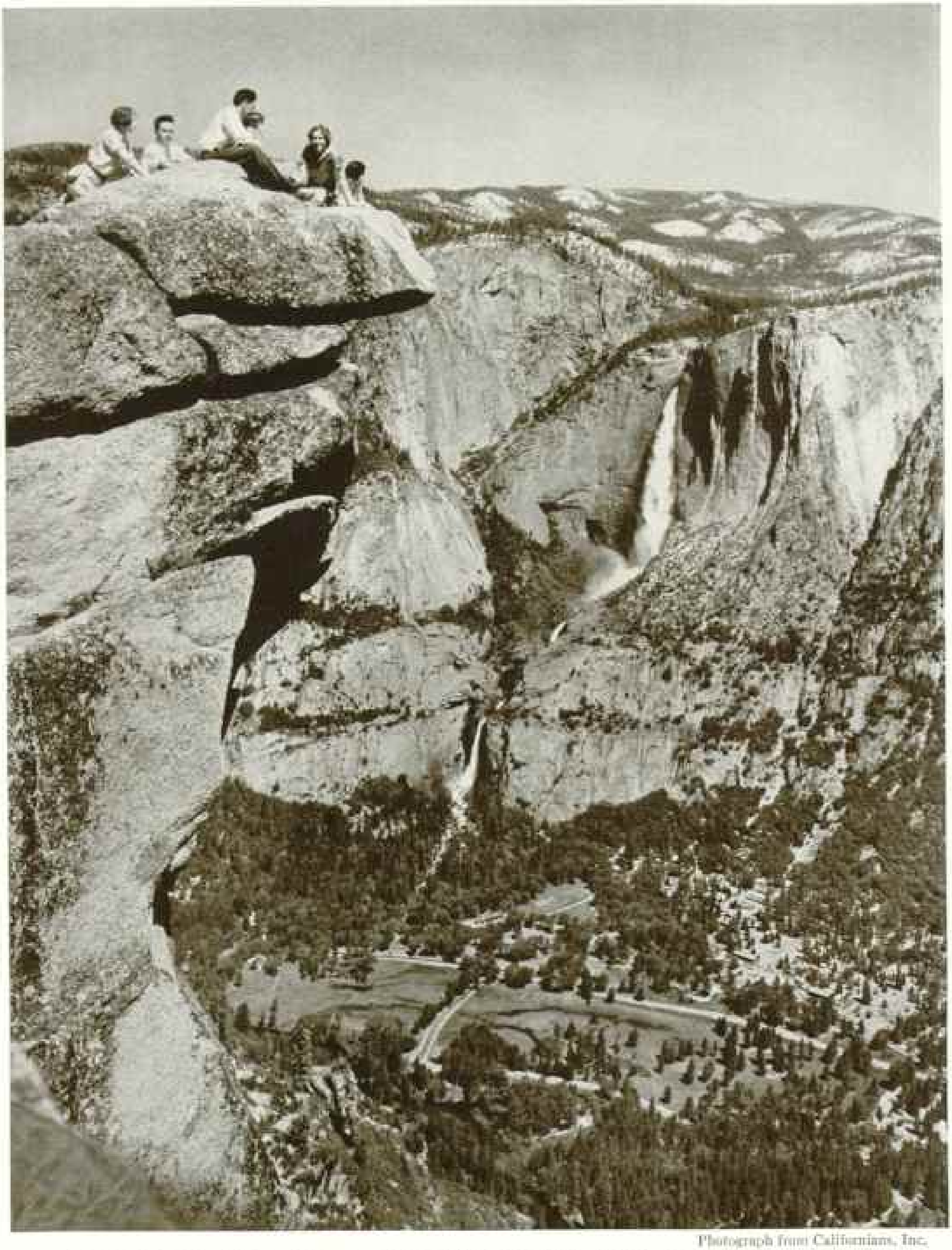
TWO MEN IGNORE SIX U. S. DESTROYERS ENTERING GOLDEN GATE, TO WATCH ANOTHER GOLFER MISS A PUTT!

Laid out in Lincoln Park, this golf course is only a few minutes from San Francisco's downtown hotels. Few links are set in such a scenic environment. The course overlooks eye-filling Golden Gate, with all its passing ships; to the east rises the new Golden Gate Bridge; the Presidio, early military post, is hard by; to the west rolls the boundless Pacific, while just across the swirling, misty-blue Gate is old Fort Baker and the far-tumbling hills of Marin County.

Photograph by J. Baylor Roberts

THEATRICAL AS A SCENE PAINTER'S DREAM, PALM SPRINGS OASIS SILHOUETTES ITSELF AGAINST A DESERT BACKDROP

This luxurious California winter resort is a striking example of how science turns dry wastes into green gardens. To the same wilderness where once pioneers cursed as they died of thirst, moderns return now and pay dizzy rates to enjoy the heat that killed the thirsty immigrants.



Photograph from Californians, Inc.

FROM GLACIER POINT, VISITORS LOOK DOWN ON THE ABYSMAL BEAUTY OF YOSEMITE VALLEY 3,254 FEET BELOW

Yosemite Falls tumbles nearly half a mile down to the Merced River. One of the oldest of all western playgrounds, the valley draws enormous crowds. In recent years, with the increasing popularity of snow sports, a new tide of winter travel has set in.

Photograph courtesy Transcontinental and Western Air

DEATH VALLEY VISITORS EXPLORE THAT ROUGH, ROCKY PATCH, "THE DEVIL'S GOLF COURSE"

Though good roads for sight-seers have been built into this strange, below-sea-level, chemical wilderness, much of its salt-bed floor is still almost impassable. Here are found rocks from nearly all major divisions of geologic time, as well as fossils and footprints of prehistoric animals. Near by are silent, ruined ghost towns, once rough and rowdy. Here, too, linger a few old "mule skinners" who drove the 20-mule-team borax wagons when that now-transplanted industry was at its peak.

© Spence Air Photos

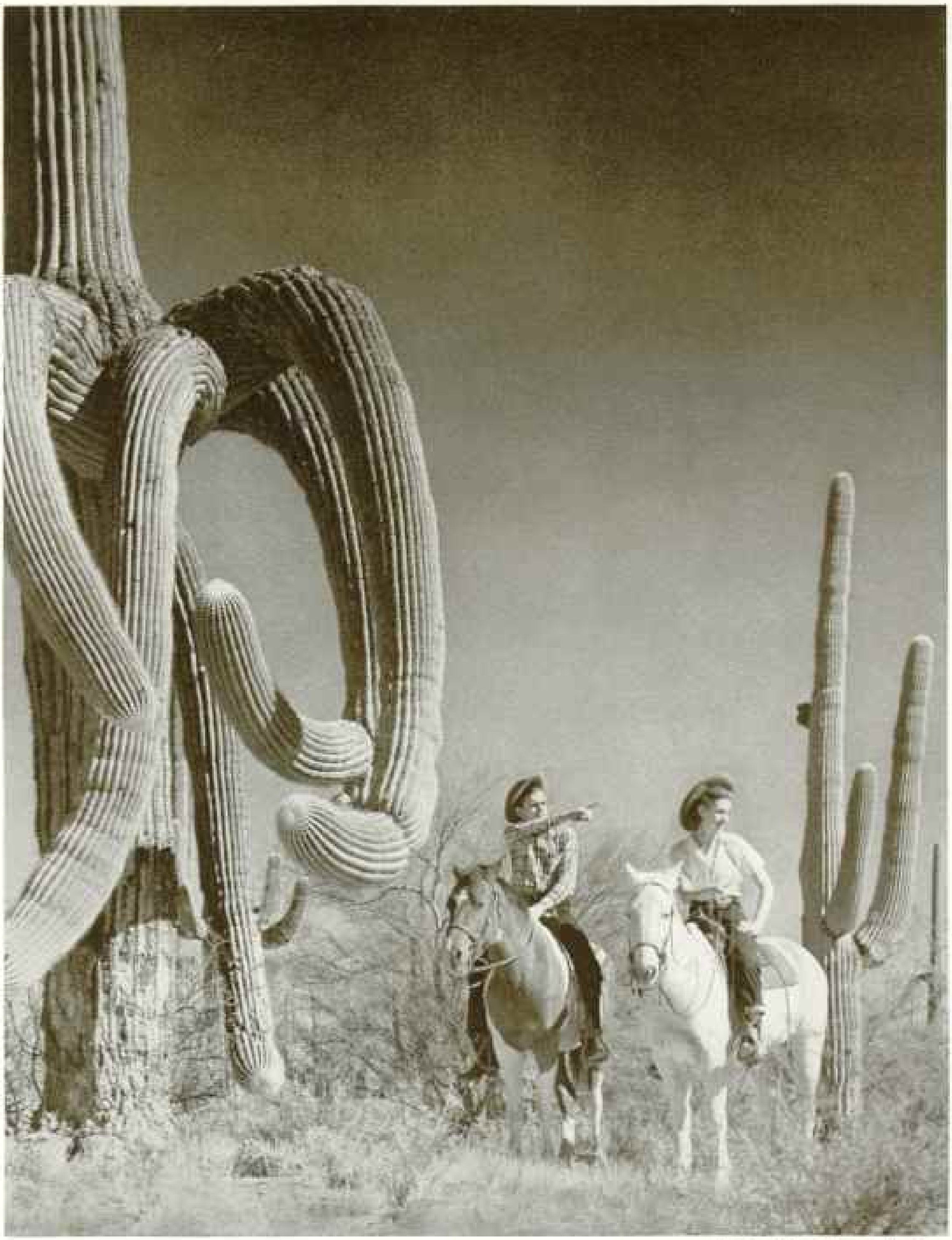
YOU SEE EXACTLY HOW GREAT BOULDER DAM WORKS, IN THIS PICTURE MADE BEFORE LAKE MEAD WAS FILLED (SEE PAGE 762)

Four windowed towers, standing in the lake, are intakes. They divert water to the powerhouse below the dam. If the lake should become too full, its overflow would escape through giant spillways (right and left). Squirting streams show big valves being tested. The roadway over the dam crest gives wheels their first chance in history to roll between Arizona (left) and Nevada across the Colorado River. Power from Boulder Dam supplies many California cities, including Los Angeles.

Photograph from Padilla Studios

NO MAN IS GREAT ENOUGH TO LOOK IMPORTANT BESIDE A TREE THOUSANDS OF YEARS OLD

Some hoary Sequoias on the west slope of California's high Sierras may be 4,000 years old. They are almost indestructible, and seem never to die. They are so tall, imaginative guides say, that could lions climb to their tops they'd look the size of chipmunks!



Photograph by Esther Henderson

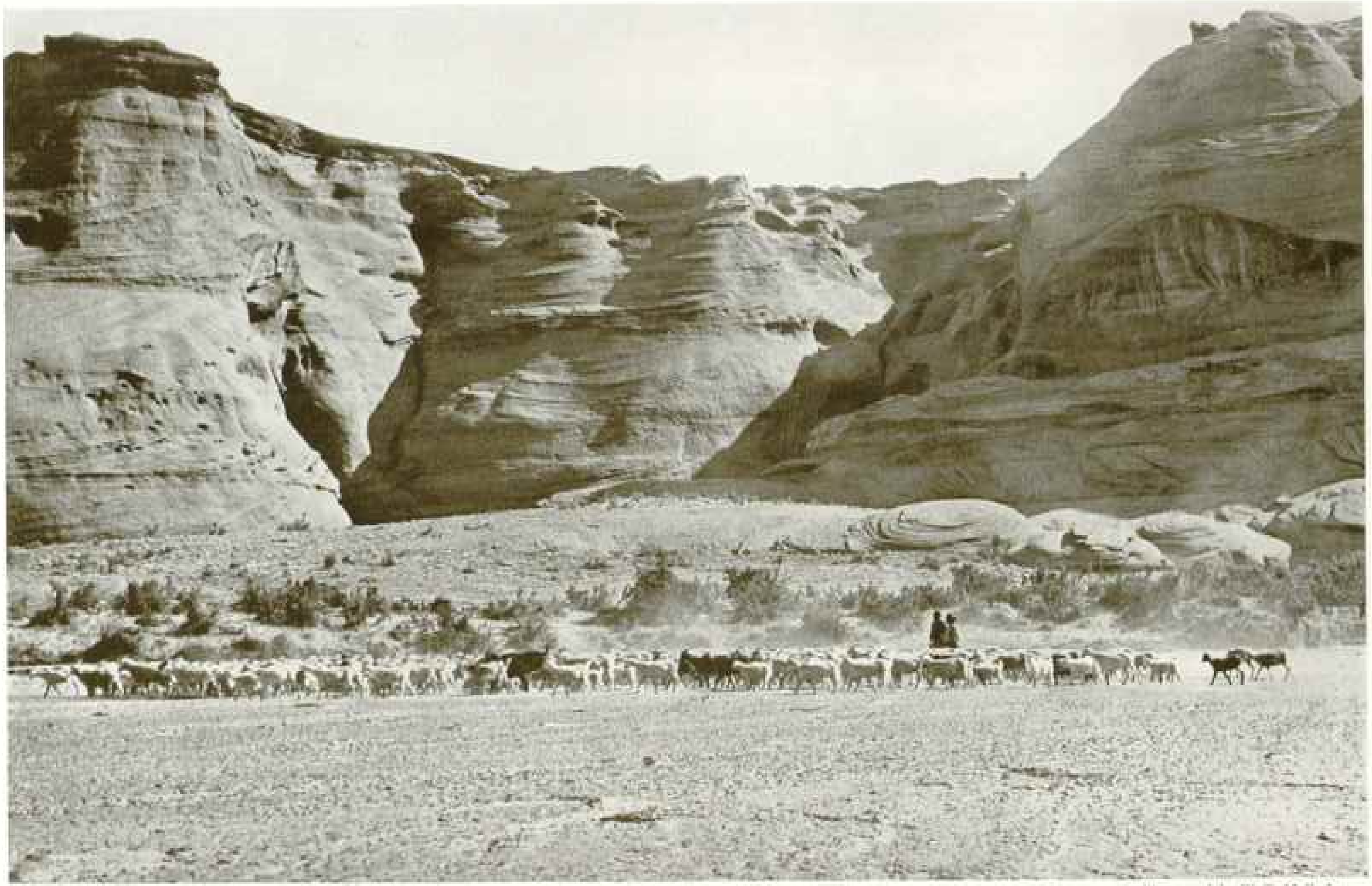
AS IF IN PAIN FROM CRAMPS, THIS CACTUS BENDS LIKE A BIG BOLOGNA

Weird, unnatural-looking, these botanical nightmares rise high above all other Arizona desert life. Woodpeckers dig holes in them, owls nest here, visitors point cameras at them, and, as rare plant curiosities, laws protect them. Near Tucson stand these saguaro cacti.

Photograph by Harry Osborne

WILD HORSES, SEEN IN THE FILM PLAY "STORMY," ARE HERDED THROUGH ARIZONA'S BLUE CANYON IN THE HOPI RESERVATION

Descended from animals imported by Spaniards, or from domesticated stock that strayed from ranches, wild horses by thousands still roam certain western regions. Frightened, a lone mustang "hightails" away from the herd (upper left); others seek to quit the herd by climbing the hill (right center).



Photograph by W. T. Mullarky

ARIZONA'S CLIFFS FORM A WAILING WALL FOR DESPONDENT GOATS BLEATING THE CAPRINE BLUES OVER DROUGHT AND SCANT FOOD

Past wind-worn scars on a cliff face in Canyon de Chelly, Navajos drive their flocks in the long, hard hunt for forage. But what small bites the goats find; how scarce the dry, thorny plants!

Photograph by Branson De Cou from Galloway

NAVAJO SQUAWS AT ZIA, NEW MEXICO, GIVE ONE ANSWER TO "WHAT BECOMES OF ALL THE SECOND-HAND CARS?"

Among many Southwest Indians the swanky motorcar of yesterday becomes the covered wagon of today. Navajos may cling to their own tribal faith, speech, customs, and superstitions, but they like the white man's horseless carriage, firearms, firewater, his sweets and canned fruits.

"AS ONE KID TO ANOTHER, I WISH HE WOULDN'T PICK US UP BY THE BELLY!"

Navajo boys, having no lawns to mow or papers to deliver, must help herd the family goats. Every morning you see these boys—and girls, too—driving their bleating flocks out to forage on hill and desert.

Photographs by B. Armstrong Roberts

BOY OR GIRL BABY? ONLY THE PUEBLO SQUAW COULD SAY AND SHE WOULDN'T TELL

These Pueblos, who built Taos and similar villages, apparently had settled down as town dwellers and developed their own arts and crafts before Navajos and Apaches entered the Southwest.

Photograph by J. Baylor Roberts

INDIANS BEGAN TO WORSHIP GOD AT MISSION SAN XAVIER DEL BAC, ARIZONA, IN 1692

Seen on a bright day through green cottonwoods, against a background of purple hills, this church is regarded as one of the most beautiful of the ecclesiastical structures inherited from Spain. Though the mission post itself was founded by that noted Jesuit missionary-explorer, Father Eusebio Kino, the present building was not begun until 1782. It is served now by Franciscans, whose congregation is mostly Papago Indians. The church shelters rare old paintings and figures of the saints.

AS IF FIRED BY ENEMIES ON ANOTHER WORLD, A METEOR SHOT THIS HOLE IN ARIZONA'S FACE, 20 MILES WEST OF WINSLOW

From rim to rim Meteor Crater measures four-fifths of a mile, and is 570 feet deep. When the meteor struck, millions of tons of stone were pulverized and splashed out, forming the many mounds about the crater's rim. Fragments excavated often contain 93 per cent iron, as well as nickel, carbon, cobalt, sulphur, silicon, and phosphorus.

Photograph by J. Baylor Roberts

TEXANS "REMEMBER THE ALAMO," WHERE MEXICANS SLEW ITS 187 HEROIC DEFENDERS

Standing at San Antonio in the shadow of the new Medical Arts Building, the Alamo, with its museum, is the shrine of all patriotic Texans. Here, in 1836, when Texas was fighting Mexico for its freedom, General Santa Anna and 4,000 Mexicans stormed the Alamo, killing Davy Crockett, William B. Travis, James Bowie—after whom the "bowie knife" was named—and 184 other Americans.

days of Captain John Smith. Even those who speak English often pretend not to understand a word. Others pretend to be camera shy until you offer them a dollar. They've learned at least that much from the whites. But they don't like that electric eye set in a roadside post to count passing vehicles. They pull their ponies way around it!"

Indian schools abound across this Southwest. I've seen them, from Haskell, in Kansas, to California, and often wonder what becomes of all the Indian girls who learn to paint and the boys who study printing or electricity. Southwest shops overflow with Navajo jewelry, and curio stores encourage mass production of pottery, dolls, and flimsy bows and arrows. But you look in vain to see an Indian school graduate holding any good job in competition with skilled whites. I asked why.

"Because the whites won't hire us," said an Indian boy from a Government school.

White visitors flock to see Indians do a Buffalo or Corn Dance, or dance with snakes in their mouths. In contrast, Indian children flock to white men's movies to see painted white men playing Indian!

INDIANS AT A WILD WEST MOVIE

In a Gallup movie I saw this: Indian schoolboys and girls whose granddads slew and scalped the immigrant, burned his covered wagon, stole his team and kidnapped his wife, watched a Wild West screen drama whereon much of such history was being re-enacted. Painted white men took the part of Apache or Comanche warriors. Smashing climax, true to form, showed U. S. cavalry dashing up in the nick of time, waving their flag and driving off the Indians.

The real show to me was the Indian children in the movie audience; they, too, yelled and stamped whenever a screen Indian fell off his horse and rolled dead in the dust!

Gallup itself, though set on the main cross-country routes, is always full of Indians and Mexicans. It has a Spanish newspaper, Spanish "talkies," and some of its Mexican miners have even been known to try to vote here for their favorite current candidate for President of Mexico! For many, all over the Southwest, Spanish is still the common tongue. Their speech, songs, dances, manners, traditions—even the very ropes and saddles they use—all reveal the survival of Spanish influence.

You don't go to Mount Vernon to see George Washington. What you see there is his tracks; his works; what he left. Spaniards left their tracks, words, and works all over the Southwest.

No power draws more teachers, painters, historians, architects, and writers to this Southwest than do these still visible marks of Spanish occupation.

SPAIN LEFT DEEP TRACKS ALL ACROSS THE SOUTHWEST

From San Antonio and El Paso to Monterey and San Francisco the map is plastered with Spanish names. In fact, 95 percent or more of all Southwest place names are of Spanish origin. These Spanish settlers contributed not only to our arts, architecture, music, speech, and religion, but also to our stock of plants and domestic animals, and to our ways of work and life.

Writing in *Agricultural History*, in 1929, Dr. Arthur P. Whitaker points out that if we only knew how hard Spain worked to transplant her crops, fruit trees, and domestic animals to our shores, we would form "a juster idea of the nature and value of the Spanish régime in America."

Scholars know the facts, he says, but people generally are still under the misconception that the Conquest was either one big romantic adventure, with no bread-and-butter aspects; or else that it was just a period when "merciless tyrants, bigoted inquisitors, and insatiable gold hunters" waded in blood to burn and plunder, and gave nothing in return.

By royal order, as early as 1532, no ship could leave Spain for America without bringing along seeds, plants, and domestic animals. Some ships even brought Spanish cats, which made the New World safe for agriculture "by ending the insolent domination of the ubiquitous rat."

"Just what animals did the Spaniards bring us?" I put that question to our Department of Agriculture, and it answered:

"Horses, cattle, sheep, goats, pigs, burros, cats, and dogs, into the Southwest. The American Indian already had the dog as a domesticated animal, and it is not clear as to which types the Spaniards brought." They also brought chickens.

We have no exact list of all plants introduced by the Spaniards. However, judging from gardens and farms left about old missions, these seem to have included figs, oranges, pears, olives, wheat, and sugar cane, as well as certain grapes and melons,

Photograph by John Edwin Hogg

GOING HOME THE HARD WAY—CANYON DE CHELLY

By finger-and-toe holds, Navajos climbed to their cliff dwellings. Describing the Indians in near-by Canyon del Muerto, Captain Albert Pfeiffer, Kit Carson's aide, reported: "They were enabled to jump about on the ledges like mountain cats, halloing at me, swearing and cursing and threatening vengeance on my command in every variety of Spanish. A couple of shots . . . gave me a safe passage through this celebrated Gibraltar of Navajodom" (page 721).

and many weeds. "The padres had green hands," Mexicans say; all they planted grew.

Lately, old adobe bricks, made of straw and mud, taken from Spanish-built houses and walls and soaked in water, have been analyzed as a source of news as to plant introduction. In them seeds and stems are well preserved.

Eventually the Spaniards succeeded in bringing us their whole system of farming and stock raising.

At first, when the conquerors came, there was a struggle to see if the priest might baptize the Indian before the Indian killed the priest. Once they had converted him, the Spaniards were first, by many generations, to try to civilize and develop the Indian as a skilled worker and farmer.

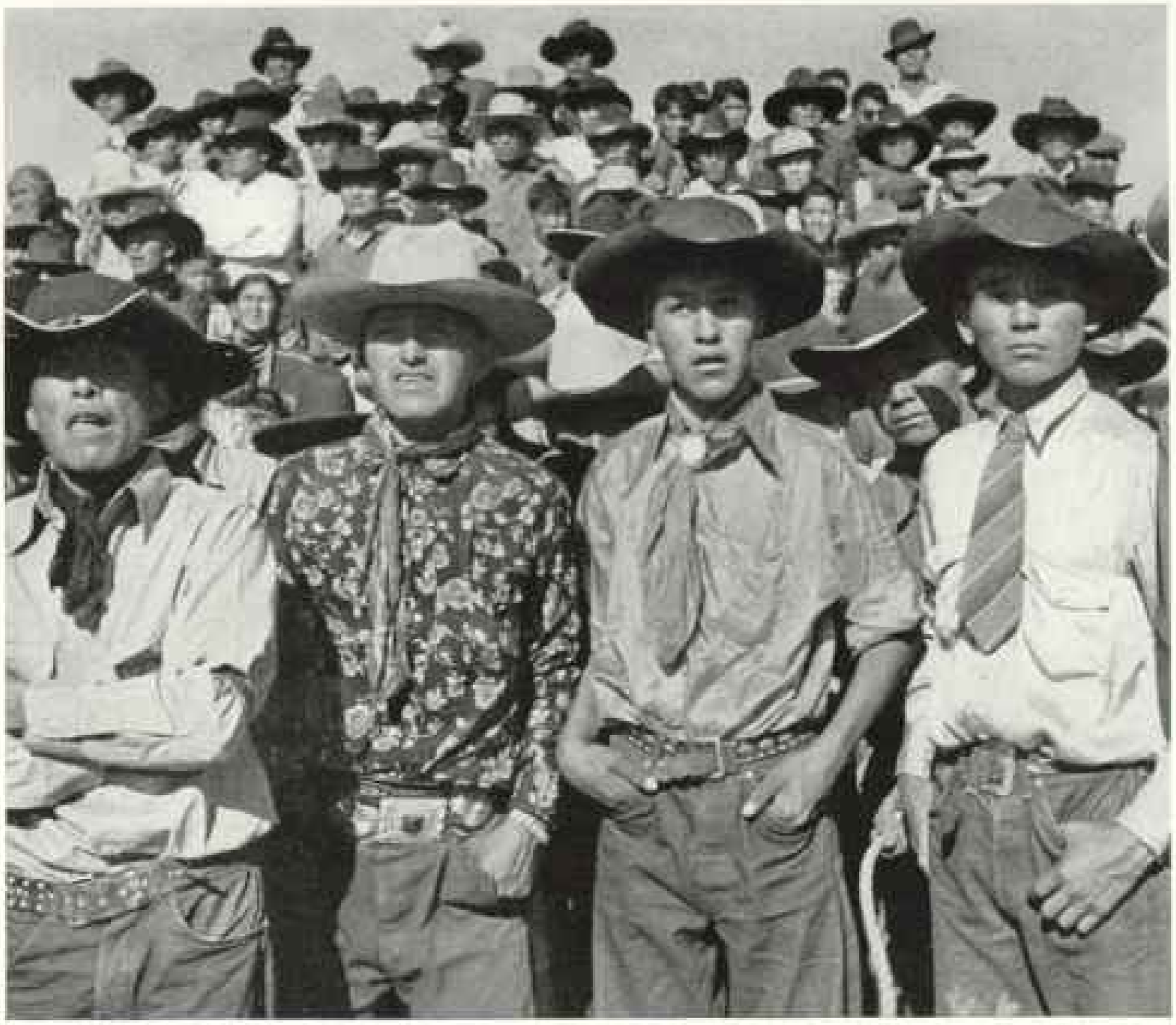
HORSES AND CATTLE FROM SPAIN PROFOUNDLY AFFECTED WAYS OF LIFE

Spain shaped the Southwest's destiny for centuries when she introduced cattle and horses.

Consider first the horse. It speeded up the Indian's economy and changed the whole course of the white man's history. It did to America, then, what the motorcar has done to us in the last 30 years.

Among Indians the horse affected not only tribal organizations and social habits, but it increased a tribe's operating radius, incited predatory war, and enabled the bucks to hunt over new, faraway ranges. Long ago historians coined the phrase "Horse Culture" to describe this new life that Spanish horses brought to the Plains Indians.

On horseback one tribe's culture was easily carried to another. Horse stealing, too, became a regular business—and so did raids on once-too-distant enemies. Comanches, when they got horses, raided as far south as Durango. In Texas' Big Bend they still show you old trails worn by Comanche raiders. They always came south in September, so to this day west Texas people call their September moon the "Comanche moon."



Photograph by André de Dienes

INDIANS WATCH THEIR TRIBAL KIN IN WILD WEST RODEO SPORTS

These boys intently follow a bronco-busting match, hoping fervently that their favorite rider can stick on, and that his rival gets thrown sky-high, at this intertribal fair at Gallup, New Mexico. Except fancy belts, nothing in their costume suggests old-time Indian dress (page 726).

Horses, multiplying amazingly, in time overran parts of the West as loose herds of wild animals. Army officers campaigning against west Texas Indians saw thousands of wild horses, and California became so overrun with them that early American settlers used to shoot them or chase them into the ocean. I myself have gone with Indians on wild horse hunts in Baja California; we would chase them for days, finally roping a few of the better-looking animals from a herd whose forebears may have been running wild for two or three hundred years.

Sometimes the bucks would rope a scrawny, useless horse, then cut off its mane and tail—bone and all—and laugh as the now-ridiculous-looking animal galloped off. Asked why they did this, the Indians said they wanted the hair from manes and tails to plait riatas.

Carloads of mustangs, in my youth, came north to Kansas and Missouri; often the herds were driven through, to save freight. From town to town owners sold these ponies at auction; you might buy one for as low as $2.50—wild as a deer.

RIDING WILD MUSTANGS

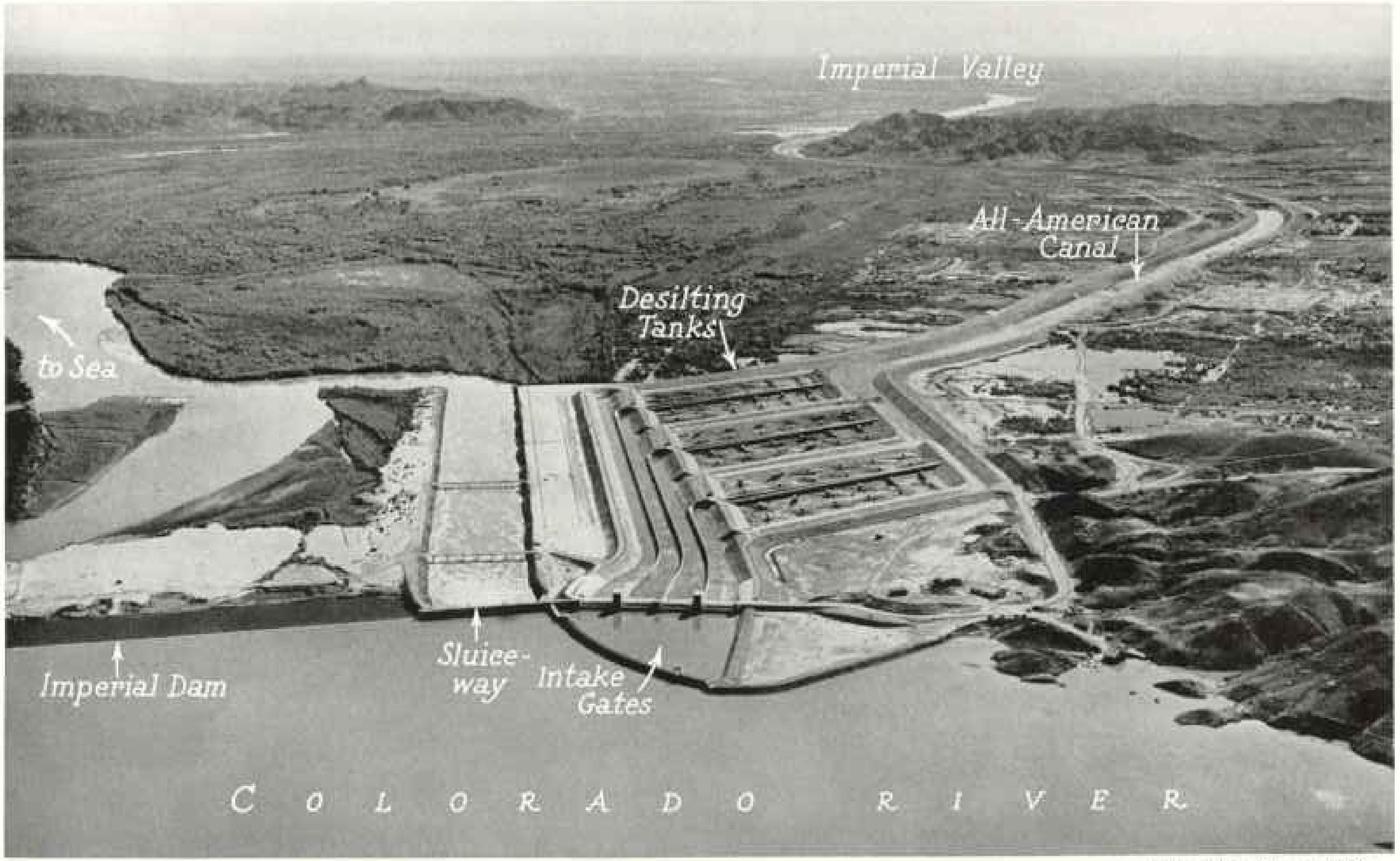
Breaking them to ride was a picnic for us boys. We'd rope one, take him out on some soft, fresh-plowed ground where a fall didn't jar you so hard, and go to it. They had fight in them, too. Since I was 10 I've worn a scar on my face from the kick of an "Indian Territory" mustang.

Spanish horses fathered all these wild herds. In Nevada and elsewhere, stock owners complain, wild horse herds are still a nuisance; they eat up needed grass and lure tame saddle stock to run away with them.

Photograph by O. Roach

HIGH ABOVE ROCKY MOUNTAIN TIMBERLINE MOTORISTS ON COLORADO'S TRAIL RIDGE ROAD LOOK DOWN ON THE CLOUDS

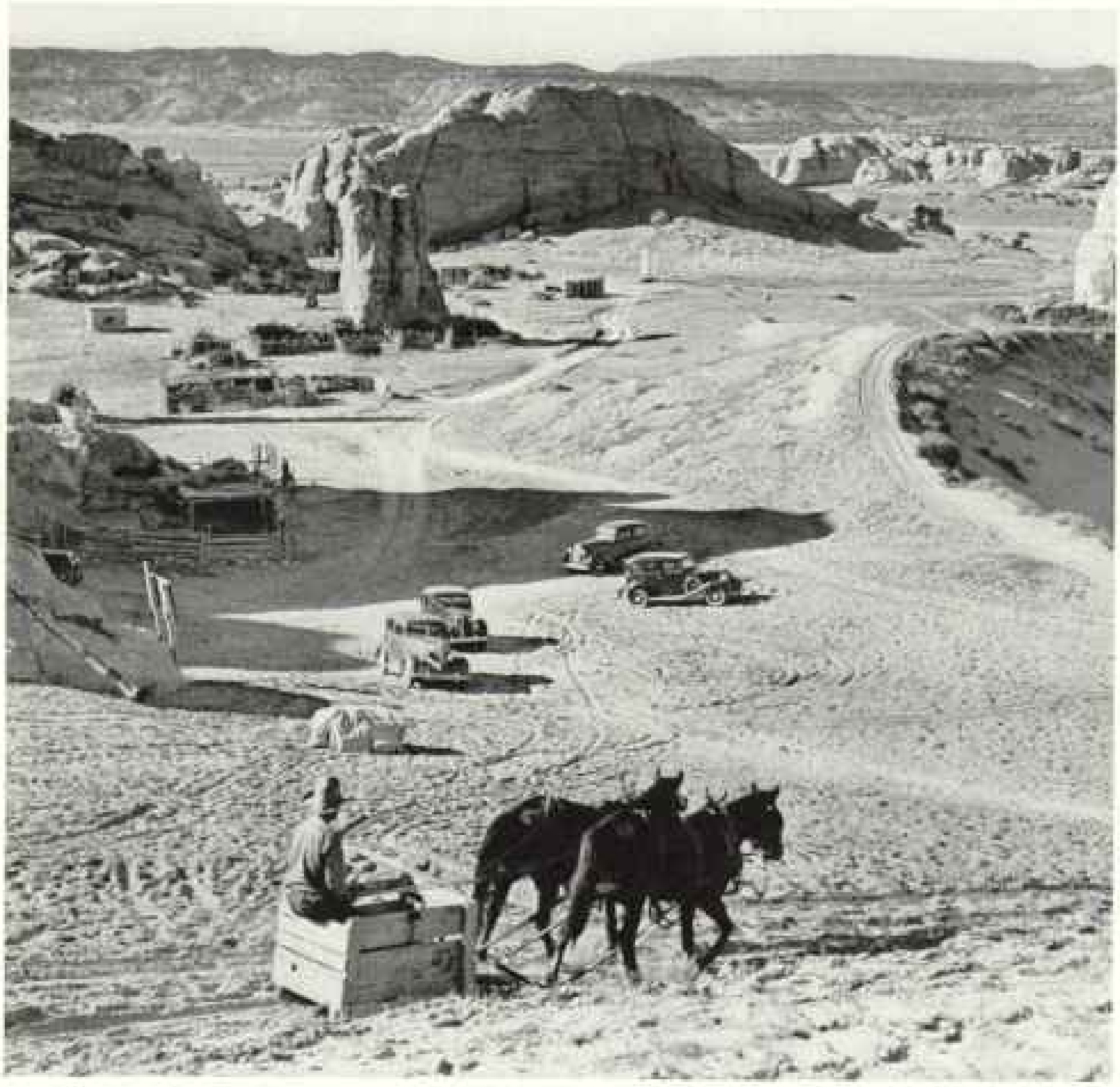
Some 600,000 motorists each year enjoy this scenic "loop" through Rocky Mountain National Park. Twice it crosses the Great Divide. At this point, 60 miles northwest of Denver, near where U. S. 34 joins the east and west slopes of the Divide, the elevation is over 12,000 feet.



Photograph by Spence Air Photos

AT IMPERIAL DAM, ABOVE YUMA, THE MUDDY COLORADO IS "DESILTED" BEFORE WATERING IMPERIAL VALLEY FARMS

To prevent the All-American Canal from becoming clogged with silt, the flow is first cleansed by passing it through the rectangular basins, called desilting tanks. The 72 squat objects seen in the basins are motor-driven scrapers with long revolving arms. These sweep up the deposited mud and draw it into underground pipes. Thence it is dumped into the sluiceway to be washed southward to the Gulf of California.



Photograph by J. Baylor Roberts

WITH CRUDE SAND SLEDS INDIANS HAUL SUPPLIES UP TO ACOMA'S ROCK

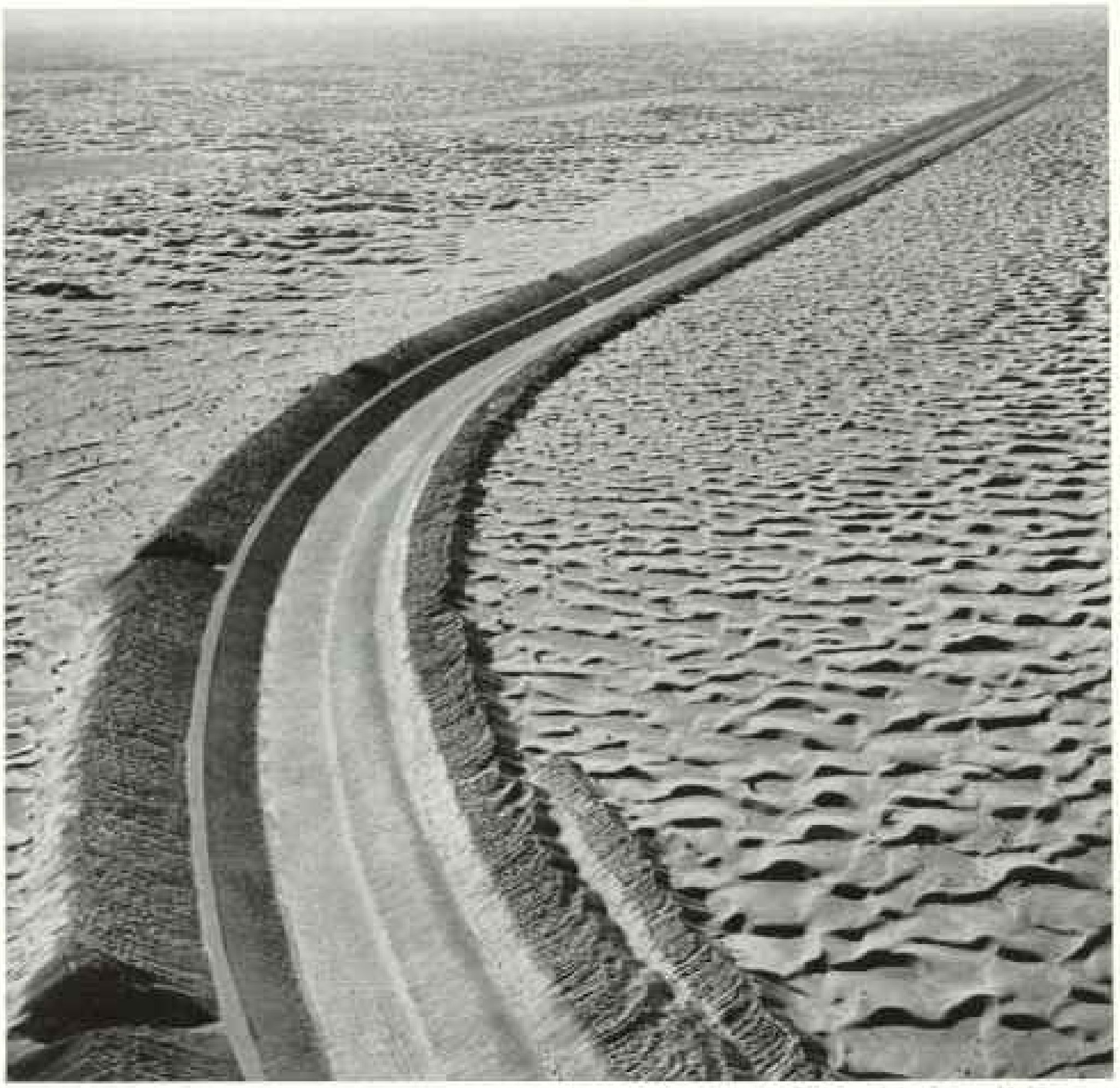
Shadows of the cliff fall across from the left, and parked cars await visitors who climb the sandy trail to the Sky City and its old church. Nothing to eat grows on the dry rock; a tank holds drinking water, but all food must be brought up from far below.

The cattle industry, founded here by Spain, dominated Southwest social and economic life for 300 years, and in many regions it still does. It shaped the whole destiny of Texas; with the Spanish-founded sheep business, it was one main reason for the admission of New Mexico and Colorado to the Union. Cattle driven up the trails also had a lot to do with the settling of Montana and Wyoming.

No animal migration in world history compares with the millions of marching cattle that were driven up the Chisholm Trail to the new railroad towns in Kansas—towns that sprang up as the railway was built. When rails were laid into the Southwest, these cattle began to ride to market.

Dusty, smelly Texas cow trains used to rumble into our home town, where they halted to water the bawling, butting longhorns and to change engines. Atop the stock cars and all over the caboose rode sunburned cowmen, armed with puncher poles; their job was to prod any steer that got down and make him get up off the car floor before other crowding animals trampled him to death. At our town was a "railroad eating house"; into it these tall, lanky cowboys would swarm, to bolt a cup of hot black coffee and exchange bunkhouse banter with a wary waitress.

This cowboy, who started in our Southwest, is without doubt America's best-known fiction character; juvenile European readers



Photograph by Spence Air Photos

STREAKING ACROSS SAND DUNES, THE ALL-AMERICAN CANAL CARRIES LIFE-GIVING WATER TO IMPERIAL AND ADJACENT COACHELLA VALLEYS

This mammoth, man-made ditch, 21 feet deep and 232 feet wide at the water surface, takes off from the Colorado River at the Imperial Dam, above Yuma, and stretches 80 miles across the desert to irrigate 322,000 acres of farms (page 747). The Coachella branch is 130 miles long. The distribution system from the two canals will eventually irrigate about one million acres.

love him. Even in Yokohama and Shanghai you see illustrated Wild West magazines, printed in heathen tongues. Think of the avalanches of books, short stories, and plays, beginning with old-time dime novels, written about this romantic region. From Helen Hunt Jackson's *Ramona* to Zane Grey's thrillers, the book lists alone run into thousands, while movie adventures of Tom Mix, Hoot Gibson, Buck Jones and company mean endless miles of film. If you gave every minute of your waking life to reading and seeing even the current, day-to-day Wild West yarns and movies, you couldn't keep up—nor long endure it!

"This cowboy of song and story was also a gift from the Spaniards," said J. Frank Dobie, Texas author. "*Vaquero* was their word for him; with him we got a whole terminology for the cow business, and in the brush country where I was born cowboys have no exact English equivalents for a lot of such words as rodeo, remuda, corral, chaps, bronco, mustang, chaparral, javelina, etc.

"It's on the cow business, particularly, that the Spaniards left their mark. In no other American industry, not even mining, is there such a survival of Spanish influence. We even got a lot of our laws about land

Photograph by Robert B. Ford

TREED BY DOGS, A MOUNTAIN LIONESS LOOKS COLDLY INTO THE LENS

titles, brands, fences, and water holes straight from the Spaniards."

The dude ranch, curious social phenomenon, involves the psychology of both escape and exhibitionism; it spreads from Montana down to the Mexican border. Arizona alone has more than 100, and draws guests even from London.

DUDE RANCHES DRAW INCREASING THOUSANDS

Look at this dude ranch advertisement: "Finest private rodeo field in the Southwest; sports for guests held five times each season, attended by 2,000 to 3,000 spectators. Informal dancing nightly; billiards; table tennis; concrete tennis courts; rifle and skeet range." They also let you break broncs, rope and brand calves, herd cattle, and take pack-horse trips down into Mexico.

Diversion, in short, may range from flirting about fine swimming pools lit at night by underwater colored lamps, to stiff poker games and stiffer mountain-lion hunting.

At one ranch I visited they even keep a Goodyear blimp, in which guests cruise low over the desert to shoot coyotes!

"Next to copper, our chief source of income is from eastern visitors," said Senator Henry Ashurst, of Arizona. "Best spenders are the dude ranch guests: they buy everything cowboyish, from big hats, boots, overalls, saddles, and blankets to cigarettes and guitar strings. At the Tucson and Phoenix rodeos you see street parades miles long, but not a motor vehicle in sight—just horses. Everybody rides a horse, or rides in a horse-drawn stagecoach or carriage . . . thousands of horses."

More cowboy clothes are sold now than ever in our history. Even school children wear them.

Drygoods stores carry specially designed prints, whose fancy patterns include longhorns, six-shooters, cacti, Indian dolls, ten-gallon hats, horseheads, spurs, saddles, bucking broncos, and other symbols of the "wild and woolly."

Students at the University of Arizona stage their own Wild West show; at roping and riding, some coeds rival professional cowgirls in skill and daring.

"I never dreamed this country could ever go so cowboy crazy," said a veteran puncher.

"Some Brooklyn cowboys dress like cowboys, yet never go near a horse! They just put on their big hats and boots and stick around the city hotels. Toward dark they swarm in the cocktail bars to sing 'Home

on the Range' or 'South of the Border.' They seem to think all us real cowboys do is set around in a silk shirt, play the guitar, and look romantic."

A GUITAR HELPS A HITCHHIKER

Sometimes a whimsical character who does odd jobs about a dude ranch will also pinch-hit as a campfire storyteller. One Death Valley resort has a genius, a cross between Munchausen and Will Rogers. Usually there's a cowboy, too, who sings bovine ballads and strums a guitar.

"I can't play a guitar, but I always carry one," a Texas hitchhiker told me. "Drivers will pick you up quicker if you're carrying a musical instrument than if you just have a suitcase."

Photograph by J. Baylor Roberts

HITCHHIKING DOG RIDES HUMBLE RUMBLE SEAT

His master takes him along on a fishing jaunt at San Diego, where that sport is wonderful "when they're biting." Some go trolling far out at sea; other devotees dream quietly on the piers, their poles propped up, and wait blissfully for bites.

One midafternoon I turned in at a dude ranch to get some lunch. Waiting for kitchen help to say "Come get it!" I sat in the big living room and noticed a fine Barcelona guitar standing in one corner. I took it up and was playing when a tall Englishman came in. Without introduction he said:

"I'm the manager. I'll give you room and board. You stay and play of evenings. All the cash you pick up is yours."

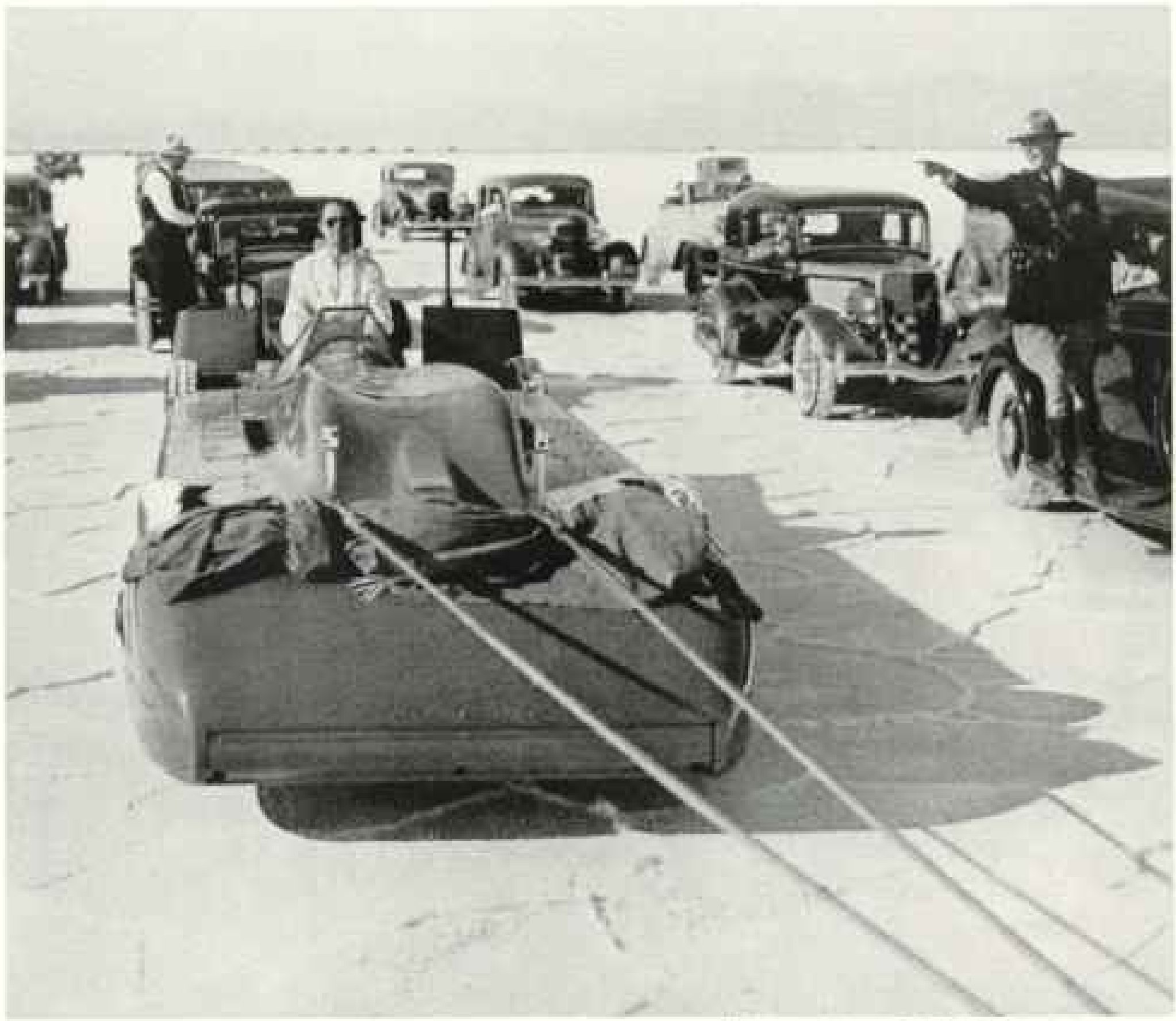
I said I already had some work. Without a word he got up, took his golf clubs, and went out.

Guitar music and ballads are part of this ranch life.

Once on the Rio Grande I stopped for food at a wayside Mexican place.

Again there was a guitar, which I played while the old lady brought tamales and beans. For her I picked a rowdy Mexican tune I'd learned in the Carranza revolution. That delighted her; she said she had been a "soldadera" (camp follower) with the Villa army; she sang some familiar and rather broad verses of Villa's time, without embarrassment—but blushed in confusion when I hinted that I ought to pay a little something for the tamales.

About all these Mexican homes, as on most American-owned ranches, you may



Photograph from Salt Lake Tribune-Telegram

TO UTAH'S ONCE-DREADED SALT FLATS, LONG SHUNNED BY PIONEERS, RACING DRIVERS COME NOW TO BREAK WORLD RECORDS

Here is the 12-cylinder, 2,000-horsepower Rolls Royce "Bluebird Special" of Sir Malcolm Campbell, being towed into position. In this perilous test Sir Malcolm reached 301 miles per hour. Since then his mark has been broken several times by Captain George E. T. Eyston and John R. Cobb, who set the present record of 369.7 miles per hour in 1939.

see hunting dogs, and plenty of coyote, bobcat, and mountain lion skins. This is still a wild country. I've shot at wolves within five miles of El Paso.

LION HUNTING IN NEW MEXICO

One of my boyhood recollections has to do with a cold, cloudy November morning when three Missouri neighbors, with guns, a keg of whiskey, shivering hounds on chains, and a negro boy to mind them, took the Texas train south.

"Where you going?" we asked.

"To New Mexico," they answered, "to hunt lions." It couldn't have hinted at higher adventure had they said, "We're going to Khartoum to fight the Mad Mullah," or "To Jerusalem, to get the Holy Sepulcher back from the Turks."

That was forty-odd years ago. Men have been killing lions in the Southwest ever since, and there seem to be as many as ever (page 750). Perhaps it's because they keep walking up from Mexico, looking for more and better beef!

I asked the Biological Survey how many wild animals its paid hunters had shot here in recent years. It said that since 1916 it had killed a total of 631,260 bears, bobcats, coyotes, wolves, and mountain lions. In Arizona alone it slew over 2,000 lions; and in Texas, 141,060 coyotes! This takes no count of thousands killed by private hunters. A lion, they say, kills a deer a week. Since 1916, then, Arizona's 2,000 lions alone could, theoretically, have killed 2,392,000 deer!

For rich tales and myths about wild

Photograph by Kopec Photo Co.

LOS ANGELES HARBOR, RANKING NEXT TO NEW YORK IN VALUE OF OCEAN COMMERCE, HANDLED 6,109 SHIPS IN 1939

San Pedro was not a natural harbor, but was entirely man-made. Laid out by the War Department about 1908, it is designed to meet the needs of a growing seaport where rail and sea-borne commerce meet. Vital to national economy and security, this harbor serves as a peacetime home for part of the U. S. Fleet. Near-by Terminal Island accommodates a new naval airplane base.

animals our folklore owes the Southwest a big debt. You can compare the coyote tales here with Europe's countless myths and literary allusions to Reynard the Fox. In fact, the Mexican has humanized and often given Spanish irony and subtlety to many of these Indian fables about the cunning, sagacity, trickery, and treachery of the coyote.

Here is one amusing example: In Mexican slang a clever crook, political scalawag, or pickpocket is called a "coyote." Riding one day with President Obregón of Mexico, we saw a coyote running into the mesquite and fell to discussing that wily animal. "Sure he's clever," said Obregón. "That's why we named him 'coyote.'"

Wild-life lovers who visit this animal Eden may see anything from deer to buffalo. Bighorn sheep are here, too, but hard to find.

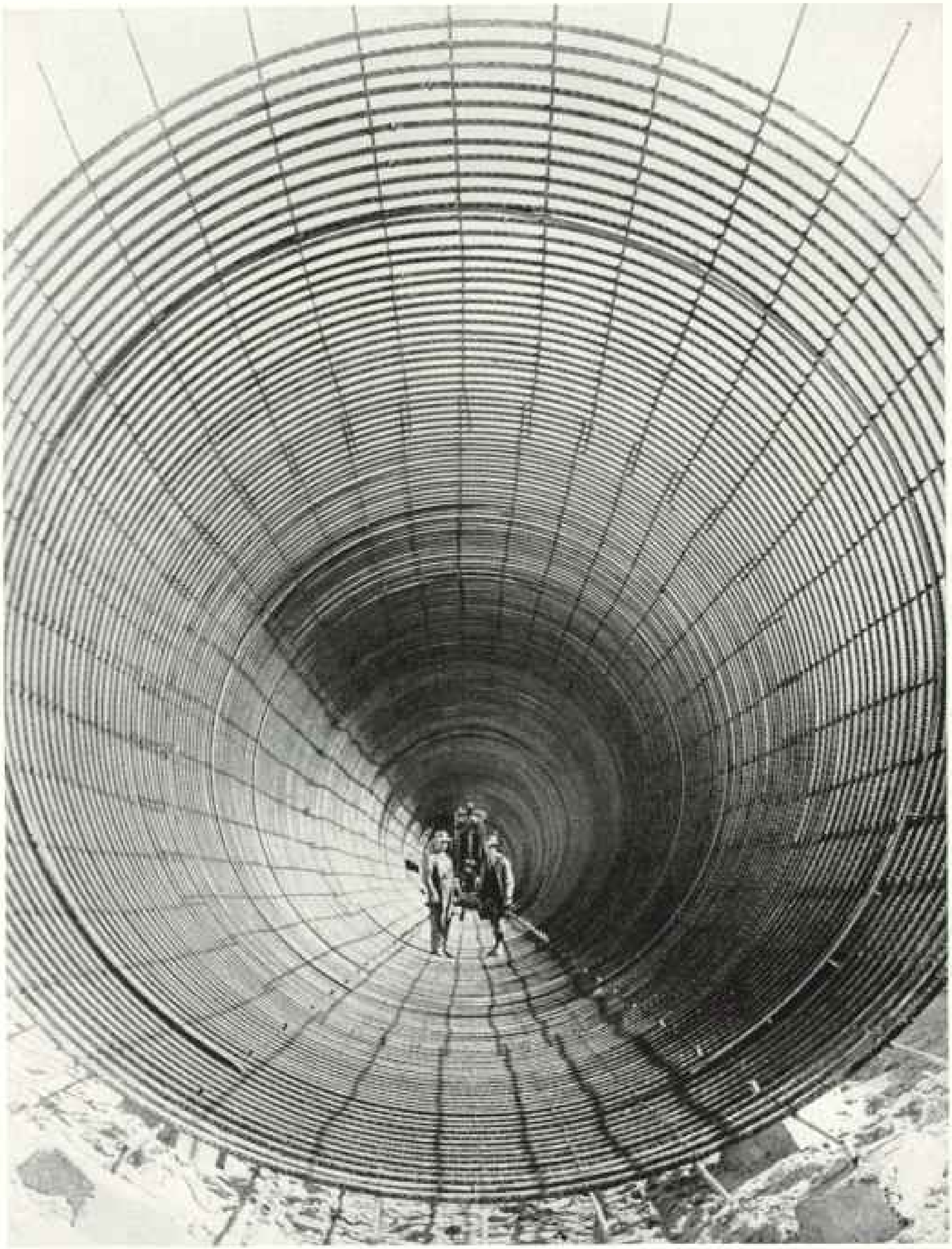
Hot dog and gas station keepers, whose shacks form all there is of many wayside stops, often lure customers with little private zoos of their own.

"Stop! Snakes!"

"Lions, One Mile," and similar signboards are not uncommon. One roadside zoo had a mother coyote and her eight whelps, a cage of owls, and a writhing mess of centipedes and scorpions.

MEXICO NEXT DOOR

Bilingual towns paint "foreign" color spots on our southern border from the Gulf of Mexico to the Pacific; in some, 50 to 75 per cent of the inhabitants are Mexicans. Each American border city usually has its



BIG SQUIRREL CAGE? NO! NEW-FANGLED SNOWSHED—OR BIG HOOP SKIRT? NO!

It's a cage of reinforcing steel, forming the core for a concrete conduit to carry water from the Colorado River 250 miles west to Los Angeles. This metropolitan aqueduct system is the mightiest job of its kind ever attempted in the United States. In recent years population grew so fast in southern California that existing water supply was inadequate. Engineering science now takes water from the Colorado at Parker Dam, downstream from Boulder Dam, and carries it through mountain tunnels and aqueducts to Los Angeles and other municipalities.

Mexican twin just across the line; familiar to veteran trippers are the bullfights, gambling casinos, enchilada joints, and curio shops of Matamoros, Nuevo Laredo, Juárez, Nogales, and Tijuana. Serene, sleepy, redolent of gin, garlic, and roasting coffee by day, they come to life at night, when crowded cars cruise among the night spots and bevies of bewitching señoritas smile their way around lighted plazas vibrant with excellent Spanish music.

Close to 1,500,000 people of Mexican blood are living in the United States. Los Angeles alone has more Mexicans than any except the four largest cities in Mexico. They support our Spanish newspapers, preserve the language, customs, and gracious manners of their Spanish ancestors, and keep alive their music, dances, costumes, and fiestas. One Spanish publishing house in San Antonio not only exports Spanish novels, nonfiction, and textbooks to Latin America, but also sells them in Spain.

STILL WESTWARD ROLLS THE TIDE

Draw a line roughly from St. Augustine, Florida, out to San Francisco. Most land below that line once belonged to Spain. When the French built New Orleans and settled up the Mississippi, they drove a wedge between Spanish possessions. But the western part of this territory remained under Spanish and then Mexican control till long after Spain lost Florida and France had sold us the Louisiana territory.

English-speaking Americans were scarce in the Southwest till long after the War of 1812.

How a trickle of travel first formed on the Santa Fe and Mormon Trails; how this grew, in the Mexican War and the gold rush of '49; and how pioneer railroads finally sold home-seeker tickets from St. Louis to the coast for a record rate-war low of $5—for one delirious day it was only a dollar!—all combine to form a still-stirring chapter in the peopling of the West.

To aid railway building, the Government gave companies vast land grants. To get settlers, railways hired colonizing agents; some went to Europe and lectured on the charms and opportunities of the West. Special trains, loaded with field, mine, and forest exhibits, and flying banners "California on Wheels," toured the East.

Then there was homesteading, with land free for the taking; now that's about gone. Today cheap lands are no longer a lure.

But the tide keeps up. Texas has grown to over 6,000,000. In the decade 1920-30 California received 1,975,900 new settlers. Babies born are still outnumbered by immigrant arrivals. Dust Bowl fugitives account for thousands; yet others, who can still afford it, come out here and buy or build ranch homes, not from profit motives but as a way of life in a friendly climate. Their number and distribution are surprising.

Private schools multiply in this dry, sunbathed country; they are filled with Eastern students. Coming west, these boys and girls meet a stream of Western youth going east to school. Such form the human warp and woof that makes up our democracy.

In a college town drugstore that fries you a steak, a student works for his board. You watch his free, friendly behavior, and you like the way he looks at you, straight in the eye. Up to the curb drives a red-headed coed, unfolding her long sunburnt legs from a low-swung roadster. On her sport shirt is some boy's frat pin. She climbs a stool, and says "Coke."

"Hi, Red!" greets the soda jerker. "I passed in Latin. Come to the gym tonight. Watch us take that Texas basketball team all apart. Yes, sir, steak coming up!"

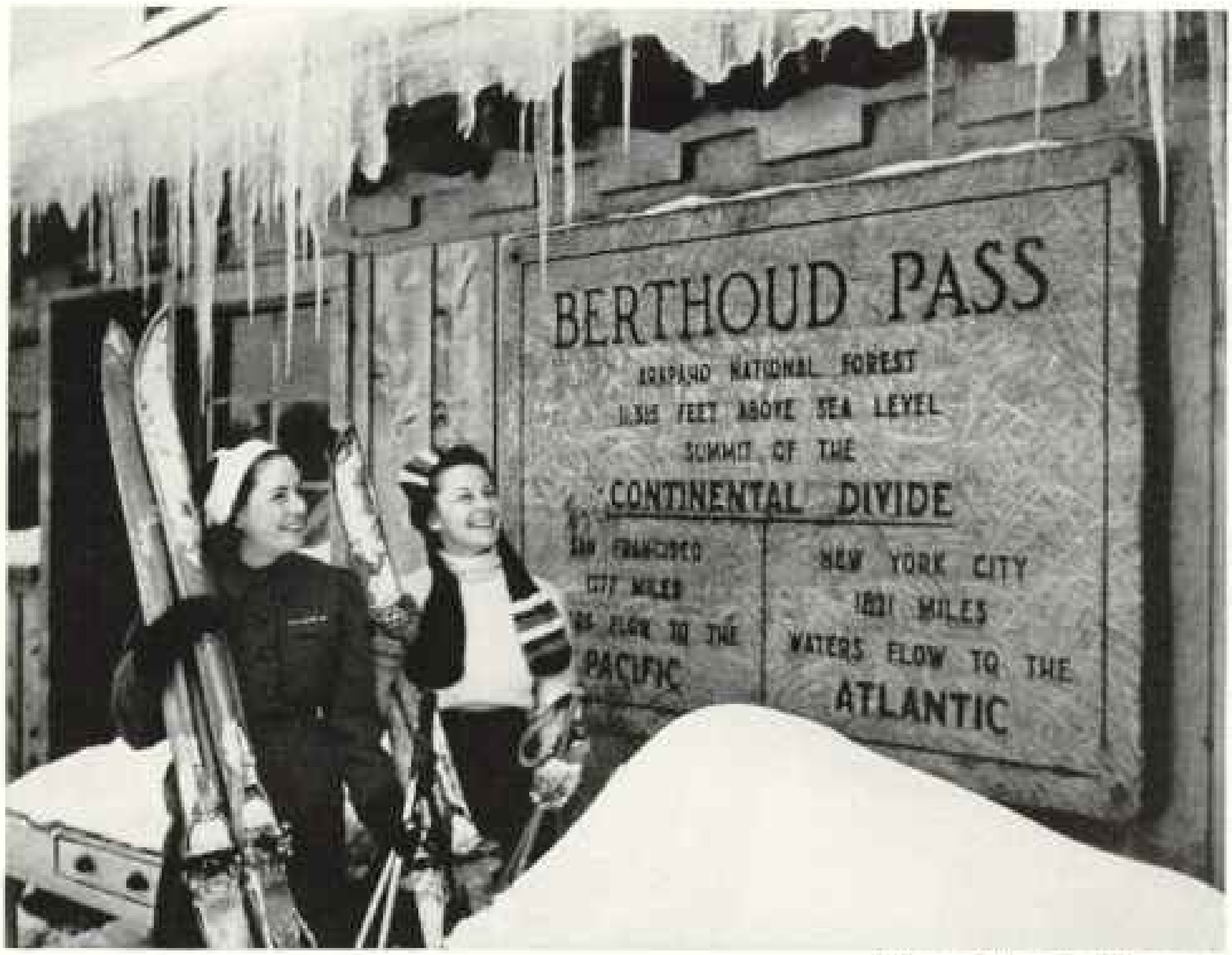
People in Los Angeles say they live "on the coast." In terms of geography, the "Southwest" does stop at the Colorado River. Yet most Southwest sight-seers push on to California, which offers its own glittering, spectacular world to visitors. They like Coronado Beach, La Jolla, the missions; they like to go aboard naval vessels at San Pedro, to explore Hollywood, and to enjoy the great Huntington Library and its gallery with "The Blue Boy" and "Pinkie."

North up the Camino Real lies Santa Barbara, Carmel's literary colony, the classic shades of historic Monterey—and then San Francisco with its Treasure Island Fair and majestic new bridges.

Take the inland road north, via Bakersfield, and high up in the Sierras spread the magnificent scenic parks, Sequoia, General Grant, and Yosemite. Long the playgrounds only of summer guests, they now draw thousands for winter sports.

WATERING ONE OF THE WORLD'S BIGGEST GARDENS

Between the coast and these mountains, stretching north and south for 500 miles, lies California's great Central Valley, scene now of yet another colossal engineering



Photograph by J. Baylor Roberts

TWO SMILES THAT MELT EVEN THE COLORADO ICICLES

At this point in Colorado the pass cuts the Continental Divide at an elevation of 11,315 feet. Just to the north of this winter playground, famous Moffat Tunnel, on the Denver and Rio Grande Western, drives six miles through solid rock far beneath the Great Divide.

job in man's fight against marching deserts.

Long one of the world's biggest gardens, this valley is in trouble: it lacks water. To get more water than rivers gave, farmers dug wells deeper and deeper; in time, they pumped up water faster than Nature could put it down; then salt water from the Pacific began to seep in, ruining rich farm lands.

To restore Nature's balance comes now the United States Bureau of Reclamation, with two big storage dams and 350 miles of canals. Shasta Dam, in the Sacramento River, will be largely fed by snows melting on Mount Shasta, volcanic landmark in northern California. Friant Dam, just northeast of Fresno, where San Joaquin River tumbles out of the Sierras, will turn still more water north and south through Madera and Friant-Kern Canals.

Since two-thirds of all California's agricultural land is under this project, you can see its significance. It will not only benefit one and a half million acres of raisin, grape, plum, peach, fig, nut, cotton, grain, and vegetable areas, but its reservoirs will control erosion, salt-water seepage, and water tables; will aid in reforestation, domestic water supply, navigation, game and fish protection; supply power; and reduce floods. In fact, had Shasta Dam been then completed, the disastrous floods of February-March, 1940, could not have drowned any people or ruined so many millions worth of property in the Sacramento Valley.

Truly stupendous is this Central Valley Project. One belt conveyor is over nine miles long! In one Gargantuan feat engineers picked up 37 miles of Southern Pacific railway track and carried it uphill to a new location, just to get it out of their way!

Like the Panama Canal, this job is so complex and involves so many conflicting private interests that only all the people, working through Uncle Sam, can carry it out. It shows again how science may ignore Nature's arrangements and kick physical geography around.

Look at such great works, and you say, "No! America is not finished!"

AERIAL COLOR PHOTOGRAPHY BECOMES A WAR WEAPON

By H. H. Arnold

Major General, Chief U. S. Army Air Corps

With Illustrations from Kodachromes by Major George W. Goddard

COLOR cameras borne by speedy reconnaissance planes are emerging as important weapons in modern war. Far better than black and white pictures, natural-color photographs pierce the artful disguise of camouflage.

Experiments carried on by the United States Army Air Corps with the co-operation of the Eastman Kodak Company show that photographs in color can now be made successfully from airplanes flying more than 200 miles per hour and at heights ranging up to about two miles.

Major George W. Goddard, in charge of this experimental work, has taken several hundred aerial color photographs during the last two years, including practically every point of scenic note in the United States. Eight have been chosen for reproduction in the accompanying color plates. These pictures were taken at 1,000 to 3,000 feet above the ground.

WORLD WAR METHODS NOW OUTDATED

The art of camouflage is as old as war itself—even older, for Nature has used it for ages. Birds, beasts, and insects disguise themselves with shadings and patterns that harmonize with normal surroundings. Jungle tribesmen use tree branches and bundles of grass as camouflage to stalk enemies and to get within killing distance of game.

When the airplane and the keen eye of the aerial camera came into use in the World War of 1914-18, military strategists copied Nature's example on a larger scale than ever. Cannon, ammunition dumps, warehouses, hangars, and so on, were covered with strange markings and somber colors. Sometimes new weapons and roads were hidden by nets and branches, or by burlap and painted canvas.

As long as enemy observers flew high and took black and white photographs, camouflage experts were fairly successful in disguising military works and even in concealing the movements of large bodies of troops. Almost any combination of colors could be used, if the result changed the recognizable form of the object.

In an attempt to "break through" camouflage in World War days, army officers studied aerial photographs under magnifying glasses. Shadows had to be separated from substance; natural and artificial colors distinguished. Experts were often deceived.

In the present European war, airdromes are camouflaged in a variety of ways. Artificial roads and ditches deceive the aerial observer. Hangars located in clumps of trees and covered with branches and leaves become invisible from above. Factories, storehouses, depots all lose their distinct appearance with the application of false exteriors and roofs. Roads hide behind walls of wire and mattressed foliage.

Old methods of camouflage, however, will soon be as out-of-date and valueless as last year's Easter bonnet. Like a magic eye, the natural-color camera penetrates the veil of camouflage. Variations of shade and tint are clearly defined; natural color also gives a sense of depth, or a third dimension.

Color shots can even spot wilted vegetation resulting from a gun blast, although the battery may be disguised. Grass faded and leaves singed by fire no longer blend with surrounding fields or trees.

A DECADE OF PROGRESS

A little less than ten years ago the National Geographic Magazine published the first aerial color photographs. Melville Bell Grosvenor, Assistant Editor of The Geographic, delved into its mysteries when he took direct color photographs from the Navy airship *ZMC-2* and from the Goodyear blimp *Mayflower* in 1930.*

It was not until 1936, however, that the United States Army Air Corps entered into a development and research program of aerial color photography. Tests were conducted with the help of the movie industry at Hollywood and the Eastman Kodak Company at Rochester, New York.

Early aerial experiments had to be carried out at plane speeds of less than 100 miles an hour. Improvements in the speed of color-sensitized film have made higher shut-

* See: "Color Camera's First Aerial Success," by Melville Bell Grosvenor, National Geographic Magazine, September, 1930.

ter speeds possible and now satisfactory color aerials can be taken at speeds well in excess of 200 miles an hour.

Altitude for color photography today is limited by the haze in the air. On clear days, verticals and near obliques can be taken from elevations as high as 10,000 feet. This series contains all obliques, reproduced from 8-by-10-inch Kodachrome film. A lens of 13½-inch focal length was used.

Dipping low over New York Harbor, Major Goddard secured the striking view of the Statue of Liberty that leads the color series (Plate I). Clearly outlined is 12-acre Bedloe's Island, now a national monument. Old barracks of Fort Wood are being demolished to give "Miss Liberty" a setting more in keeping with her dignity.

About Washington's changing Capitol Hill (Plate II) clings a diadem of monumental buildings. Here, but a few years ago, the Capitol and Library of Congress stood among old residences and World War barracks. Cream white are the porticoed Supreme Court and the new Annex of the Library of Congress behind the copper-domed parent building. Gone are unsightly frame structures from the Mall and from the approaches to Union Station.

FROM WHITE HOUSE TO BOULDER DAM

The importance of the White House and of the State and the Treasury Departments is reflected in the clustering of office buildings, hotels, clubs, department stores, and theaters around their doorsteps (Plate III). Near the upper left corner, facing tree-lined 16th Street, can be seen a part of the offices of the National Geographic Society.

Swinging across country, Major Goddard found in Lake Mead, behind Boulder Dam, a new and surprising subject for his color camera (Plate IV). The turbulent Colorado River that feeds it is always a muddy brown, but this largest man-made lake is a vivid, unbelievable blue that contrasts strikingly with the yellows, reds, and browns of its stark desert surroundings.

Fast-growing fleets of small motorboats and sailing craft enjoy good cruising on the lake. So steep are the walls of the canyon and so deep the water, however, that skippers find it impracticable to anchor. When they wish to moor their boats, they seek a cleft and tie up to the rocks. Lake Mead at present is 575 feet deep at Boulder Dam, or more than twice as deep as Lake Erie!

From any vantage point, the Grand Canyon is a breath-taking spectacle of sheer, overpowering beauty. Its magnificence is accentuated from the air (Plate V). The great labyrinth, carved by the wild waters of the Colorado, shades from brilliant reds to pinks and blues, until it drops to the purple depths where flows the muddy stream that carved it. To the geologist the color camera discloses bandings that delineate centuries, even eons, in the mile-deep gorge.

Sentiment turns an Army man's airplane to West Point, and so the splendid photograph of the U. S. Military Academy (Plate VI) includes the "Plain" (center), the Chapel clinging to the rocky hillsides at extreme left, and the crenelated barracks.

CATCHING A RAINBOW

Although not the tallest falls in the United States, Niagara still retains the charm that has lured thousands of honeymooners and other visitors (Plate VII). From the air the color camera has caught the sweep of rushing green water plunging over a curving cliff, to be dashed into foam and rainbow-stained mist.

Like a scene from the Arabian Nights is New York's "World of Tomorrow," viewed from the magic carpet of the Air Corps plane (Plate VIII). In the foreground can be seen the Aquacade and the Amusement Area. In midcenter rises the white needle of the Trylon above the globe of the Perisphere. To the right are the Government buildings. Upper left spreads the new La Guardia Airport (North Beach).

In addition to the United States Army Air Corps' aerial research work, the United States Navy has been carrying on experiments in natural-color photography from the air at the United States Naval School of Photography, Pensacola, Florida.

The military cameraman faces many problems unknown to the amateur or the civilian professional. Each delicate shade of nature must be faithfully reproduced. The slightest change in color of plowed fields, buildings, woods, or gardens may mean camouflaged activity. Lives of thousands depend upon the detection of that slight difference.

Still in its infancy, the art and science of aerial color photography has made much progress during the last ten years, but greater developments will come. Elimination of the long time now required for developing and printing, perfection of a process for quantity production of aerials, special polarized screens, and extreme high-altitude equipment will tend to make aerial photography in natural color as popular in the commercial field as it has become necessary in military operations.

Official Kodachrome U. S. Army Air Corps

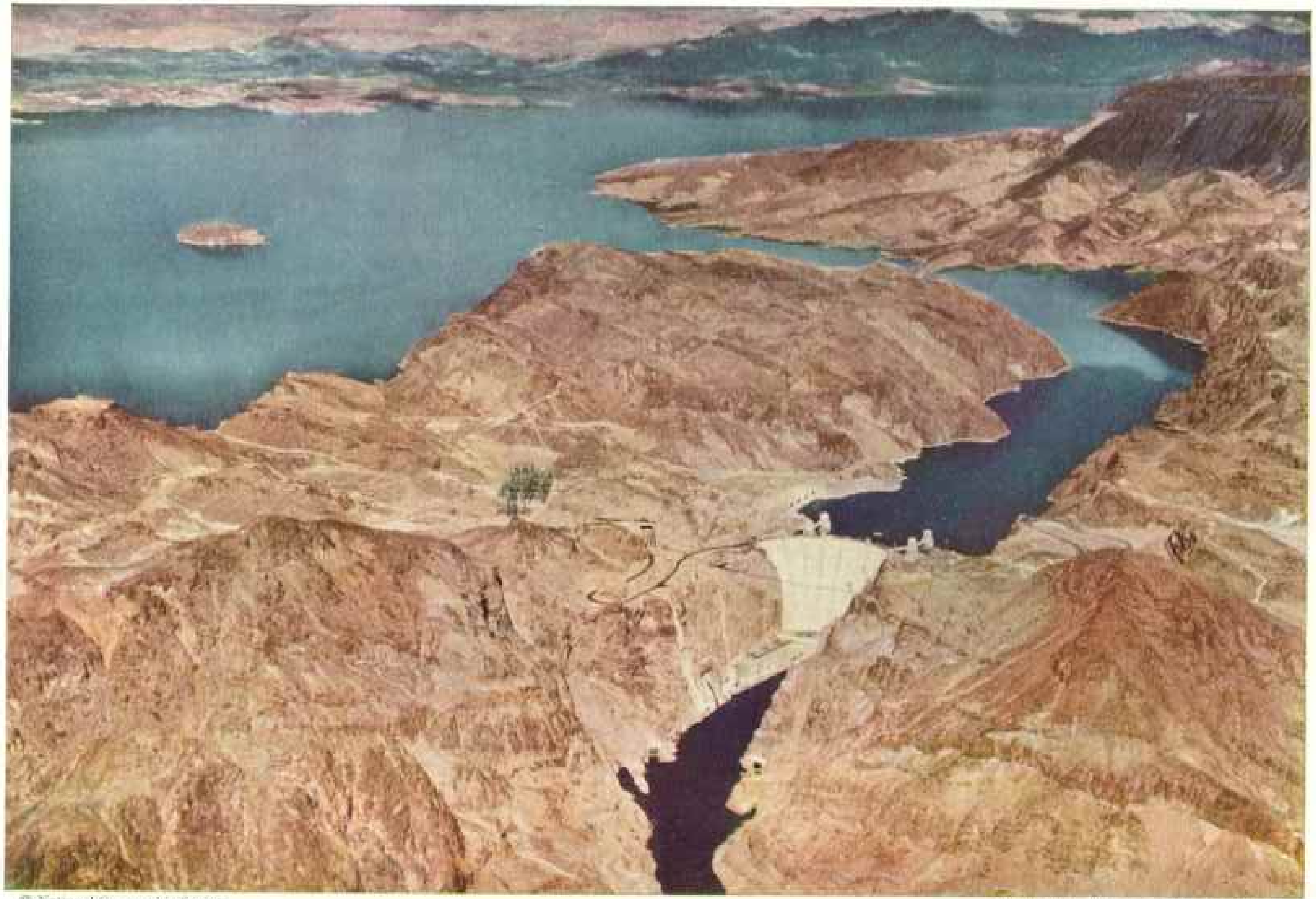
HER TORCH HELD HIGH, THE STATUE OF LIBERTY SYMBOLIZES PEACE AND SECURITY IN A WAR-TORN WORLD

Official Kodachrome U. S. Army Air Corps

CLASSIC TEMPLES OF LEGISLATION, LAW, AND LEARNING CROWN CAPITOL HILL, ACROPOLIS OF WASHINGTON

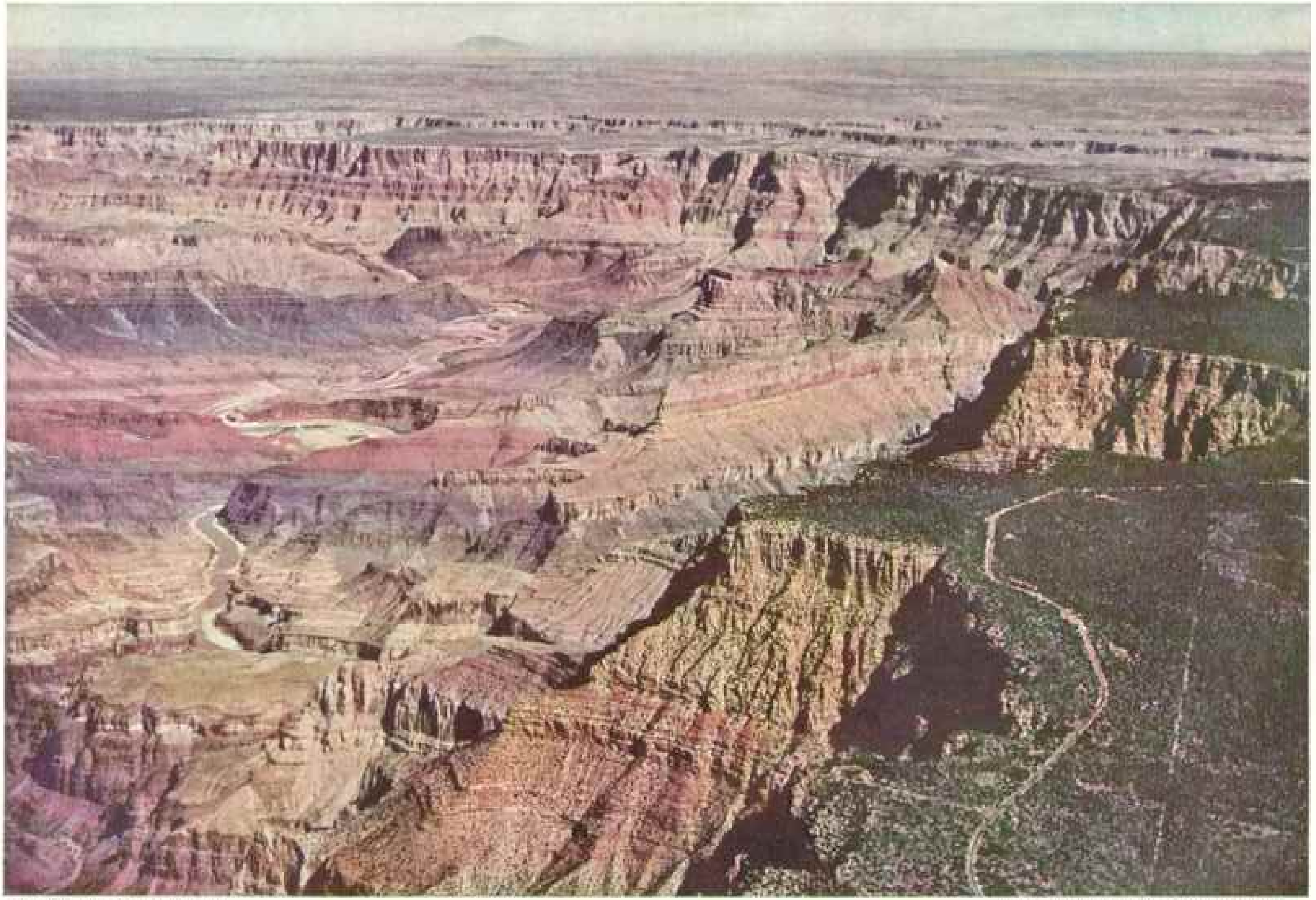
Official Kodachrome U. S. Army Air Corps

"WINGS OVER THE WHITE HOUSE" REVEAL WASHINGTON'S EXPANDING BUSINESS, THEATRICAL, AND HOTEL DISTRICT



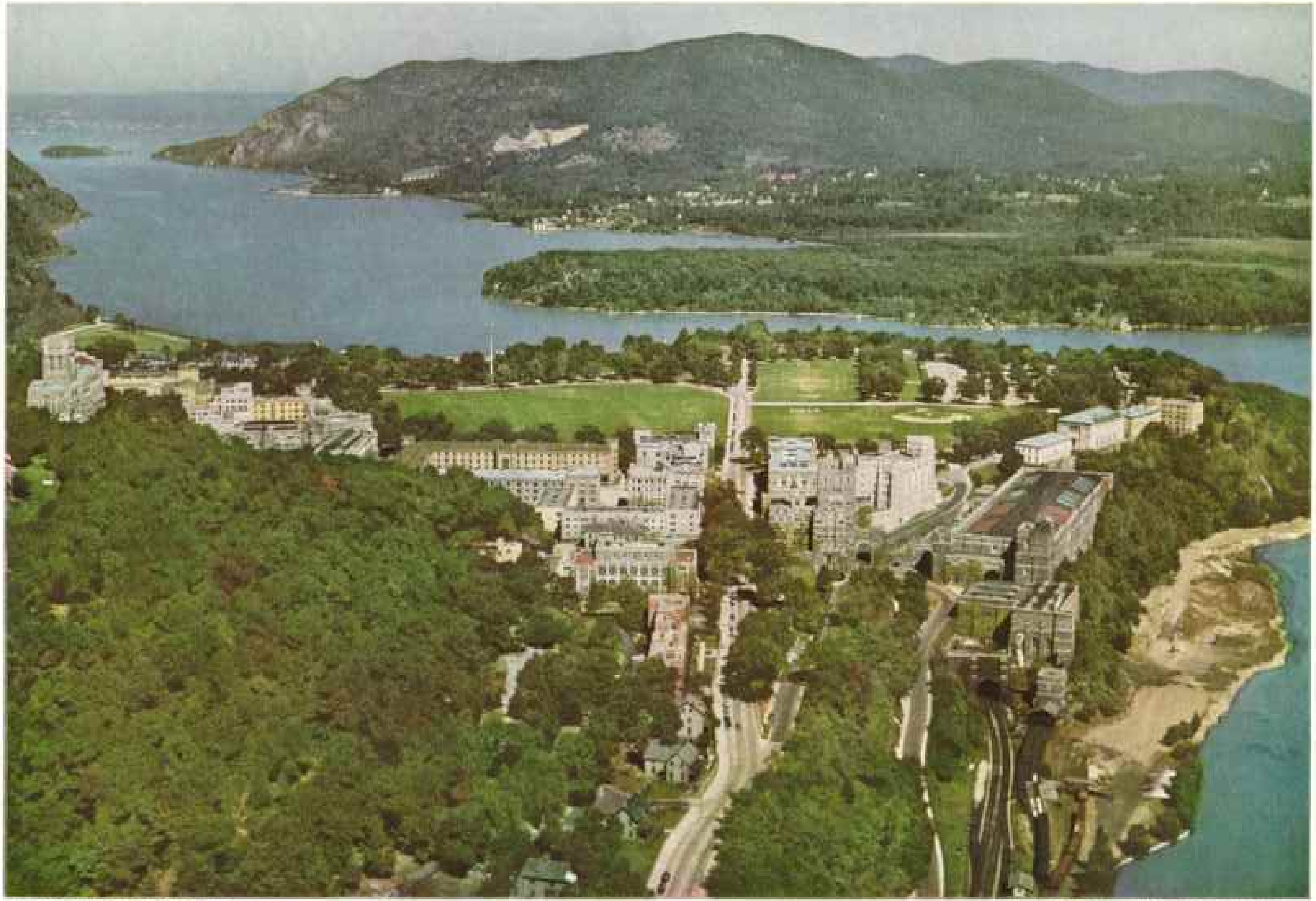
Official Kodachrome U. S. Army Air Corps

INCREDIBLY BLUE LAKE MEAD, BEHIND BOULDER DAM, IS FED BY THE CHOCOLATE-COLORED COLORADO RIVER



Official Kodachrome U. S. Army Air Corps

THE GRAND CANYON OF THE COLORADO UNROLLS ITS TAPESTRY OF REDS, BROWNS, AND PURPLES: BEYOND, THE PAINTED DESERT

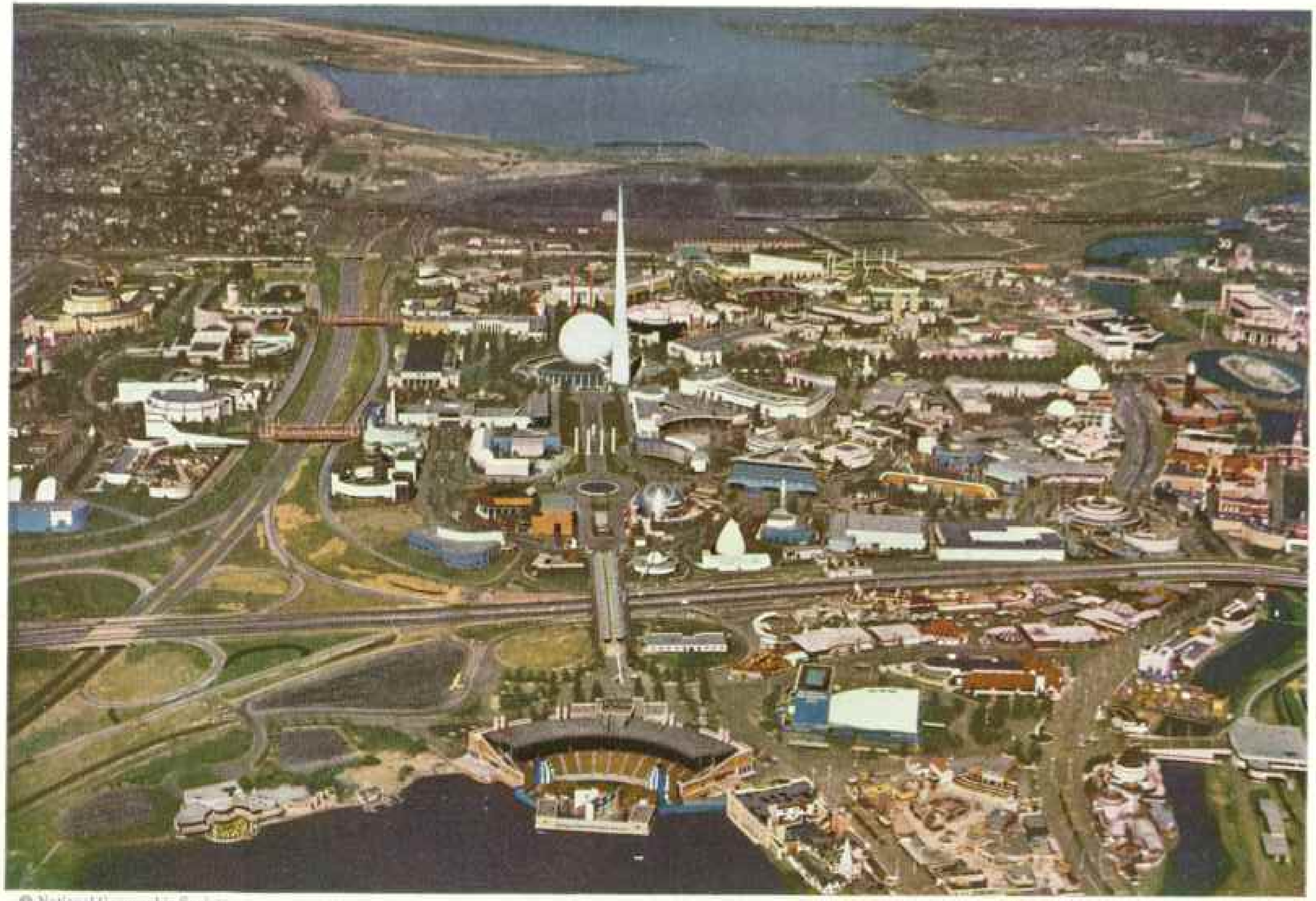


Official Kodachrome U. S. Army Air Corps

WEST POINT, ALMA MATER OF THE ARMY, GUARDS THE HUDSON WHERE COLONIALS STRETCHED A CHAIN TO BAR BRITISH SHIPS

Official Kodachrome U. S. Army Air Corps

AIRMEN FIND A NEW "PROSPECT POINT" HIGH ABOVE THE RAINBOW MISTS OF NIAGARA FALLS



Official Kodachrome U. S. Army Air Corps

ALADDIN-LIKE, THE SPLENDOR OF NEW YORK'S "WORLD OF TOMORROW" SPRANG FROM DRAB FLUSHING MEADOWS, LONG ISLAND

SOUTHWEST TRAILS FROM HORSE TO MOTOR

IN A YEAR when travel-minded Americans more than ever are exploring their own wide land, the National Geographic Society now presents to its membership of 1,150,000 families a new ten-color map depicting with all its glamorous background the vast American Southwest.

This special supplement to the June number of the NATIONAL GEOGRAPHIC MAGAZINE is especially timely because 1940 marks the four hundredth anniversary of the exploration of what is now the southwestern United States by that resplendent, golden-armored Spaniard, Francisco Vásquez de Coronado. The Coronado Cuarto Centennial is being celebrated with pomp and color in the region through which he rode.

Showing Coronado's route and other historic trails—as well as modern highways, railways, airways, canals, national parks and monuments, reclamation projects, and Indian reservations—this unusual map, "The Southwestern United States," will form an eloquent guide for thousands heading southwest this summer.*

Historical and other points of interest are high-lighted in 3,800 words of notes—equivalent to an article in your NATIONAL GEOGRAPHIC MAGAZINE.

Thirty-six pioneer trails are marked, including the route of Coronado's aide, García López de Cárdenas, who discovered the Grand Canyon.

AREA WOULD COVER MUCH OF EUROPE

If the area shown were laid on the map of Europe, it would reach from London to Bessarabia and from Berlin southward farther than Rome.

Long stretches are desert as grim as the Sahara or Gobi, yet across them run excellent highways. Travelers crossing the Painted Desert of Arizona today think not of its dangers but of its strange and savage beauty.

Here, too, are some of the most fertile areas in all the United States—and some of the world's most remarkable engineering feats. Boulder Dam on the Colorado River, 727 feet tall, is easily the world's highest, but it will have a rival in magnitude when the Shasta Dam on the Sacramento River is completed. Shasta will be the world's second highest dam (560 feet) and more than twice as long as Boulder.

The traveler—or armchair traveler—armed with this map may compare such marvelous works of 20th-century man with the evidences of less civilized men in this area in such notes as this: "Massacre Lake, Nev.—40 members of emigrant train killed by Indians 1850."

Amazingly diverse are the sights and subjects recorded: Bonneville Salt Beds, Utah, where Englishman John R. Cobb set an automobile speed record of 369.7 miles per hour last August; the world's tallest tree at Founders' Grove, California; Pueblo Bonito, in Chaco Canyon National Monument, New Mexico, explored and dated by the tree rings in its ancient beams by National Geographic Society expeditions.

From Dante's View, in Death Valley National Monument, California, are visible the highest and lowest points in the United States—Badwater Lake, 279.8 feet below sea level, and Mount Whitney, 14,496 feet above the sea. Some of America's most remarkable natural wonders, now national parks, may be seen in this area, including the Grand Canyon in Arizona, and Zion and Bryce Canyons in Utah. "A terrible place to lose a cow," Ebenezer Bryce called the fairyland of erosion that bears his name.

Preparation of this useful map required months of painstaking effort by the staff cartographers of the National Geographic Society. If a single copy of such a map were prepared especially at the whim of a king or a millionaire, it would cost him $10,745.

One square inch of that map would cost $12.64—more than four years' dues of National Geographic Society members. Yet The Society's members receive it free as the third map supplement issued with their NATIONAL GEOGRAPHIC MAGAZINE in six months.

The border design, by C. E. Riddiford, suggests the Southwest's rich background of Indian culture, Spanish influence, history, legend, and modern achievement. The border fret and the bird design around the National Geographic Society Seal are taken from a Pueblo Bonito bowl discovered by a Geographic expedition, the shieldlike circles from a Hopi pot, and the filigree from other Indian pottery. The small designs on either side of the title are Navajo deities—Mother Earth and Father Sky.

* Additional copies of the map "The Southwestern United States" may be obtained by writing to the National Geographic Society, Washington, D. C. Prices, in United States and Possessions, 50¢ on paper (unfolded); 75¢ mounted on linen. Outside of U. S. and Possessions, 75¢ on paper; $1 on linen. Postage prepaid.

Photograph by Edwin L. Wisherd

IN A STEAMING WORLD: EARLY RISERS GAZE AT CASTLE GEYSER, WHOSE WATERS THROUGH THE CENTURIES HAVE BUILT THIS HUGE CONE

Of all the geysers in Yellowstone National Park, Castle has the biggest cone, a mighty mass of geyserite which suggests the ruins of an old Crusader stronghold. At the present rate of growth it is estimated that from forty to fifty thousand years have been needed to rear its walls this high. Castle is not erupting here—just letting off a little steam. In eruption, every 24 to 30 hours, it spouts hot water from 65 to 100 feet in the air for about half an hour.

FABULOUS YELLOWSTONE

Even Stranger Than the Tales of Early Trappers is the Truth About This Steaming Wonderland

By Frederick G. Vosburgh

MEN came out of the west with wild, incredible tales.

High in the Rockies, they said, was a land where the earth boiled under your feet, where spouts of hot water as tall as a flagpole came roaring out of the trembling ground, and whole valleys steamed with sulphurous fumes as if the lid over Hell itself had been shot full of holes.

Boiling springs bubbled by an icy lake, and a man could catch and cook a trout without moving a step or taking the fish off the line. There were mountains of glass and mountains of sulphur and mountains that spoke with growling voices.

A galloping river leaped over a cliff and landed in a gorge a thousand feet deep all lined with yellow stone. Mud volcanoes sputtered and churned, and down a terraced mountainside ran the waters of immense hot springs, scalding at first and cooling as they flowed, so a man could take a bath of any temperature he chose.

Thus ran the tales of the mountain men, long-haired, leather-garbed scouts and trappers such as John Colter, Joe Meek, and Jim Bridger, who ranged westward from St. Louis early in the 19th century.

"Out thar in the Yellowstone," Bridger related, "thar's a river that flows so fast it gets hot on the bottom." Or he told of the "two-ocean river" that ran down into a pass and divided, one branch flowing to the Pacific and the other to the far Atlantic.

MORE WONDERS THAN EVEN BRIDGER KNEW

Incredible tales indeed! Yet nearly half a million visitors to Yellowstone National Park every year see for themselves that many of the old-timers' yarns were the truth and that there are more wonders in the Yellowstone than even Jim Bridger knew.

Just south of the park in Wyoming is grassy Two Ocean Pass, where Atlantic and Pacific Creeks, a quarter of a mile apart, flow away to merge their waters eventually with oceans on opposite sides of the continent. Isa Lake, in the park, on the Continental Divide, also drains two ways (page 784).

You can wade in the river that "gets hot on the bottom"—the Firehole River near Old Faithful. But the heat comes from hot springs in the bed, not from friction of water on rock (Color Plate VII).

At Fishing Cone beside Yellowstone Lake almost anybody can catch and cook a fish without moving out of his tracks; or, rather, he could if the rangers would let him, for National Park Service rules forbid putting anything into the hot pools.

Glass mountains? There's Obsidian Cliff, of black volcanic glass. There's Sulphur Mountain; and Roaring Mountain, named for the steam vents near its top. And in the awed accounts of the early trappers the present-day visitor recognizes such familiar yet marvelous features as Old Faithful and the great geyser basins, Mammoth Hot Springs, and that colorful, unbelievable canyon "where falls the Yellowstone."

LOFTY LAND OF GEYSERS, BEARS, TROUT

Last summer I went to the Yellowstone, as did exactly 486,935 others. Like every Yellowstone visitor I wanted to (a) see Old Faithful in eruption, (b) see a bear, or a lot of bears, and (c) connect with a few of the famous Yellowstone trout.

Driving up through Wyoming's Jackson Hole country and past the cathedral-like spires of the Tetons, we entered the park by the South Entrance near the rushing Lewis River. All five of the entrance roads penetrate the Yellowstone through the valleys of streams, for otherwise there would be no admittance to this lofty, mountain-guarded world (map, page 771).

At the rustic gate paused cars from many States while the occupants paid the all-season entrance fee of three dollars a car and chatted with National Park Service rangers in neat uniforms of forest green.

"Bears?" said the ranger. "They'll be holding you up before you have gone very far in the park."

As we neared Old Faithful, we found he was right. A black bear and her cinnamon cub were holding up all cars.

"Do not feed the bears," the rangers warn. Yet some heedless visitors feed and even fondle these dangerous wild animals.

Photograph by Edwin L. Wisherd

HOLDUP, YELLOWSTONE STYLE

Black bears never seem to learn that in Yellowstone National Park it's emphatically against the rules to feed them. Many visitors, too, forget—every year about a hundred are treated for bear bites or claw marks (see below). Bears are most dangerous when they have a cub or two in tow, as here on the road near Old Faithful. Woe to him who carelessly walks between a mother bear and her young!

and every summer about a hundred persons are bitten or clawed.

BEAR FACTS

In the rangers' office later I looked over reports:

> Chicago boy bitten left thigh. Bear being photographed and food being thrown to him. Boy approached very close and the animal snapped, catching the boy in the leg.
>
> Woman from Saginaw, Michigan. Husband taking pictures of large black male and she walked to about ten feet. Bear jumped up and sprang upon her.
>
> Man from Willard, Missouri. Black bear with cubs. He reached out to pet the bear. Two deep lacerations in hand.

Sometimes bears get so bold and destructive that they have to be trapped and hauled away by truck to exile in a distant corner of the park, or even, in extreme cases, sentenced to become a rug.

Past more of the furry official greeters we rolled at last to the lodge at Old Faithful where the queen of the Yellowstone rises each hour in draperies of steam (Plate I).

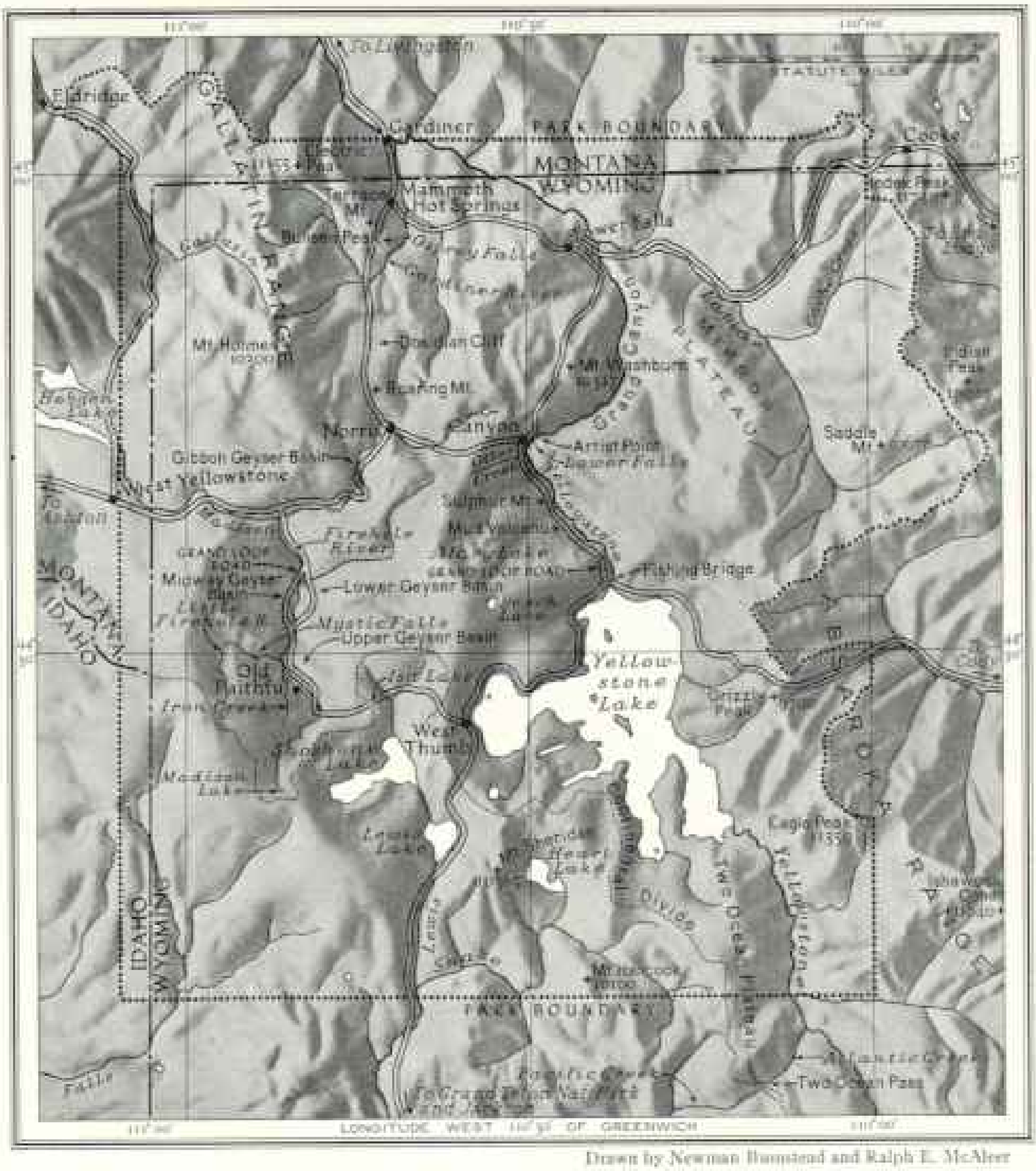
FIERY FURNACE A MILE DOWN

In only three places in all the world can you see the never-forgotten sight of tons of hot water shooting out of the earth, propelled by the awesome explosive force of Nature's hidden fires.

One is Iceland, whence came the word "geyser," from an Icelandic verb meaning to gush. Another is faraway New Zealand.* But the biggest geysers and the largest number are here in the Yellowstone.

Deep under this ground—perhaps a mile

* See "North Island of New Zealand: A Vulcan's Playground," by W. Robert Moore, the National Geographic Magazine, February, 1936.



Drawn by Newman Hunstead and Ralph E. McAleer

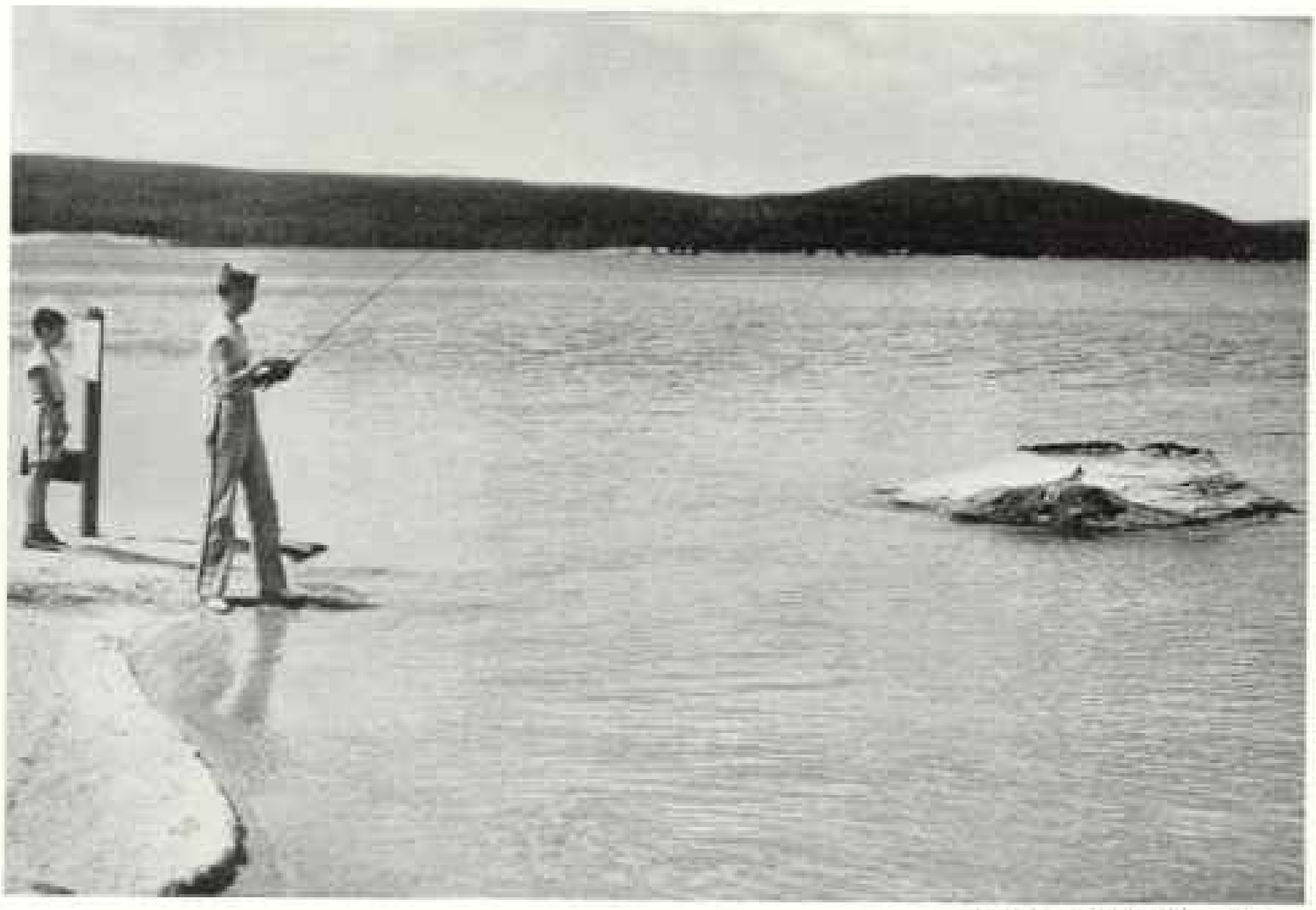
YELLOWSTONE, THE NATION'S LARGEST NATIONAL PARK, IS NEARLY AS BIG AS DELAWARE AND RHODE ISLAND COMBINED

Through this vast and unspoiled heritage of mountains, lakes, rivers, and geyser basins curls a pretzel of highway, the Grand Loop Road. Entrance roads join it from five directions and three different States. Most of the park's 3,472 square miles are in Wyoming, but its northern and western edges lie in Montana and Idaho. This relief-type map gives the effect of an aviator's-eye view near sunset.

down, the geologists tell us—seethe superhot magmas of lava left from the days when belching volcanoes were building up these mountains. Cold ground waters, trickling downward, strike rising vapors of indescribable heat. They boil, flash into steam. If the explosion takes place in a tube of rock hard enough to stand the strain, the cooler water above is driven out in a geyser eruption.

Such manifestations of Nature's power are found throughout much of the Yellowstone's area of 3,472 square miles—some three thousand hot pools, geysers, and patches of boiling mud. Most of the big "hot water volcanoes," including Old Faithful, are here in the Upper Geyser Basin.

What a moment it must have been when the Washburn-Langford-Doane exploring party of 1870 emerged from the woods at



Photograph by Haynes, Inc.

HERE AT FISHING CONE THE OLD-TIMERS CAUGHT AND COOKED TROUT WITHOUT TAKING THEM OFF THE LINE

Standing on the craterlike hot-spring formation surrounded by the cold water of Yellowstone Lake in West Thumb Bay, early visitors pulled in fish and boiled them on the hook. Park regulations now prohibit the practice. In August, 1939, this hot spring staged its first recorded eruption when it threw up a column of water five to six feet high for about half an hour.

the crest of a hill and looked down upon this valley with its waving plumes of water and steam!

The names they bestowed at that time have stuck: Old Faithful, named for the ages by General Henry Washburn in a moment of inspiration; the Giant, Giantess, Beehive. The last three and Grand erupt higher than Old Faithful, but you may have to wait many days to see them. More gracious is the queen.

"Next eruption of Old Faithful about 6:40," read a sign at the ranger station. Near a low gray cone of geyserite a ranger naturalist was speaking:

"Old Faithful plays as regularly and as high as it did when discovered. . . . Height varies from 115 to 150 feet and once last year a 180-foot eruption was measured with a transit. Intervals between eruptions average 66.5 minutes. . . . The source of heat——"

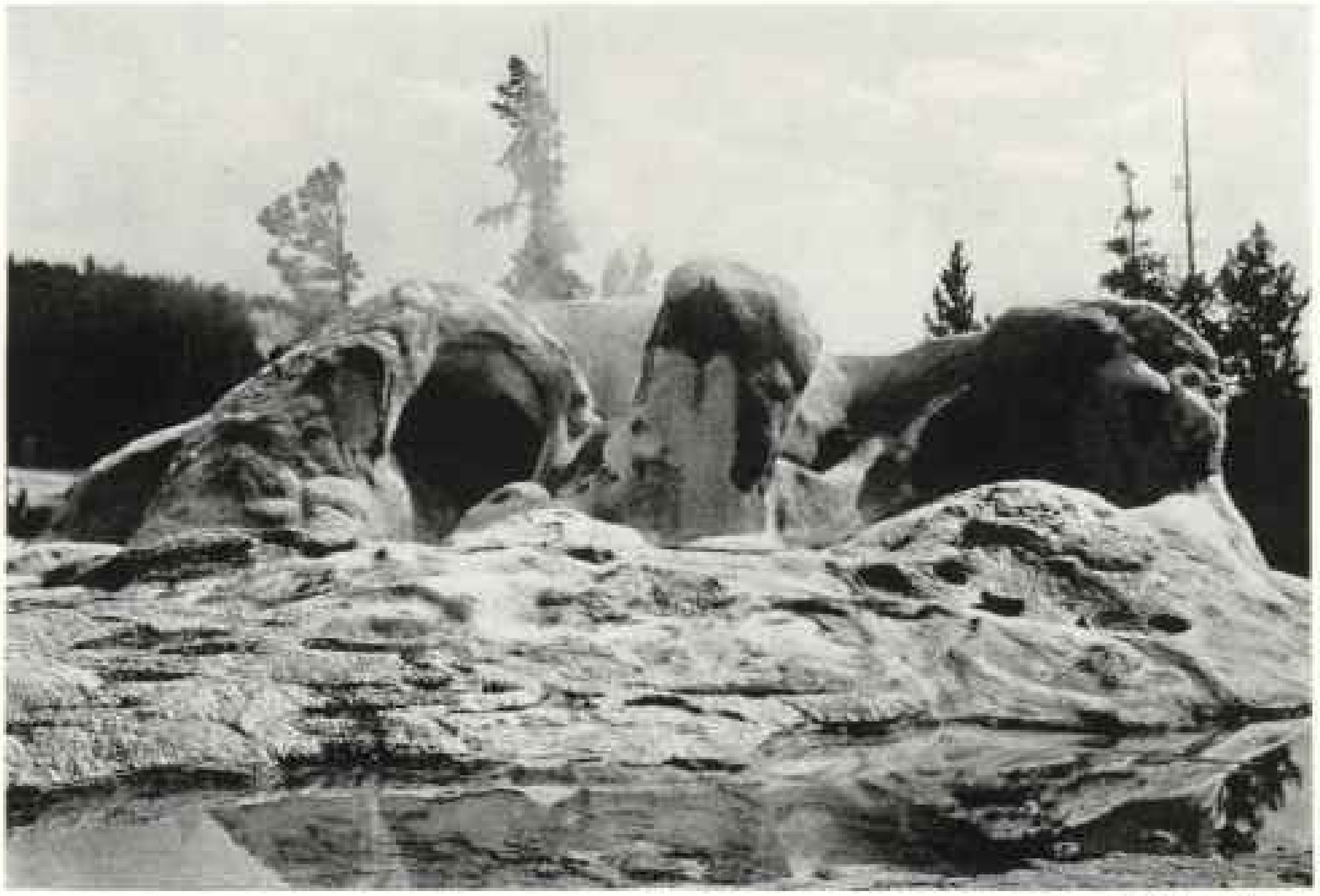
But what was that? From beneath the earth came a rumbling sound, as if a giant were preparing to speak. From the top of the cone welled a little water. Higher it rose, fell back, then triumphantly tons upon tons of steaming water surged toward the darkening sky. From hundreds of throats came an exclamation, a kind of collective gasp. Great billows of steam rolled off on the breeze.

Higher, yet higher, leaped the column, a hundred feet, a hundred and fifty, still higher, while the billowing steam rose far above, a pillar between the earth and sky.

Four minutes, and the spouting flood had spent its power. Old Faithful's high plumed head sank lower and slowly she withdrew to her home in the earth, like a genie into its box. Again people spoke; the spell was broken.

OLD FAITHFUL REVEALS HER AGE

In the 70 years of her recorded history, Old Faithful has given her marvelous show about half a million times. Yet recent discoveries indicate that this renowned geyser is not the hoary 10,000-year-old veteran that she had previously been supposed.



AN EARLY EXPLORER CRAWLED INTO WEIRD GROTTO GEYSER AND NARROWLY ESCAPED BEING SCALDED TO DEATH

Private Williamson of the 1870 expedition had no sooner emerged than the geyser erupted. When quiet, this strangely contorted formation looks as if it sheltered malevolent gnomes. In eruption, with its tossing spray, it suggests waves dashing on a rocky shore—except that these are boiling hot.

Geologists had based the 10,000-year estimate on the size of the cone and the average rate of deposit of geyserite (siliceous sinter), about a thirty-second of an inch a year. Now, however, Dr. C. Max Bauer, Park Naturalist, and Ranger Naturalist George Marler have found that the hot flood from Old Faithful is actually eroding away the cone on one flank instead of building it up. Over much of its area there are being uncovered stumps, roots, and trunks of trees.

On a spot which now gets an hourly drenching in ten thousand gallons of scalding water there once grew a grove of lodgepole pines. Forty stumps and sixty sections of trees have been found. Even the craggy-looking formations at the top of the cone, the very mouth of Old Faithful, turned out to be stumps thickly coated with geyserite (page 784).

Obviously Old Faithful, as we know it, did not exist when these trees were growing, perhaps three or four hundred years ago. It may have been a mere hot pool, or possibly this was a dormant cone, showing no sign that some day it would burst into furious life, kill the trees with its boiling flood, and play in a period of 70 years to a gallery totaling millions.

GIANT REACHES THE 250-FOOT MARK

Some of the other nozzle-type geysers have built up huge cones (page 768).

Giant Geyser, loftiest spouter of all, has a big chunk missing from its cone—torn out by a particularly violent eruption at some unknown time in the past. When the Giant shoots to a height of 200 or 250 feet at an interval of 9 to 21 days, it discharges some 700,000 gallons of water—about 70 times as much as Old Faithful. Eruptions last an hour and a half compared to her four minutes. At the height of the Giant's fury about 22 tons of water are in the air at one time.

The roaring, ground-shaking Giantess may reach the 200-foot level on the rare occasions when she deigns to erupt. Beehive has been measured even higher—a thin stream to 230 feet.

Two favorites, about as regular as Old

Faithful, are Daisy and Riverside. Daisy sprang into existence in 1892 with the demise of Splendid Geyser, fifty feet away. Riverside's slanting stream, like a huge fire hose, pours into the Firehole River.

"Doesn't that hot smelly water kill the fish?" asked a visitor, sniffing the sulphurous fumes.

"Not at all," said the ranger naturalist. "You'll find plenty of trout in here. The river rises about six degrees in temperature as it flows through this geyser area, but that isn't enough to hurt the fish. And bad as it smells, geyser water is pure. It tastes just about like water boiled in your own teakettle.

"In fact," concluded the naturalist, "this geyser drainage is good for the fishing. It keeps the river open in winter, so the fish grow all year round."

Geysers of the fountain type—as opposed to the nozzle type such as Old Faithful—are often glassy pools until almost the instant of eruption. A good example is Grand Geyser, which erupts to a height of 200 feet on an average of every two days. One minute it is a placid mirror; the next the water is blasting into the air as if propelled by dynamite. The flying rocketlike jets suggest a fireworks display.

TOSSING PENNIES INTO MORNING GLORY MAY BRING A FINE

Every geyser and pool has a personality. No two are alike.

One of the best-known is Morning Glory Pool (Plate III), around which a superstition centers. Somehow the idea has spread over the country that tossing a penny into Morning Glory brings good luck. Bad luck is much more likely, though, for the penny tosser may be fined for defacing the pool.

"Oh, ranger, where's Handkerchief Pool?" is a question often heard.

"Unfortunately," comes the regretful answer, "it isn't here any more."

For decades this tiny hot spring performed as a nature-made washing machine. Visitors tossed in their soiled handkerchiefs, saw them sucked out of sight by convection currents and whisked back in four minutes, much cleaner.

The gay little worker departed this life a decade ago, but accounts differ as to the cause. Some say unspeakable vandals rammed a log down her delicate throat. Another story has it that someone tired of mere handkerchiefs and tossed in a sheet, whereupon the little lady gave up the ghost, dying of overwork.

SOAP TURNS A POOL "PEUMB LOCO"

One of the strangest things about these hot pools and geysers is the effect that ordinary soap has upon them. Like small boys, they can't seem to stand it. Many of the pools are in delicate hair-trigger balance, so that a slight change in pressure will turn them into geysers. A little soap may make them erupt.

A dramatic example is Chinaman Spring, a few steps from Old Faithful Geyser. A Chinese laundryman at the hotel many years ago decided that it was a shame to let all this ready-made hot water go to waste. He put up a small tent over the pool, tossed in the clothes, added soap, and was rubbing his hands in satisfaction when suddenly up roared the pool—tent, laundry, laundryman and all.

"Soaping" today is unlawful and strictly forbidden, as it is dangerous and likely to harm the geysers.

Draining off a little water may turn a Dr. Jekyll pool into a raving Mr. Hyde. Hot water for a swimming pool at Old Faithful is piped from a spring on a wooded slope above the main geyser basin. Result: a formerly peaceful hot spring is now Solitary Geyser, erupting 35 feet high about every five minutes.

SOME LIKE IT HOT

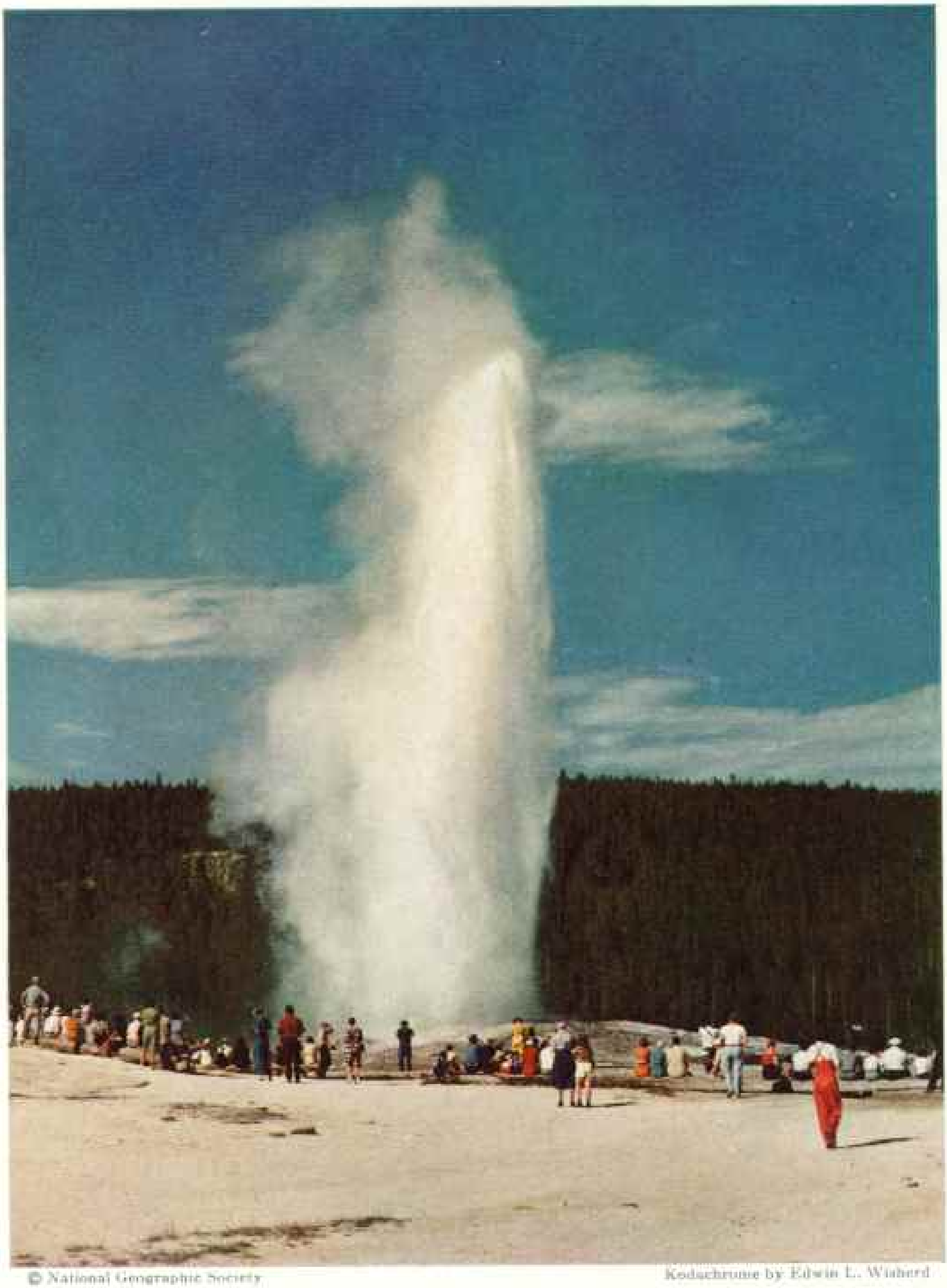
In the runoff streams of geysers and the borders of pools flame brilliant expanses of red or gold. These are natural gardens of tiny plants, vividly colored algae which seem to like always being in hot water (Color Plate VI).

One of the park's finest liquid jewels is Sapphire Pool; it is really a geyser, for it boils up every 10 to 20 minutes to a height of four feet or more. As the eruption begins, huge bubbles rise slowly, like a cluster of silver balloons.

In other springs, notably Firehole Lake, the bubbles look like shooting blue flames and led early explorers to think gas was burning under the water.

Beauty Pool, Emerald, Opal, Gentian, all fulfill the promise of their names. Most surprising after dozens of scalding springs is cloudy-blue Turquoise, stone cold (Color Plate IV).

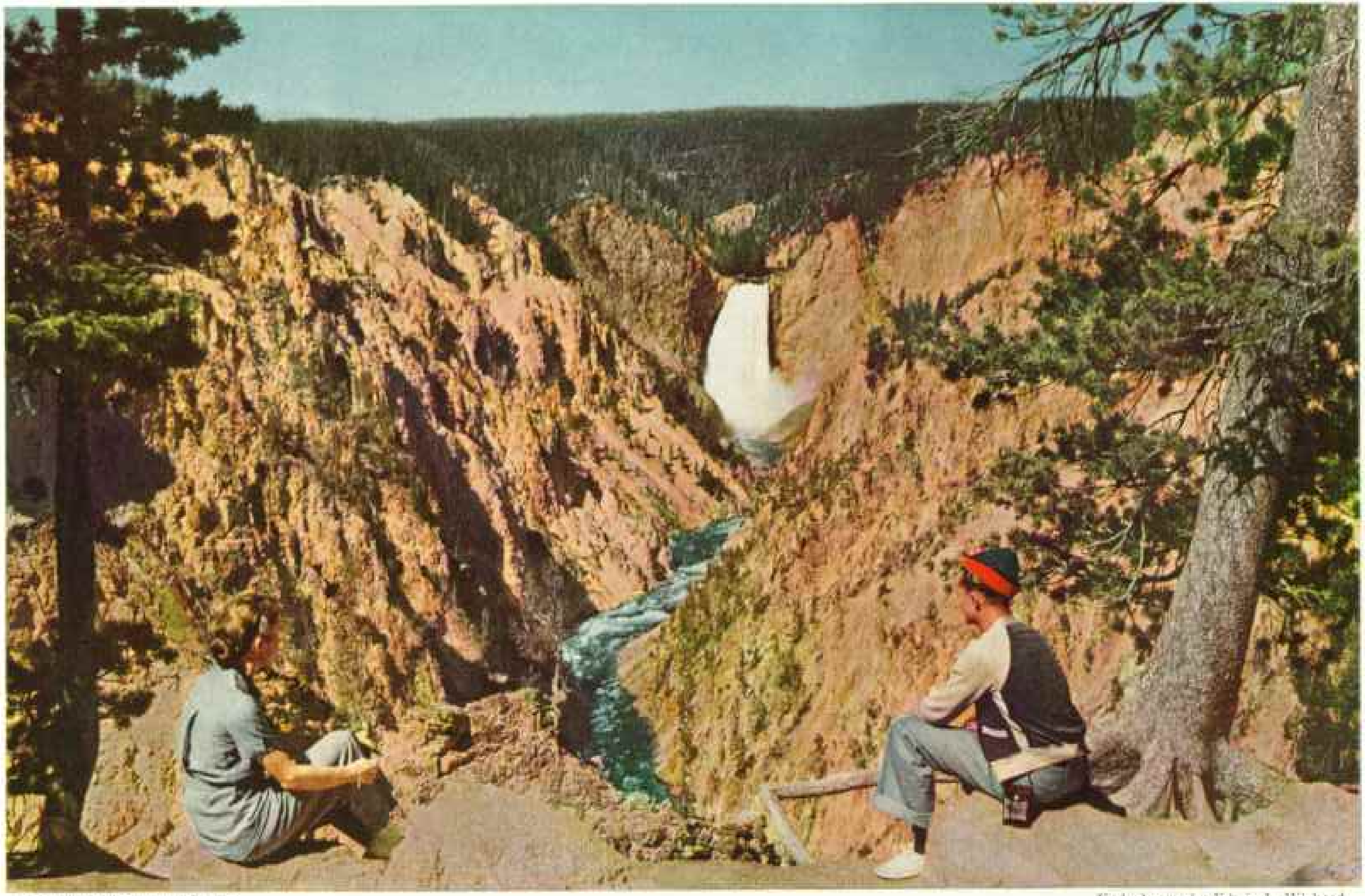
In Buffalo Pool are skeletons of two



Kodachrome by Edwin L. Wisherd

A HUNDRED AND FIFTY FEET OR MORE RISES OLD FAITHFUL IN ROBES OF STEAM

Queen of the Yellowstone is this wonderful geyser, which has been erupting night and day, winter and summer, ever since its discovery in 1870. To the millions who have watched Old Faithful shoot forth her ten to twelve thousand gallons of scalding water on an average of every 66½ minutes, her regularity is a byword. But you can't actually "set your watch by Old Faithful." On occasion she has waited 82 minutes or has beaten the gun by nearly half an hour. Eruptions last about four minutes.



Kodachrome by Edwin L. Wisherd

WHY THEY CALL IT THE "YELLOWSTONE."—GRAND CANYON AND LOWER FALLS FROM ARTIST POINT

The colors come largely from oxides of iron in the rhyolite, a lava rock. Nearly a mile away the river leaps over a 308-foot cliff, and even here its roar is heard. Hot springs and steam jets, softening the rock, helped the river to carve the canyon. Some are still active, deep in the golden gorge.

Kodachrome by Edwin L. Wisherd

BESIDE MORNING GLORY POOL, NAMED FOR ITS COLOR AND BELL-LIKE SHAPE, VISITORS PAUSE TO REFLECT

Their own images gaze back at them as they peer down toward the earth's hot heart through glass-clear scalding water. Sometimes a placid pool like this will suddenly become a geyser and burst into roaring life; or a geyser may weary of it all and lapse into mirrorlike quietude.

Kodachrome by Edwin L. Wisherd

ALL AROUND LIE STEAMING SPRINGS, BUT THE WATERS OF TURQUOISE POOL ARE COLD

The cloudy-blue hue of this liquid gem is attributed to tiny particles held in suspension in the water. At times one's hand even looks bluish when held under the surface. Most of the waters of Turquoise Pool come from Grand Prismatic Spring above it, a hot pond nearly 400 feet across.

Kodachrome by Edwin L. Wisherd

MORE OPTIMISTS GATHER AT FISHING BRIDGE THAN ANYWHERE ELSE IN THE PARK

Sometimes their hopes are justified, for as many as 450 cutthroat trout have been caught in a day from this bridge across the Yellowstone River as it flows out of Yellowstone Lake (Plate VIII). Every day, from July 1 throughout the season, fifty or so fishermen are assembled here.

Kodachrome by Edwin L. Wisherd

BILLIONS OF MICROSCOPIC PLANTS GIVE THESE BRILLIANT COLORS TO THE RUNOFF WATERS OF SUNSET LAKE

In water not far below the boiling point grow algae, which here lend their vivid hues to the bank of Iron Creek. Sunset Lake, in the background, takes its name from its flamelike colors, which are often reflected in the rising steam.

Kodachrome by Edwin L. Wisherd

RIDING BACK FROM MYSTIC FALLS, THEY WADE A RIVER "THAT GETS HOT ON THE BOTTOM"

Trapper Jim Bridger a century ago reported that a stream in the Yellowstone ran so fast that the friction heated its stones! In truth, the Firehole River is hot on the bottom in certain spots, but because of warm springs in its bed, not friction of running water. Mystic Falls, on the Little Firehole, is a favorite spot for riders from Old Faithful. The man in cowboy garb is the "dude wrangler," or horseman-guide.

QUIET LITTLE BEACH SPRING SUDDENLY BOILS AND BECOMES A GEYSER

To a group on a "geyser hike" near Old Faithful, Ranger Naturalist Harry Truman points out this dual-personality pool which last summer, for the first time in its recorded history, started to erupt.

 Kodachromes by Edwin L. Wisherd

"TEN—COUNT 'EM—TEN! WE'VE CAUGHT OUR LIMIT!"

Of these twelve beauties the ones on the rod are the native Yellowstone trout, called "cutthroats" for the red slash near the gills.

boiled bison which have been there since the early days of the park.

The vicinity of these hot pools is no place for the absent-minded. Anybody who walked into one would parboil in a trice. In fact, a fatal scalding occurred at West Thumb a few years ago. Danger areas are well marked, however, and even minor scalds are rare.

WHERE DEER AND ANTELOPE PLAY

At Old Faithful, as everywhere in the Yellowstone, wild animals are constantly appearing. A big elk bound for the river to drink strolled past a crowd around Grand Geyser. Under the porch at the lodge lived golden-mantled marmots, grandfatherly looking little dignitaries, who ate from the visitors' hands (page 794). During an eruption of Old Faithful a little black cub ambled across the formation—and promptly stole the show.

At night at a campfire session I looked at the strangely assorted people singing "Home on the Range"—tenderfeet on their first trip west, schoolteachers, business men, doctors, clerks, lawyers, engineers. Manfully we sang, while the big western moon went up the sky and the chill of these high altitudes made us huddle more closely together:

> Oh, give me a home
> Where the buffalo roam,
> Where the deer and the antelope play. . . .
>
> . . . Where the graceful white swan
> Goes gliding along
> Like a maid in a heavenly dream.

"That's a good song to be singing here," said the ranger, "for Yellowstone is one place in the world where all of those creatures are still to be found, even the rare trumpeter swan. Seventy-five pairs of them nest in the park, on the loneliest lakes they can find.

"Up near the Gardiner, Montana, entrance plenty of 'antelope play,' and on the Mirror Plateau hundreds of 'buffalo roam.'"

Over at Old Faithful Lodge a hilarious show was on. The actors and actresses had been working, a few minutes before, as porters ("packrats," in Yellowstone slang), waiters (called "heavers"), maids ("pillow punchers"), dishwashers ("pearl divers"), or laundresses ("bubble queens").

College students, they work in hotels and lodges, doubling in entertainment at night. Last year this light-hearted army of 531 girls and young men represented 32 States.

In the park lingo all visitors are either "dudes" (if they stay at hotel or lodge) or "sagebrushers" (if they pitch their own camp). Employees are "savages" and a temporary summer ranger is a "ninety-day wonder."

You can stay in the Yellowstone for practically nothing, if you bring your own camping equipment and food. At the other end of the scale are the luxurious hotels, with the lodge cabins midway between.

In each cabin is a little stove and a stack of pine. At 6:30 a.m. comes a knock at the door and a voice asking, "Fire this morning, sir?" So cold is the Yellowstone night, even in August, that many say yes.

MIGHTY EXCELSIOR DESTROYED ITSELF

At Midway Geyser Basin we peered into the huge boiling crater of Excelsior, a geyser that was too big and powerful to endure. It burst into furious action in 1878, hurling water to a height of 300 feet and blasting out big chunks of rock until its crater was greatly enlarged. After several years of spasmodic violence it ceased to erupt and now spends its wrath in constant boiling.

"The other day," said a ranger, "a man came up and asked where 'the big fellow' was. He said he meant the geyser that threw out so much water it drowned a soldier and a horse crossing the stream half a mile below.

"Undoubtedly he meant Excelsior. It's the subject of many a tale."

As a matter of fact, when this geyser erupted it threw out such a tremendous flood that the Firehole River was swollen to double its normal size and for a long distance was too hot to ford.

STEAM-HEATED BEARS' DENS AND BIRDS' NESTS

Farther on, at the Gibbon Geyser Basin, new steam vents were discovered in 1938—and, believe it or not, steam-heated bear dens! Wise bruins had found that vapor-warmed rocks made a snug hideaway.

Steam-heated birds' nests are another Yellowstone oddity, several species making their homes within reach of the warm drifting vapor from geyser basins.

Contrary to popular belief, these sulphurous fumes have no blighting effect. Dead trees near some of the basins were killed by boiling water, not fumes.

In the Norris Geyser Basin there is more activity per acre than anywhere else in the

Photograph by Frederick G. Vosburgh

OLD FAITHFUL'S THREE-FOOT THROAT: THE "BUMPS" BETRAY HER AGE

Between eruptions, a ranger on the twenty-foot-high cone rests his hand on the sinter-covered stump of a pine. Recent discovery that trees grew here, in a spot now deluged hourly in 10,000 gallons of scalding water, indicates that the geyser is much younger than supposed (page 772 and Plate I).

Photograph by Edwin L. Wisherd

A PAIR OF PEDALING SCHOOLTEACHERS "CROSS THE GREAT DIVIDE"

They shipped their "bikes" and themselves to the park by train, then roamed in quiet, rubber-tired leisure from one end to the other. Here they pause at Isa Lake, which drains to both Atlantic and Pacific.

Photograph by Haynes, Inc.

STONE GHOSTS—"THE HOODOOS"—LINE THE HIGHWAY HERE

An ancient landslide on the side of Terrace Mountain tumbled the huge gray blocks about in senseless fury. The rocks are of travertine, deposited in preglacial times by hot springs like those now at work farther down this strange mountain (page 786 and below).

park. On all sides are boiling springs and busy little geysers.

Hotter than hot is Norris's Black Growler Steam Vent. Its temperature is 280.4 degrees Fahrenheit, or nearly 85 degrees above the boiling point at this elevation. (Many of the Yellowstone's hot pools are superheated—hotter than the boiling point.)

When Drs. E. T. Allen and Arthur L. Day of the Carnegie Institution of Washington made their notable study, *Hot Springs of Yellowstone National Park*, they sank a shaft into the earth at Norris. When the boring reached 265 feet the steam registered 401 degrees Fahrenheit and a pressure of 300 pounds per square inch. New jets burst through the ground near by with such dangerous force that work had to be stopped and the hole plugged with cement.

Obsidian Cliff, farther on, was Bridger's "glass mountain," and a munitions factory for Indians, who made arrowheads from the black volcanic glass.

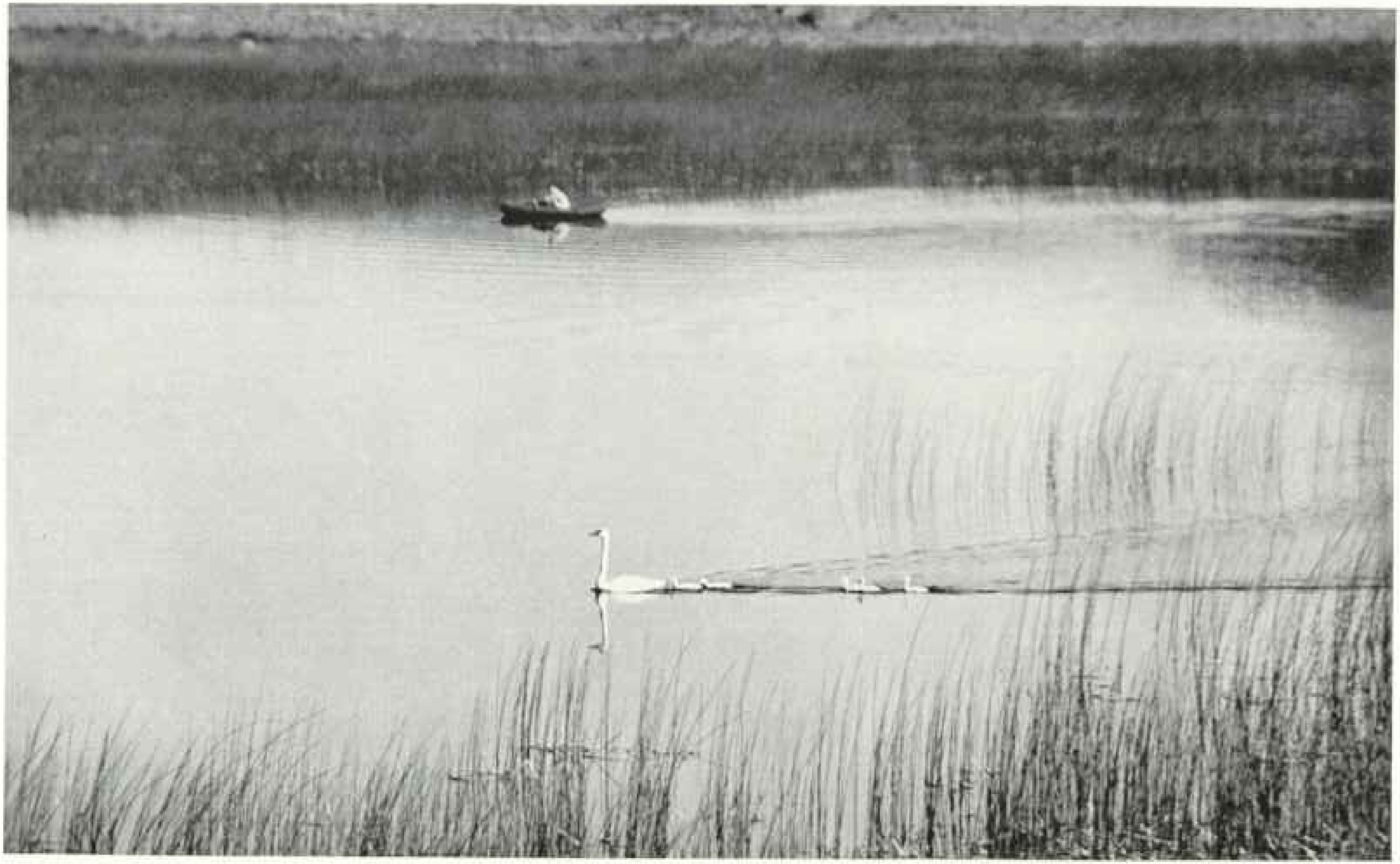
Near by is a beaver dam, 1,054 feet long. The beaver, incidentally, was largely responsible for Yellowstone's discovery, since beaver pelts lured John Colter here in 1807. Later the same animal saved his life a few miles northwest of the park. Fleeing naked from Indians who had made him run the gantlet, Colter dived into the Madison River just ahead of his foes and crawled up into a beaver house while the savages searched the shores in vain.

A MOUNTAIN TURNING INSIDE OUT

If Colter had ever told in St. Louis that out in the Yellowstone there was a mountain that was turning itself inside out, he would have been laughed out of town. Yet that is exactly what is happening at Mammoth Hot Springs (page 786).

JUPITER TERRACE OF MAMMOTH HOT SPRINGS IN 1872—ONE OF THE FIRST PICTURES EVER MADE IN YELLOWSTONE

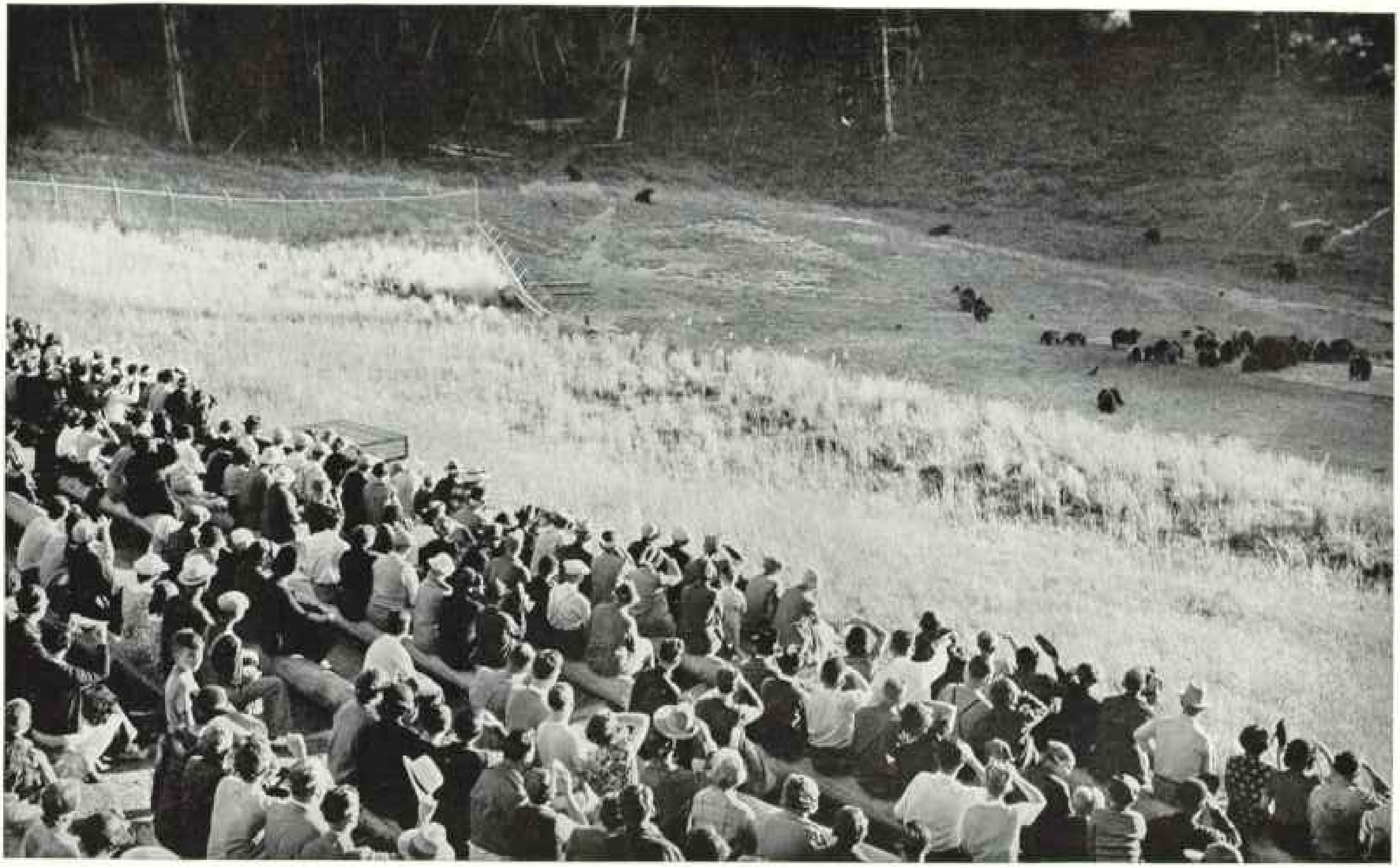
This striking photograph is taken from the remarkable collection of William H. Jackson, pioneer photographer and explorer, now 97 years old, who visited the Yellowstone with a survey party in 1871 and whose photographs were instrumental in inducing Congress the following year to make it a national park. In 1872 he returned, using 11-by-14-inch wet plates. Later he even employed a huge 20-by-24-inch camera, for enlargements at that time were unknown. Here at Mammoth Hot Springs Jackson washed his plates in natural warm water from the terraces. This mountain is turning inside out (pages 785 and 790).



Photograph by J. S. Dixon

IN LONELY CORNERS OF YELLOWSTONE NESTS THE RARE TRUMPETER SWAN

Ignoring the man in the rubber boat, a mother trumpeter leads her cygnets through the tules and out across a glassy lake in the Lamar Valley. Such a picture requires patience, planning, and luck, for these shy birds are difficult to photograph, even in the sanctuary of the Nation's largest national park.



NOWHERE ELSE IN THE WORLD CAN YOU SEE WILD GRIZZLY BEARS BOTH IN SAFETY AND IN NUMBERS

At the grizzly grounds in Yellowstone National Park every night in summer some 1,500 persons sit on logs behind strong wire fences and watch the huge animals partake of a dinner punctuated by fearsome growls, fights, and bluffing matches (opposite page). Here twenty or more bears (right) are eating "combination salad," table scraps, while from time to time a late arrival shambles down from the woods. Noisy California gulls and ravens share the feast.

NOT A DUEL TO THE DEATH—JUST A BIG BLUFFING MATCH BETWEEN TWO SNARLING 600-POUND GRIZZLIES

WISE ELK GATHER TO PICK UP "CRUMBS" FROM THE BUFFALO FEAST OF HAY

To keep the bison from ranging down into inhabited regions in quest of food, the giant beasts are fed in winter at the buffalo ranch on the Lamar River (page 792). "No effort is made to feed the elk, but a few have learned that pickings are pretty good," says former Assistant Park Naturalist Frank Oberhansley, who took the picture. "I recall quite vividly," he adds, "that the temperature at the time was somewhere around 40 degrees below zero."

Out of the depths of Terrace Mountain, hot springs are bringing lime in solution from limestone beds 1,200 to 1,500 feet down and depositing it on the outside in the form of travertine (calcium carbonate). This light porous rock builds up fast—six inches to a foot a year—compared to a mere thirty-second of an inch for the hard geyserite of the geyser basins.

Huge terraces have been formed on the mountainside—and one can imagine caverns, correspondingly huge, deep in the earth below.

On one of these travertine terraces stands the little town of Mammoth Hot Springs, headquarters of Superintendent Edmund B. Rogers and the other officials of the park. The soil was hauled in by horse and spread over the rock when this was Fort Yellowstone.

Down the face of the mountain we wound to Mammoth, past Jupiter Terrace and the other formations standing like pulpits above the town. Over them ran steaming hot water and many wore mantles of vivid algae.

Far down at the base of the lowest terrace emerges Hot River, the subterranean stream draining this eccentric mountain.

Climbing on foot up the terraces, we found in one pool an egg which someone had left to boil. Farther on, a new spring had broken out in the middle of the path.

"They change course overnight," said the ranger naturalist.

"Why aren't there any geysers here? Because the rock is soft. The water just boils up and flows away. There's no hard, siliceous sinter here to form breeches and barrels for water cannon like Old Faithful and the other geysers."

GAS POISONS SMALL ANIMALS AND BIRDS

In the mountain's sides are many caves, some filled with deadly gas. One, the Devils Kitchen, had been boarded up for safety. Another, Poison Cave, bore a warning sign: "Danger. Cave filled with carbonic acid gas. It suffocates birds, mice, and squirrels."

All around Mammoth wild life abounds. North America's fleetest animal, the prong-horn antelope, strolls across the parade ground at a pace any camera fan can equal,

Photograph by Edwin L. Wisherd

WITH SHORT-WAVE RADIO THEY FIGHT A FOREST FIRE

When lightning started a stubborn blaze last summer on the Mirror Plateau, Yellowstone rangers went into action with Machine Age methods. Airplanes dropped supplies for fire fighters in isolated sections, and forces were ordered to strategic points by radio.

and a mule deer reaches through a window to take an apple from the hand. On a dirt-road loop around Bunsen Peak and past dizzy-high Osprey Falls in the Gardiner Canyon, we saw Canada geese on a pond, a dusky grouse, an osprey falling like a thrown spear to catch a fish far below.

Rangers and naturalists here, observing the animals, add many an odd footnote on nature. Joseph Joffe, for instance, in 1938 saw why mother bears watch over their young so carefully. A big male bear killed and devoured a cub.

Rangers rate the grizzly bear as the most dangerous animal in Yellowstone, with the buffalo second, and the bull moose third.

BIGHORN BIRTH ON A CLIFF

Near Tower Falls one day in 1939, Frank Oberhansley, then Assistant Park Naturalist, saw a sight human eyes rarely witness. It was June 1 and lambing time. Down the steep side of the Yellowstone gorge came a bighorn ewe, heavy with young. She sought the most inaccessible spot, so her lambs would be safe from hungry jaws.

Facing upward on a rocky slope, she gave birth to her baby—and the tiny creature, making instinctive efforts to save itself, began rolling downhill. Down leaped the bighorn mother, headed it off near the brink of a sheer drop, dug a little hollow to hold it, and nursed the lamb.

Then she climbed back up the slope and gave birth to a twin. This one also rolled, but its progress was checked naturally some 25 feet below. A raven attacked the lambs, but the mother drove it off.

Forty-three minutes after its birth, the first lamb was able to walk and when 58 minutes old it followed its mother across a 50-degree slope. Next day, both lambs could follow her wherever she went over the steep canyon wall.

Jim Bridger, in his best romancing mood, used to tell that out in the Yellowstone there were not only "peetrified" trees but on their branches perched "peetrified birds a-singing peetrified songs."

No "peetrified" birds or stone songs have been found, but the truth is almost as strange. Science knows, for example, that there are not one but a dozen petrified for-

ests piled one on top of another. Giant trees were smothered by ashes and lava spewed out by thundering volcanoes and on the débris new forests grew, until there were a dozen of them, like layers in a cake. Now the Lamar River has cut the cake for the wondering eye to see.

Up the Lamar I visited the buffalo ranch where hundreds of bison are rounded up each fall by hard-riding horsemen and fed through the winter on hay. Otherwise the herds would move downward with the coming of winter, hunting better forage. But that would bring these tremendous animals into contact with civilization. Once three or four did get to Gardiner—and all doors were closed while the great beasts strolled the streets.

So thriving is the herd, and so limited the forage, that anybody wanting a buffalo can have one, simply by paying the freight and proving he can give it a good home. Buffaloes from this Yellowstone herd have been shipped all over the country and to zoos in Argentina and Chosen (Korea). More than 600 have been sent out in the last thirty years.

Meat from those killed—usually the ornery old males—goes to near-by Indian reservations. The skins are prized for robes and the heads for ancient tribal rites.

YELLOWSTONE NAMED BY INDIANS

Awed Indians unknown years ago peered into an incredible golden gorge where a river leaped like a plume of smoke from the top of a high cliff. In their language they called it the river of the yellow stone.

Restrained and simple, the name is perfect, but it fails to prepare you for the tremendous sight that inspired it. Of all the wonders of wonderland, none hit this beholder with a stronger impact than the Grand Canyon of the Yellowstone (Color Plate II).

Yellow it is, this breathtaking gorge, and myriad blending shades as well, from ochre to orange and deep, rich red. "Land of sand and ruin and gold . . ." Somehow the line from Swinburne kept running through my mind. But this was rock and ruin and gold—ruin wrought by a river on solid rock with the aid of hot water and steam.

Ospreys usually look down on man. Here the tables are turned as the big fish hawks soar below in the gorge and nest in plain sight on pinnacles of rock. Many visitors mistake them for eagles.

If you descend into the canyon, and if you are lucky, you may see the little water ouzel, or dipper, dive into the Yellowstone's foam-flecked torrents to "fly under water" in quest of aquatic food.

Another unforgettable trip is the ride up Mount Washburn at dawn.

Near the canyon, at the Otter Creek grizzly bear grounds, from 25 to 50 magnificent animals—and some 1,500 persons—gather every evening in summer (pages 788-9).

"Why does the ranger carry a rifle?" one visitor asked.

"To protect the bears from the people," he replied.

Though the gun is a wise precaution, a wire-topped wall keeps the bears in the pit well separated from the spectators seated above.

FIGHTS ENLIVEN A GRIZZLY DINNER

Fifteen bears were already on the heap of "combination salad"—scraps from the hotel tables—as we quietly took our seats. Grizzlies are shy and too much noise would send them back to the hills.

A moving shape at the edge of the woods and another grizzly shambled down to the pit, moving at a pace remarkably fast for one so huge. Another came, more, then a mother with four cubs. Soon there were more than thirty grizzlies busily eating—and taking time out for fights or fearsome bluffing matches. Rearing on their hind legs, mighty jaws wide, they roared and lunged at each other, defending their right to choice bits.

Among the big grizzlies were a few black bears. They were here merely on sufferance and if one grew too bold it felt the blow of a powerful paw.

One old grizzly had lost a paw in a bear trap outside the park. Seeing he was crippled, a cheeky black bear took liberties, stole his bacon rind, dared him to fight. At last the old silvertip with a furious roar reared up and raked the black with his one good paw. The bully left for the woods.

Also sharing the feast with the grizzlies were scores of screaming California gulls (page 789) and raucous ravens. When the birds get too bold and seem to think this is their show, a lightning paw swing teaches a lethal lesson.

As shadows lengthened, a blur appeared on the hill—a coyote sneaking down to steal a tidbit. So marvelously camouflaged was he that it seemed I could see the hillside

Photograph by Haynes, Inc.

HAND-IN-HAND THROUGH WONDERLAND

right through him. Sometimes a pair of these wise little beasts bluff a grizzly out of his dinner. One harries him till he drops the meat to charge—and the other whisks it away, sharing it later with his pal.

Feeling an urge for elbow room, we spent a night in a ranger cabin on Mary Lake—no other humans within ten miles, no neighbors but grizzlies, bison, elk, and the other creatures of the wild. Once we surprised a herd of elk, striding in antlered glory along a plain. A startled lift of lordly heads, and the whole herd whisked up a rocky hill like a puff of smoke up a chimney.

Past Mud Volcano and Dragons Mouth Spring, with its flickering tongue of hot water and steam, we drove upriver from Canyon to Yellowstone Lake. A golden eagle soared over the woods; white pelicans over the river.

On Fishing Bridge anglers almost elbow to elbow were casting for cutthroats, the gorgeous native Yellowstone, or Montana black-spotted, trout (Plates V and VIII). Several thousand, averaging three-quarters of a pound, are caught in the park each season. No fishing license is needed.

From a government hatchery on the lake come millions of fry every year. Females are trapped in streams flowing into the lake and 15 to 30 million eggs are collected each spring. Of these, about 90 per cent are hatched, whereas Mother Nature's best is rarely better than 8 per cent.

One of the highest big lakes in the world, Yellowstone today drains to the Atlantic via the Yellowstone River, the Missouri, Mississippi, and Gulf of Mexico. But centuries ago glacier ice blocked the outlet and the lake drained to the Pacific through the Snake and the Columbia. That explains the presence of the Yellowstone's cutthroat trout, a distinct species, but related to Pacific coastal cutthroats.*

* See "Fishing in Pacific Coast Streams," by Leonard P. Schultz, NATIONAL GEOGRAPHIC MAGAZINE, February, 1939, and the National Geographic Society's new *Book of Fishes*.

Photograph by Haynes, Inc.

FAT, DIGNIFIED NONPAYING GUESTS LIVE UNDER OLD FAITHFUL LODGE

Golden-mantled marmots eat from visitors' hands and seem to be always hungry. No wonder! They have to gobble enough in the summer to last them all winter; in autumn, with a layer of fat under the skin, they go quietly to sleep in their burrows for four or five months.

In this strange land "dry lightning" sometimes strikes. Last summer a bolt from a "dry thunder storm" caused a forest fire which burned some 2,500 acres on the Mirror Plateau. Chief Ranger Francis La Noue and his aids licked it with the aid of airplanes and short-wave radio (page 791).

CLIMBER ON ELECTRIC PEAK FELT HIS HAIR STAND ON END

An electrical curiosity is Electric Peak, so named from an experience of the late Henry Gannett of the United States Geological Survey, long a trustee of the National Geographic Society. He reported that when nearing the summit with surveying instruments in 1872 while a thunder shower was approaching, he heard crackling sounds like a rapid discharge of sparks, and the current, passing through his body, made his head and fingertips prickle while his hair "stood completely on end." Others in the party felt similar effects.

"Which of all the marvels of the Yellowstone," I wondered, "makes the greatest impression?" To get a cross section of opinion I stopped and asked questions at each of the five gates where cars pour in and out of the park.

"What hit me hardest?" said an easterner. "Old Faithful, of course."

"Bears!" yelled another.

"That wonderful canyon!" a woman exclaimed.

"The unparalleled thermal activity," said a serious-minded student.

But I think the best reaction to Yellowstone is that of old White Hawk, a Bannock Indian, whom Bill Kearns, Assistant Park Naturalist, escorted through the park in 1935. At Old Faithful someone asked White Hawk whether it was true that Indians used to shun the geyser areas, believing them the abode of evil spirits.

The old chief shook his head and gazed with practical eye at the plumes of hot water, the gemlike seething pools.

"Ugh," said he. "Good place cookum meat."

RURAL SWEDEN THROUGH AMERICAN EYES

A Visitor in Peacetime Finds Warmth, Welcome, and Strange Folkways On a Century-old Farm

By Elizabeth W. Nilson

With Illustrations from Photographs by Volkmar Wentzel

IN 1933 I sat in a Swedish dining car with an interesting young man who had been a deck-chair neighbor from New York to Göteborg. I was bound for Russia. He was returning home to visit his mother. Outside the country flew by—dark-green forests now broken by the white trunks and lighter green of birches, now water, then fields, a red farmhouse, then more woods and water and more red houses.

Halfway to Stockholm we parted, for he must change trains to reach his home in south central Sweden. I hardly expected we should meet again, still less that he was to be my husband. But five years later I sat in another Swedish train, with a Swedish name and the same young man, watching a similar countryside as we traveled north from Malmö to Örebro, whence we would taxi to the ancestral farm.

We arrived in the early afternoon. It was Monday and a season when the fields make rigid demands on their owners, but all were in Sunday attire and sticking close to the house lest they miss the long-scheduled event or fail to contribute to the welcome.

Almost before the presents could be extracted from the bags, we were ushered downstairs for coffee. I had heard much of Swedish coffee drinking and wondered how I should manage the traditional two cups on all the occasions the summer might necessitate. To my surprise the cups were only slightly larger than our usual after-dinner ones and the coffee excellent, not too strong as I had feared.

EIGHT KINDS OF BREADS AND COOKIES

It was only the coffee breads and cookies that came to be formidable. On this occasion there were eight kinds of breads and cookies and a rich cake made for the occasion—all very good, but a foreigner, at least, has her limits.

Yet being the honored guest is supposed to increase one's capacity. In fact, one may judge one's status with the hostess by counting up the items on the coffee table. To be served only rolls or rusks and *pepparkakor* (a kind of plain ginger cookie) means that one is either such a frequent coffee guest as to be on terms of equality with the family or else of no account.

My husband has told me that in his boyhood some women served eighteen kinds of cookies and cake, but that his mother considered it to be putting on airs to be serving more than twelve.

Do not suppose that these are a table decoration. On the contrary, the honor carries with it the obligation of eating one of each. Nor is it good form to skip one and eat two of another you especially like, for your hostess very likely has her cookies counted with an eye to maintaining the varieties until the next baking.

Of course, if you remark that some one kind, new to you, is particularly good, she will insist that you have another of the same. But you will politely decline—that is, if you have a Swedish husband who has told you about the storeroom counting.

SOFA BEDS DO DOUBLE DUTY

A *smörgåsbord* supper followed all too soon upon the ample coffee, and after the unpacking had been accomplished my sister-in-law came upstairs to make the beds.

Swedish beds are an experience for the uninitiated. Our room had two. One was a very narrow, brass-trimmed black iron bed, a duplicate of the King's, according to a picture magazine commemorating his eightieth birthday, even to the red-covered draft-breakers that were tied at the head and foot. The other was a genuine Swedish sofa bed (Color Plate IV and page 796).

My sister-in-law asked whether she should make up both or whether the sofa bed would be enough. Two beds, I knew, would mean many more sheets for the fall washing. Accordingly, though the sofa bed was an unknown contraption to me, I assured her it would be enough.

In English, "sofa" suggests something that is soft, but in Sweden the usual sofa

PLAY BENCH BY DAY—FEATHER BED AT NIGHT

Beneath the removable wooden seat are mattress and covers, made up for use (Plate IV). The wall sampler reads: "Thanks for the roses along the road, thanks for the thorns among them; thanks for the ladder raised to heaven, thanks for the ever-protected home."

bed is a hard wooden bench by day. At night the wooden seat cover is lifted off and the under part pulls out like a drawer.

Into this wooden box is put a big feather bed, which is shaken and smoothed until it rises even with the edge of the box. An extra feather bolster is added at the head end before the bottom sheet is tucked in; then the square pillows are placed.

NO DANGER OF FALLING OUT OF BED

Such a springless bed is more comfortable than it sounds. In fact, it compares favorably with most Swedish hotel beds. Its chief defects are its shortness and narrowness for one accustomed to American dimensions.

There is no danger of rolling out. Long before morning any occupant has reached the depths of the box and must literally climb out on waking.

The next day I had a chance to become better acquainted with the house and its environs. Like most Swedish farmhouses, it was built of heavy, substantial timber and painted red with that by-product of the copper mines at Falun which has imparted its hue to most of the rural wooden buildings for centuries.

PLOW STRIKES A VIKING GRAVE

The house was more than a hundred years old, having been bought by my husband's great-grandfather, but it was certainly not the first building which had stood on the land, for a generation ago a spring plowing turned up a Viking grave.

Regardless of size and irrespective of age, Swedish farmhouses are in a sense all alike. Some more progressive owners, however, may have exchanged the picturesque tile stoves (Plate X) for a system of central heating which they claim takes no more wood than a tile stove requires for a single room. It is a rare home that is not electrically lighted, for current is very cheap.

Old, remodeled, or new, the house is certain to have a minimum of plumbing. In the town where I visited, a returned Swedish American had built himself a new house which contained a bathtub—a sheer superfluity, according to village gossip, espe-

TEACHER STEPS ASIDE AS A STAR GEOGRAPHY STUDENT DESCRIBES "AMERIKA"

Some of the pupils in this Swedish country school have relatives in the United States. Pictures of a South American condor and a black bear hang on the wall near the large map of North America. Teachers are elected by the parents, but the children's choice often wins (page 809).

cially as the Old People's Home had public baths where one could have a shower, a tub, or a steam bath for a few cents.

KITCHEN IS THE BUSIEST ROOM

Nor do room arrangements vary much. The kitchen is the most important room, and a very busy place, too. There all the baking must be done, which is considerable, for the Swede eats bread in some form or other with his three regular and two coffee meals each day.

There the hired girl and hired man eat with the family. There also food must be prepared for the pigs; hands must be washed, children bathed, clothes changed in rainy weather, and there also, at night, the hired girl sleeps in what becomes a wooden bench in the daytime.

Usually as large as the kitchen, and often larger, is the coffee room. Reserved for wedding and funeral banquets and for coffee parties, it is a cross between a little-used dining room and an old-fashioned parlor.

Next to the kitchen is the family bedroom, by no means large, though it may accommodate the children as well as the adult members of the family.

A really double bed seems nonexistent. The farmer and his wife generally sleep in what, by American standards, is little wider than a single bed. In daytime this is usually shortened to a quarter its length. Children beyond the crib age sleep in sofa beds in the same room. Besides all this, the farmer may have his desk there and his wife her sewing machine.

Only when the children approach their teens are they moved from the family bedroom. If the house is large enough, an unused upstairs room may be assigned the boys, while, if there is only one daughter, she may have a sofa bed placed at the other end of the kitchen from the hired girl.

The Swedish family, being accustomed to all this, feels no crowding or inconvenience. In fact, the Swedish housewife reasons that the fewer rooms she uses, the fewer she has to care for and the more she saves her steps.

Our own ample quarters on the second floor had been my late mother-in-law's after the farm had been taken over by the daugh-

ter and her husband, and though they had bought the farm, these rooms were hers. Moreover, it was understood that they should furnish her with milk and eggs and whatever else she needed. Such an arrangement is common.

We had arrived three days before Midsummer, one of the most important holidays of the year. So, though everything had been scrubbed and polished for our coming, it was all done over again the day before Midsummer. My sister-in-law suggested that I gather flowers to decorate the house.

Pleasant as the assignment was, it proved longer than it sounds, for every vase was to be filled. It was too early in the year for many garden flowers, but the fields made up for anything the gardens lacked. Quantities of lovely blue bachelor-buttons grew in the grainfields. Then there were wild scabiosas and some advance specimens of Canterbury bells that could vie with any cultivated varieties.

When everything had been scrubbed and decorated, the hired girl and the hired man departed. For the first time since our arrival we were permitted to have supper in the kitchen. It was a quiet family affair with the help gone and the farm work reduced to the necessary care of the animals.

TOWNSFOLK MEET AT THE CEMETERY

In the evening we made our second trip to the cemetery with flowers for the family grave. (In keeping with Swedish custom we had gone there the day of our arrival.)

This time the cemetery was a meeting place for the township and those who had come home from the city for the holiday. There was much visiting back and forth. The men gathered around the church steps while the women strolled about to see flower beds and exchange greetings. It was all very reverential, but not the least bit sorrowful.

At such a time no one hurries away, for all the work has been done and it will be light enough all night to read a paper. Even children have no bed hour on this day, and if you are young and in love you may bicycle off with your friend to observe the glorious midnight twilight.

On Midsummer Day itself we went to the special church services, a custom which is passing, judging from the attendance. My husband and I represented two-fifths of the congregation—not exactly a happy circumstance, especially if you find yourself seated far in front of the rest and your years away from Sweden have made you a little forgetful of just when you rise and when you sit.

The altar had been decorated with the traditional birch boughs, and the minister held forth from his high, canopied pulpit with the ancient hourglasses at his elbow and with as much force as if he had been preaching to packed pews (page 813).

PLENTY OF CREAM IN SWEDISH GRAVY

Dinner that day was a special affair. Children as well as adults ate in the party room and the table was set with the best china and silver. The meat course was roast veal, cooked in a deep iron pot after having been well browned in butter.

Though the Swedish smörgåsbord is famous and every hostess vies with the previous one for a greater variety of delicacies, I found the cream gravies that are served with either veal or fowl the most memorable. Close to them I would rank *strömming*, a kind of Baltic herring, which has been dipped in rusk crumbs and fried in parsley butter.

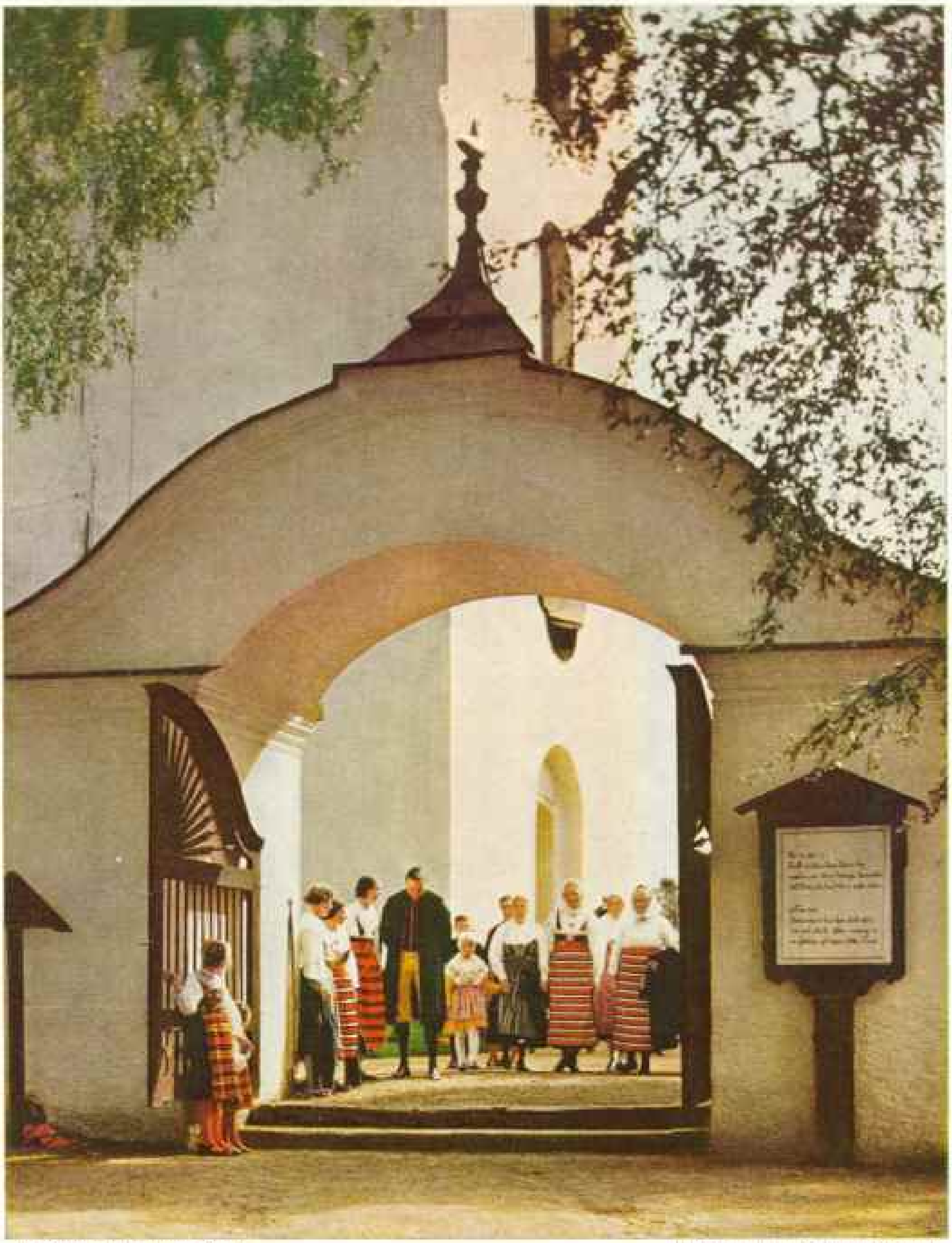
Proud is the farmer who has new potatoes for Midsummer, but to other vegetables he gives little thought. His wife will have a kitchen garden of a few square feet where she raises peas, string beans, carrots, cucumbers, tomatoes, onions, dill, and parsley, but only a few short rows of each. When vegetables appear on the table, they are either the colorful part of the smörgåsbord, like the beets, cucumbers, or tomatoes, to be eaten a slice or two at a meal, or else, like the carrots, they are the decoration for the meat dish.

Of course it is true that sometimes a vegetable like spinach is made the main dish of a weekday meal on the farm, but then it is chopped, cooked, and thickened beyond recognition except in color.

Once in Stockholm in a gathering of relatives I ventured to comment upon this lack of vegetables in the Swedish diet. The reply was prompt and final: I should know that man is not a grass-eating animal.

A common dessert is *kram*, which is any kind of fruit, berries, or rhubarb, cooked with a great deal of water, thickened with potato flour, and slightly sweetened. When cold, it is served in soup dishes with rich milk.

Party desserts vary. The Swede, having a high regard for things from abroad, once



 Kodachrome by Volkmar Wentzel

IN TIME-HALLOWED GARB, VILLAGERS LEAVE RÄTTVIK'S HISTORIC CHURCH

On Sundays men don short, yellow chamois trousers, stockings with red knee tassels, and long blue coats trimmed in red. Bright multicolored aprons and linen blouses are the women's finery in this Siljan Lake resort town of Sweden. Four centuries ago, Gustavus Vasa stood in the old churchyard and exhorted parishioners to rise against their Danish rulers. Here he set in motion the forces that gained Swedish independence.

Kodachrome by Völkmar Wentzel

JAMMED WITH COMMUTERS, A LAUNCH SKIRTS "OLD TOWN," BOUND FOR SUMMER HOMES ON LAKE MÄLAREN

Strollers, resting between Carl Eldh's statues in the City Hall Park, look across to the "City Between the Bridges." There, on an island at an entrance to the Baltic Sea, stand most of Stockholm's old buildings. Gustavus Adolphus, national hero, is buried in Riddarholm Church, whose tall metal spire rises at right.

Kodachrome by Volkmar Wentzel

HERCULES, CLUB POISED ALOFT, MENACES A MONSTER BEFORE DROTTNINGHOLM CASTLE

The famous fountain once stood on the grounds of Wallenstein Palace in Prague, but Katarina Jagellonica, Sweden's Polish queen, brought it to Drottningholm three centuries ago. Summer home of King Gustavus V, this palace near Stockholm is also the gathering place of royalty on Christmas Day.

SKANSEN, STOCKHOLM'S OPEN-AIR MUSEUM, KEEPS ALIVE THE OLD WAYS

Kodachromes by Volkmar Wentzel

SHUT DRAWER, REPLACE WOODEN COVER, AND PRESTO—BED BECOMES SETTEE!

CHURNING BUTTER IS WOMAN'S WORK ON A SWEDISH FARM

Kodachromes by Volkmar Wentzel

WOODEN HORSES, CARVED IN DALECARLIA HOMES, GO TO ALL THE WORLD

Kodachrome by Volkmar Wentzel

DRAWING WATER FROM THE OLD-FASHIONED WELL IS EASY—THE LONG, HEAVY SWEEP DOES THE WORK

Beside the weather-beaten old barn rises a modern one with shiny tile roof. Nearly all Swedish farms have electric light and power. Current for milking, threshing, and all other purposes on a farm of ordinary size averages about $25 a year.

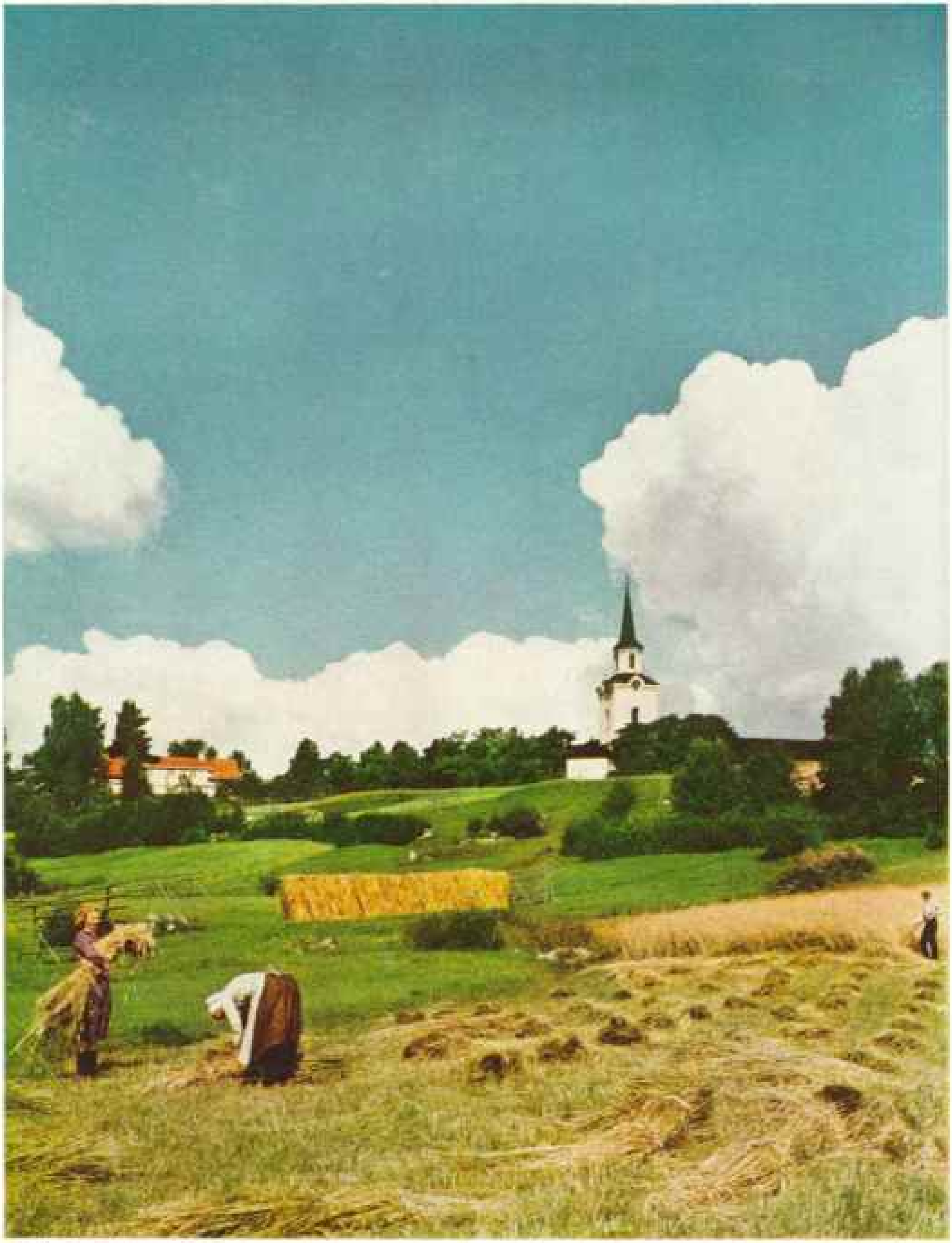
GROCERY STORES GO TO THE FARMER IN SWEDEN

Daily the trucks call, with full stocks of meats, vegetables, and other merchandise. Many of these stores on wheels are operated by co-operative organizations. About one-fourth of the population is represented in such buying and selling groups.

Kodachromes by Volkmar Wentzel

TO MAIL A LETTER—MEET THE BUS!

The driver will stop on signal anywhere along the country roads to permit posting of mail. He also operates a rural express service, delivering parcels ordered from town by telephone. If packages are numerous, he leaves town five minutes ahead of schedule, so he may end his run on time.



© National Geographic Society Kodachrome by Volkmar Wentzel

HARVESTING WHILE THE SUN SHINES IS FAST WORK IN SWEDEN

So frequent are the rains that the crop must be quickly cut and dried on racks, which are simply made of wire or poles strung between posts (center). Once the grain has been draped on these, even a heavy downpour will do little damage, and a minimum of sun will make it ready for storing.

considered prunes with whipped cream a fit dish for special occasions. Now, unless fresh berries are in season, it is more apt to be mixed California fruits, canned peaches, or pineapple—always served with whipped cream.

As the summer season is short and may be too cold for a good fruit crop, fruit is rather a delicacy. So it was with considerable pride that my sister-in-law brought forth, after Midsummer Day supper, fresh apples bought at the store. Another time her special surprise was sliced oranges heavily sugared. Though ice cream is common enough in the cities, and my nephews, six and nine, were taken to town several times a year, they had never tasted it, their mother considering fruit a much better treat.

After Midsummer it was time to start haying. Some farmers were up at four o'clock in the morning making the most of the early light.

As rain is frequent, the only hope of getting hay or grain dry is to hang it over wires stretched between poles. Then a heavy downpour will do it no harm and a minimum of sun will prepare it for storing. For this part of the haying the men welcome any extra help the women and children can give.

SWEDISH PRAISE FOR AMERICAN PIE

Under such circumstances my suggestion that I get dinner one day did not meet with serious objections. A little hot and anxious from cooking with a strange wood stove, I managed to serve fried chicken and chocolate pie at the appointed noon hour.

Both were so appreciated as to embarrass me. My personal opinion was that the fried chicken could not be compared to Swedish-style chicken with cream gravy. As for the pie, well, it ought to have been good with all the butter and cream I had been told I might use.

Present at the meal was "Lars' moster" (Lars' aunt), an old woman from the next village who had come to pick over feathers for feather beds (page 809). Being the first real American she had seen, I was an object of much interest and, judging from her suppressed laughter, considerable entertainment. My Swedish and English seemed equally funny to her, but back in her village she bragged of having had an American dessert which she described in such detail that her neighbors could supply the word "pie," which she had forgotten.

Once again I took the responsibility for the important meal of the day. For the most part, however, I learned it was wise not to insist on helping in the kitchen beyond the drying of dishes.

For one thing, utensils are so different that it was hard to be efficient. I never remembered to grind up the spice I might need, in the big heavy mortar, before I started mixing. I know I used too many dishes, nor could I disguise that fact by doing a few myself. I attempted it once, only to realize that I was wasting what should have gone into the feed for the pigs.

Dishes were stacked, washed in warm water without soap, and rinsed in a scalding solution of soda. They were clean and shiny after such a bath, but I found it best to stick to the drying end.

The housewife's day is long and full. Winter and summer she must be up at five, when the milking is done. An electric pump and central heating are not accompanied by the conveniences they suggest in the United States. She gets her hot water from a small tank that fits into a crevice in the stove. It must be hand filled, and the hot water is obtained on bended knee. Her "refrigerator" is an earthen cellar several steps from the house.

She prefers linoleum floors, but their expense makes them prohibitive for much more than the kitchen. Elsewhere she must still struggle with scrubbing the soft wooden boards. Beds, workbenches, and stoves are all too low for one of normal stature, with the result that many women become round-shouldered before their years.

Washing, too, has changed little. The clothes are soaked, boiled, beaten with a wooden spatula, and taken to the river for rinsing. However, the Swedish household has an ingenious way of mangling them between perfectly cold wooden rollers. Run through these when slightly damp, the linens emerge perfectly smooth and with a softness no heated iron can duplicate.

By preference the thrifty housewife weaves her own sheets and towels, not because it is cheaper, for she buys her materials already prepared by the Homecraft Association, but because she believes rightly that in this manner she gets a better product. Some women of today, however, have such an inherited supply of linens that they say there will be no need of weaving in their

IN SUMMER, A SWEDISH HEARTH FLAMES WITH FLOWERS

Ten miles from the Norwegian border, and close to the main highway and railroad linking Oslo and Stockholm, the National Geographic staff photographer, Volkmar Wentzel, came upon this well-to-do Kola farmer. He is seated in the room which he reserves for his private study, where he may be alone with his hunting dogs, guns, and pipes. Here also he keeps his accounts. He hauls his farm products to Arvika, a few miles away, for shipment on the railroad.

lifetime. Rugs are woven at home from rags when replacements are needed.

In many respects farm life has its attractions. With government backing and his own co-operatives, the farmer is sure of a market at a fair profit for his staple crops. There is enough cash so that no attempt is made to derive food and clothes entirely from the farm.

The farmer buys fresh meat and fish from the trucks of the Konsum (consumers' co-operative store) as regularly as the city person (Color Plate VII). He varies his evening porridge, gruel, or bean soup with rice or other items bought at the store. The abundance and security of the Swedish farm have drawn some wanderers back to their birthplace.

AMERICAN PIE CAPTIVATED "LARS' AUNT"

This jolly housewife came to the Swedish farm where the author was stopping, to pick over feathers for a feather bed. When she returned to crocheting in her village home, she boasted to all the neighbors of meeting an American for the first time and of eating her strange and delicious dessert (page 807).

PUPILS PICK A NEW TEACHER

It happened, while I was visiting, that a new teacher was to be elected to run the local school. The school board selected the candidates, and finally in August the three men were to try out on three successive Saturdays. Parents were notified that the children must appear at school and all interested adults might come and observe.

The children were not keen on spending their last vacation Saturdays as guinea pigs for the new teacher. But the oldest of my husband's nephews, when informed that a new teacher was to try out, announced with much glee, "We shall try him out!"

When the vote was taken, it was the children who had the final say, for the parents were too busy with getting in the grain to appear at school themselves. The children reported that one man was nice and kind; so the parents voted for him, though the minister and the smaller children's teacher had done their best to impress upon them the superior qualities of one of the other candidates.

Today school children are taken on excursions that go farther and farther afield as they grow up. Boys and girls of the late teens and twenties have their Young Farmers' organizations with their own clubhouse, monthly dances, and outings.

Beginning with the fortieth year, and each

EARLY-RISING HARVESTERS STOP WORK IN THE FIELDS FOR A SECOND BREAKFAST AT 9 A.M.

Their Swedish-made binder is pulled by an American tractor. Although Sweden still imports grain, acreage devoted to wheat raising has more than doubled in recent years. Farmers' co-operatives not only handle the marketing of the crops, but also distribute the seed and conduct schools and experimental stations to make farming more profitable.

SISTER DOES HER BIT IN THE FIELDS AT HAYING TIME, WHEN ALL HANDS ARE NEEDED

After Midsummer Day, one of the most important Swedish holidays, harvesting commences (page 807). Boys drape the crop over the racks so it will dry rapidly (Plate VIII). Nearly half the farm acreage of Sweden produces hay. Most of the farms are less than 100 acres in area.

TWO RIDE A BICYCLE BUILT FOR ONE!

Cushions placed on the luggage carriers make comfortable rumble seats for the children, as a Swedish family sets off for a Sunday excursion in the country. Bicycles are not so numerous here as in Denmark, but their popularity is increasing.

decade thereafter, one's birthday may be celebrated by a "surprise" visit from a group of neighbors who come bearing a joint present, too apt to be one of those white elephants that must long thereafter reside on the buffet. The inevitable coffee is served. The wise housewife has just "by accident" had a baking the day before.

Weddings, of course, are gala affairs; but funerals are great events, too. The service does not take place until sufficient time has elapsed for relatives and friends to gather from long distances.

After the burial the guests return to the house of the deceased, where an elaborate meal is served. Special hired cooks have been busy preparing it ever since the death.

FEIGNING RELUCTANCE TO EAT

Sweden is famous for the formality of its social life. Some of that is passing, but in the country odd formalities may still be seen—for instance, the custom that you must seem reluctant to come to the table when a meal is announced.

The hired man's brother had arrived late one evening without any advance notice or invitation. In the morning the employee was told to bring his brother in to breakfast. The hired man went out but returned alone, reporting that the brother had said he couldn't possibly accept such an invitation.

The man was sent out a second time and a third, returning on each occasion with much the same story.

Then my sister-in-law sent her husband and the brother was led in, still protesting verbally, though I am certain that he was eager to get at the good, hearty breakfast.

TOWNS BUILD OLD PEOPLE'S HOMES

No description of community life is complete without mention of the Old People's Home, once known as the Poorhouse. Towns rival each other in building bigger and better ones, with the result that some have found themselves burdened with institutions much too large and elaborate for their needs and have had to abandon them for smaller buildings.

These Old People's Homes would not, of course, be mistaken for the King's palace, as the Swedes claim was the case in Stockholm with the Danvik Home, when the

A SWEDISH PASTOR TIMES HIS SERMON BY THE SAND OF THE HOURGLASSES

Parishioners also may keep an eye on the sand trickling through the old-fashioned instrument, which stands in plain view to the left of the canopied pulpit. For the special Midsummer Day services, the altar is decorated with traditional birch boughs (page 798). Most country churches, plain and unadorned on the exterior, house historic treasures and delicately carved wooden furnishings.

King of Italy made a visit a few years ago. Even so, indigent old people find such comfortable quarters there that some retired farmers and artisans of small means prefer to board at the Old People's Home rather than live in the humble quarters their finances could command elsewhere.

One old man, living under such arrangements in the local home, went up to Dalarna for his vacation at Midsummer—*the* place to go for that holiday. He might live in what seemed charitable surroundings, but he was a free gentleman.

In a country as progressive as Sweden it is not surprising that the sharp distinctions between country and city are breaking down. Costumes are worn only in the more tourist-conscious centers and then chiefly on Sundays and holidays, except where they have become a hotel or museum uniform (Color Plates IV and IX). The wearers are the more affluent members of the community, not the farmer and his wife.

Even the permanent wave has reached the younger members of the community, though a few years ago artificially curled hair was frowned upon.

BUSES RUN ERRANDS, CARRY MAIL

Improved roads and widespread rural bus lines have had much to do with these changes. Both men and women say it is very easy to get to town now. The bus is also a rural express that will bring from town almost anything they care to order by phone.

The bus carries a mailbox by the front door, and it is not unusual for the driver to halt in some little-inhabited stretch so a letter may be posted (Plate VII).

In spite of the irregularity of stops, the buses make excellent time and are nearly always on schedule—perhaps because the time-table carries a footnote that teaches promptness: "In order to reach the end station on time, buses may leave five minutes ahead of scheduled time."

It was early September when the time for our departure came, but already nights and mornings had the chill of autumn weather in New England. The long twilights of June and early July had suddenly become black nights that shrouded everything in darkness from suppertime to breakfast.

This darkness was creeping up so rapidly onto the two ends of the day that it was not hard for me to visualize a time when artificial light would be needed for all but four or five of the waking hours. I could appreciate more keenly why Midsummer was such a time for rejoicing and why Swedes reveled in sun-bathing.

"ROSE-HIP SOUP" SOON IN SEASON

We no longer hunted orchids in the deep ditches that lined every field, when we carried coffee to the men. That had been our pastime while we waited for them to empty the basket in the haying season. Now they were taking in the grain and there were few flowers that could survive the cold nights. It was nearly time to gather the wild rose hips out of which is made a dessert known as *nyponsoppa*, or rose-hip soup.

Exploring my husband's boyhood haunts and visiting his friends and acquaintances, I had become so familiar with our own village and several neighboring ones that it was hard for me to remember that week in June when, having cut across the fields, I was never quite sure which one of the many red houses was the farm.

Now, though still the same red with white trimmings, each house had individuality. Having had coffee or fruit juice in a number of them, I had a vivid picture of a party room that varied with the taste of the hostess. At others, the farmer had often managed to be by the road when we passed and to waylay us in conversation.

As we made our last round of calls, we ate prodigious quantities of cake and once we had coffee twice on one visit, first on arrival, then again as we left—to make up for not having called earlier in the summer, I suspect.

Everywhere I had been received with such warmth that these people were like old friends. It seemed sometimes as if nearly every family had a near or distant relative in America and our departure made them think of those who had not come back, while the returned Americans got a more severe case of what I called the American disease. They admitted the good things I had to say of Swedish farm life—its progress and contentment, security and modest comforts, but they still said they would like to visit "the U. S." again.

Finally, there were only the family farewells to be made, and, hard as they were, I could leave with the joy of having been made a part of a Swedish home and community.

 Kodachrome by Volkmar Wentzel

MARIEFRED, NEATLY CAMOUFLAGED IN TREES, NESTLES BESIDE LAKE MÄLAREN

Visitors come to this quiet hamlet, 30 miles west of Stockholm, by boat or motor. Usually they are on their way to visit famous Gripsholm fortress, just beyond the town's borders. Until King Gustavus III built a Cavaliers' wing in the old castle, gentlemen of the Swedish court lived in Mariefred's unpretentious inns.

Kodachrome by Volkmar Wentzel

ANTIQUES RUB SHOULDERS WITH MODERN FURNISHINGS IN A FARMHOUSE "FINE ROOM"

Like the old-fashioned parlor, this part of a Swedish home is set aside for special occasions. The table cover, right, is a three-century-old bridal veil. Barrel chairs of log and the tile stove, left, are almost as old. The Dalar clock is another antique. Bed, statuary, picture frames, and hooked rugs are modern.

"YOU SIMPLY MUST SEE MY NEW HAT!"

Old are their costumes, but their talk is of styles, movies, and motorcars. The girls are attendants at Skansen, Stockholm's outdoor museum (Plate IV). Here farm folk preserve traditional folk dances and music. Every Province and every period of Swedish history are represented.

Kodachromes by Volkmar Wentzel

YOUTHFUL DREAMS CENTER IN AN OLD HOPE CHEST

For generations womenfolk in this Swedish girl's family, when they were in their teens, wove and embroidered linens for this same chest. The girl's nimble fingers are busiest during the long winter evenings. Some farm women inherit enough sheets, towels, and other linens to last their lifetime.

Kodachrome by Volkmar Wentzel

YOUNG AND OLD ABRUPTLY HALT WORK IN MIDAFTERNOON—IT'S THE HOUR FOR COFFEE AND SWEDISH PASTRIES

Kodachrome by Volkmar Wentzel

SWEDISH FARM WOMEN INSPECT VEGETABLE-DYED WOOLS IN A GOVERNMENT EXHIBIT

Most housewives will weave their own woolens and linens, because they are better satisfied with their own handiwork. The exhibit is part of a successful educational campaign to obtain pure bright colors in home-woven textiles and to modernize designs and weaving processes.

SMALL DAUGHTERS WAIT AS MOTHERS SHOP IN THE "KONSUM"

Foodstuffs, household goods, and notions make up the stock of this consumers' co-operative store, one of hundreds throughout Sweden. This organization also conducts study circles, attended by 30,000 persons annually, where household and economic problems are discussed.

Kodachromes by Volkmar Wentzel

SHE SCRUBS THE MILK STRAINER UNTIL IT SHINES

Small red homes like this, with their bright flower beds, dot the entire Dalecarlia region. On June 23 nearly every town and hamlet revives the old ceremony of raising the Midsummer Pole, decked with garlands and crowned with blue and yellow, the national colors.

Kodachrome by Volkmar Wentzel

A VILLAGE HOUSEWIFE TAKES HER TURN IN A COMMUNITY BAKERY; ABOVE HER, KNÄCKEBRÖD (CRISP BREAD) HANGS ON POLES

BLOND-HAIRED BOYS AND GIRLS TROOP TO SCHOOL IN BJÖRNÖ

Kodachromes by Volkmar Wentzel

IT'S JELLY-MAKING TIME IN SÖDERVIK WHEN LINGENBERRIES RIPEN

WHERE NATURE RUNS RIOT

On Australia's Great Barrier Reef Marine Animals Grow to Unustual Size, Develop Strange Weapons of Attack and Defense, and Acquire Brilliant Colors

By T. C. Roughley

AUSTRALIA'S Great Barrier Reef is one of the outstanding natural wonders of the world. Largest of all coral reefs, it stretches for 1,250 miles along the continent's northeast coast.

The reef is a region of strange contrasts. Animal life of rare beauty mingles with forms that are ugly and repulsive; giants lie side by side with their pygmy relatives; boldness and ferocity contrast strangely with extreme delicacy and sensitiveness. Nature appears to have thrown discretion to the winds and run completely riot.*

On the way to Heron Islet from the mainland we sighted our first coral isle. It appeared as a low mass of dense vegetation surrounded by a snowy white beach.

Heron Islet is a coral cay about a mile in circumference and is typical of scores of islands throughout the Great Barrier Reef (map, page 827). Each is usually more or less surrounded by an oval rampart which may be many miles in extent and is exposed at low tide. It is amazing to contemplate that all these hundreds of miles of islands and reefs have been built up by tiny animals, the coral polyps, which take lime out of the sea water to form their stony skeletons.

STRANGE CREATURES OF THE CORAL

Of course the most conspicuous feature of the reef is the coral itself, almost infinite in its variety, form, and color. But it is rarely brilliant; rather does it exhibit its beauty in subdued tones, which range the length of the spectrum, and it serves to throw into stronger relief the bright hues of the fishes and clams (see Color Plates).

Yet not all the fishes are beautiful. Indeed, the Barrier Reef harbors one that may rightly be regarded as the world's ugliest fish—and most poisonous, too. Known as the stonefish, it is about as loathsome as any creature on land or in the sea. Its slimy body is just a mass of warty excrescences; its wide, upwardly directed mouth is a sickly green inside; its movements are sluggish and altogether lacking the grace of other fish.

But if Nature has treated it abominably in the way of looks, one can almost imagine that the stonefish has made an effort to retaliate by subjecting to a painful death every living thing that touches it.

13 UNLUCKY SPINES

Along the back are 13 spines, each as sharp as a needle, each provided with two venom glands, each effectively concealed by innocent wartlike coverings.

Normally, these spines lie flat, but the moment they are touched they stand up, erect and rigid. As they penetrate the flesh, the venom is carried along grooves in their sides to enter deep into the punctured wound. The venom is probably a nerve poison; there is no known antidote, and it causes a prolonged agony that is well-nigh unbearable.

Effectively armored and camouflaged as it is, the stonefish makes no attempt to dash for cover at one's approach. Lying still amid the coral and harmonizing with its surroundings in color and contour, it simply waits and watches as if secure in the knowledge of the fate that will overtake those who dare to molest it.

Visitors to the reef can be assured, however, that with heavy soles on their shoes the possibility of poisoning by stepping on a stonefish may be forgotten.

But let us leave this loathsome creature and pass on to a subject more pleasing, the butterfly cod. Many fish are more brilliantly colored than this, but for comeliness and grace none can surpass it.

The butterfly cod is never in a hurry; it moves slowly about with a quiet dignity reminiscent of the peacock. What a contrast is this pride of the pool to the stonefish! Yet both belong to the same family.

If the stonefish is the most horrid fish of the reef; if the butterfly cod is the most beautiful, then the mudskipper, or walking

* See "The Great Barrier Reef and Its Isles," by Charles Barrett, in the National Geographic Magazine for September, 1930, and "Coral Castle Builders of Tropic Seas," by Roy Waldo Miner, June, 1934.

Photograph from J. B. Heape

NOT A TANK! JUST A BIG TURTLE LOOKING FOR A NESTING PLACE

Out of the sea and up to the top of Heron Islet beach the giant laboriously makes her way. Islanders follow the corrugated tracks when they search for the eggs, which they eat. Sometimes 200 of the leathery eggs, 1½ to 2 inches in diameter, are found in one buried nest (page 826).

fish, is surely the most interesting and comical. Interesting, because it lives more out of water than in it; comical—well, if you saw a fish staring at you intently with one eye elevated above its head while it moved the other in all directions in search of prey, you would doubtless class it as ludicrous (page 828).

WHEN FISH GO WALKING

The mudskipper is found on those islands, such as Low Isles, east of Port Douglas, where mud flats are uncovered at low tide. Then scores of these small fish may be seen on the surface, and even a foot or two above it, clinging to the sloping roots of the mangroves.

If undisturbed, they move about slowly with a rowing motion of the pectoral (side) fins, which are strong, flexible, and fleshy at their bases; thrusting them forward, they lever the body along aided by a pushing motion of the pelvic fins. But if they are frightened, they skip over the surface of the mud and the water with surprising agility.

I have a lasting recollection of a day when from Cairns I journeyed to a mangrove-fringed mud flat to secure specimens of these fish. No net was available, but I was under the impression that mudskippers would be very clumsy out of water and that their capture by hand would be easy.

Wearing high rubber boots, I entered the mud and sank below the knees in the oozy slime. Dragging each leg alternately with the help of both hands, I made after my quarry, which abounded everywhere.

The little creatures seemed to be playing a game. They would remain motionless till I was within a foot or two. Then, just as I thrust out my hand, they would skip away and flop into a shallow pool or down a crab burrow.

These small pools were only two or three inches deep and I expected to scoop the fish out easily, but they were never in the pools

Photograph from J. B. Hoops

FLESH, FAT, AND FLIPPERS MAKE DELICIOUS GREEN-TURTLE SOUP

Turtle steaks, tender as young veal and somewhat like it in flavor, will supply a second course for dinner. Fifteen years ago thousands of cans of turtle soup were packed annually along Great Barrier Reef. Today the business is unprofitable and has been abandoned.

when I got there. Thinking they perhaps hid in the mud just beneath the surface, I bailed out whole handfuls of it in quick succession, but never was a fish to be found there. They are apparently as agile in the mud as they are above it.

At last, after about an hour, when I was perspiring, panting, and nearly exhausted, one of them left its run a little too late, and the game was over.

Why is it that this, a true fish, can live for such long periods out of water when ordinary fishes quickly suffocate? Of course there are species called "lungfish" in which the air bladder has been modified to function as a lung; but the mudskippers do not possess lungs. The explanation in their case lies in the enlarged cavity behind and above the gills. Since it encloses air as well as water, the surrounding tissue is able to absorb oxygen from the air.

While on the subject of extremes, we may as well consider the laziest fish on the reef, the suckerfish, or remora, which I suppose may be classed as the laziest fish in the world. It is widely distributed in tropical and warm temperate seas.*

REMORA, THE HITCHHIKING FISH

Although a fairly strong swimmer, well able to forage for itself, this loafer prefers to cling to the skin of other animals, such as sharks and turtles, and get carried about without any effort of its own, lunching off the scraps that its larger host overlooks.

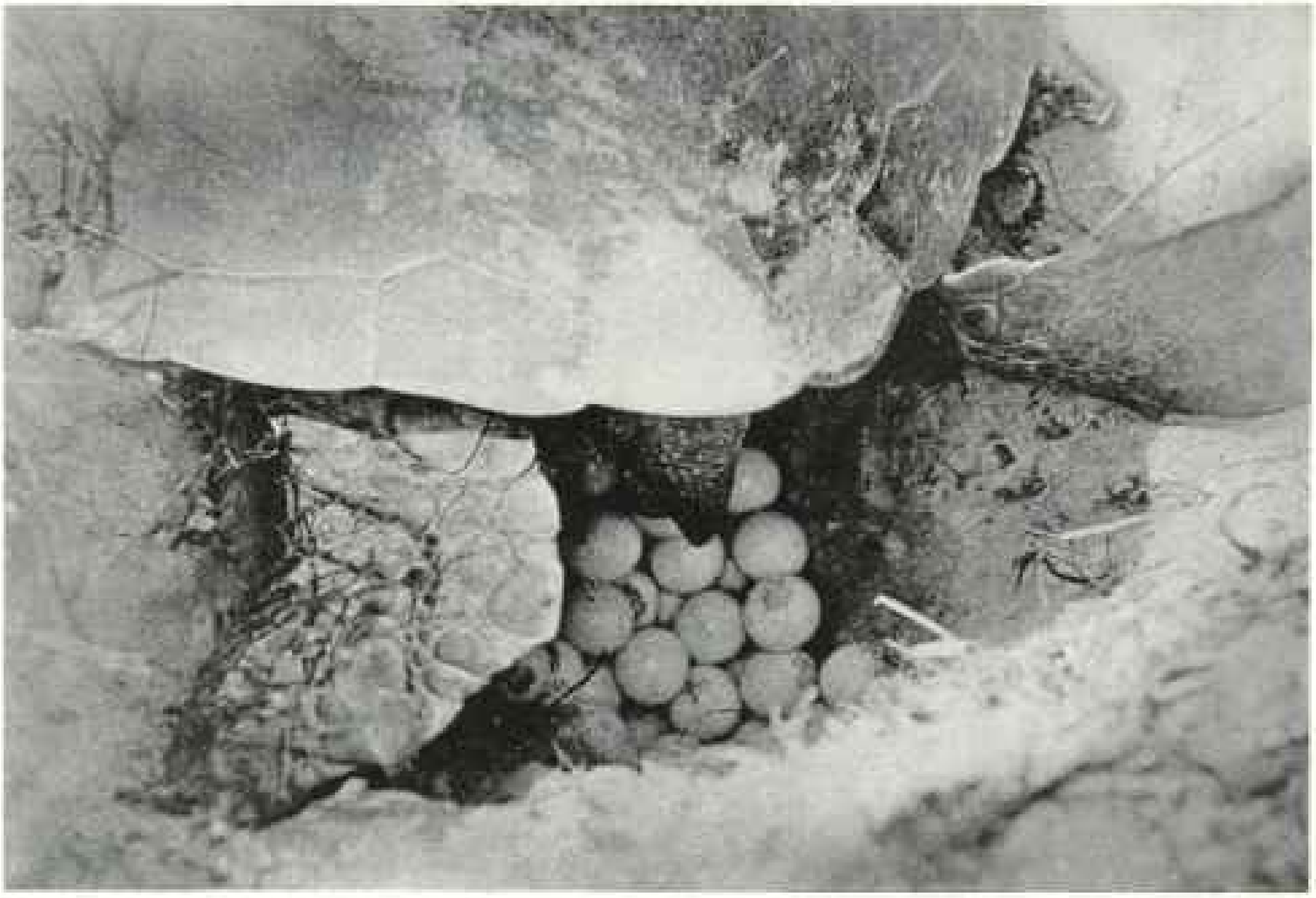
The suckerfish, long and narrow, grows to a length of three or four feet: on top of its head is an elongated oval disk, an extraordinary modification of the dorsal fin.

When a suckerfish attaches itself to a turtle, shark, or other large fish, it depresses the base of the disk and so creates a partial vacuum which forms an extremely powerful attachment. The fish can free itself without effort by swimming forward,

* See "Interesting Citizens of the Gulf Stream," by John T. Nichols, NATIONAL GEOGRAPHIC MAGAZINE, January, 1921.

Photograph by Otho Webb

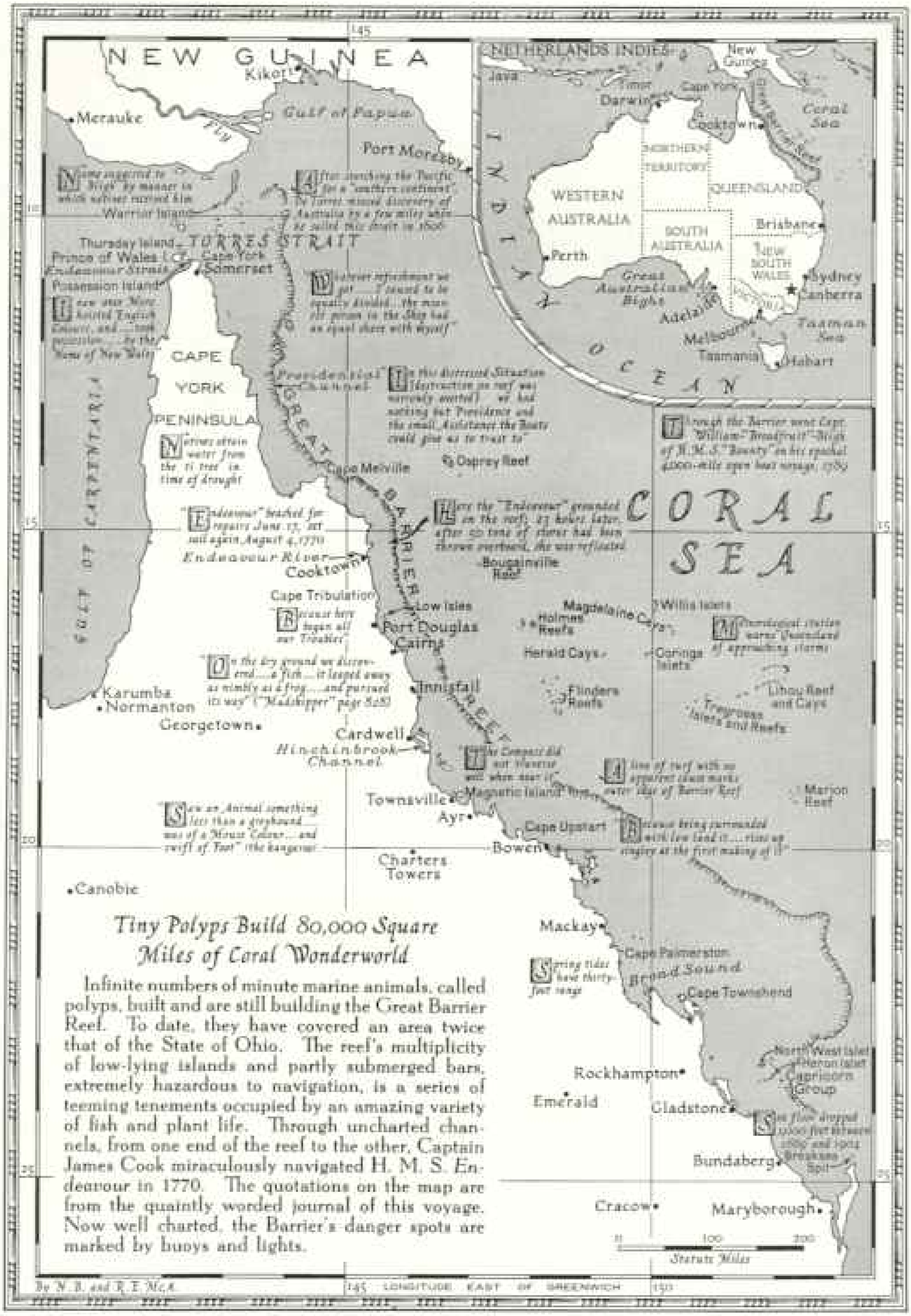
UP THE BEACH COMES A BLACK ROCK COD, A RELATIVE OF THE QUEENSLAND GROUPER



Photograph by Miss Hilda Geiermann

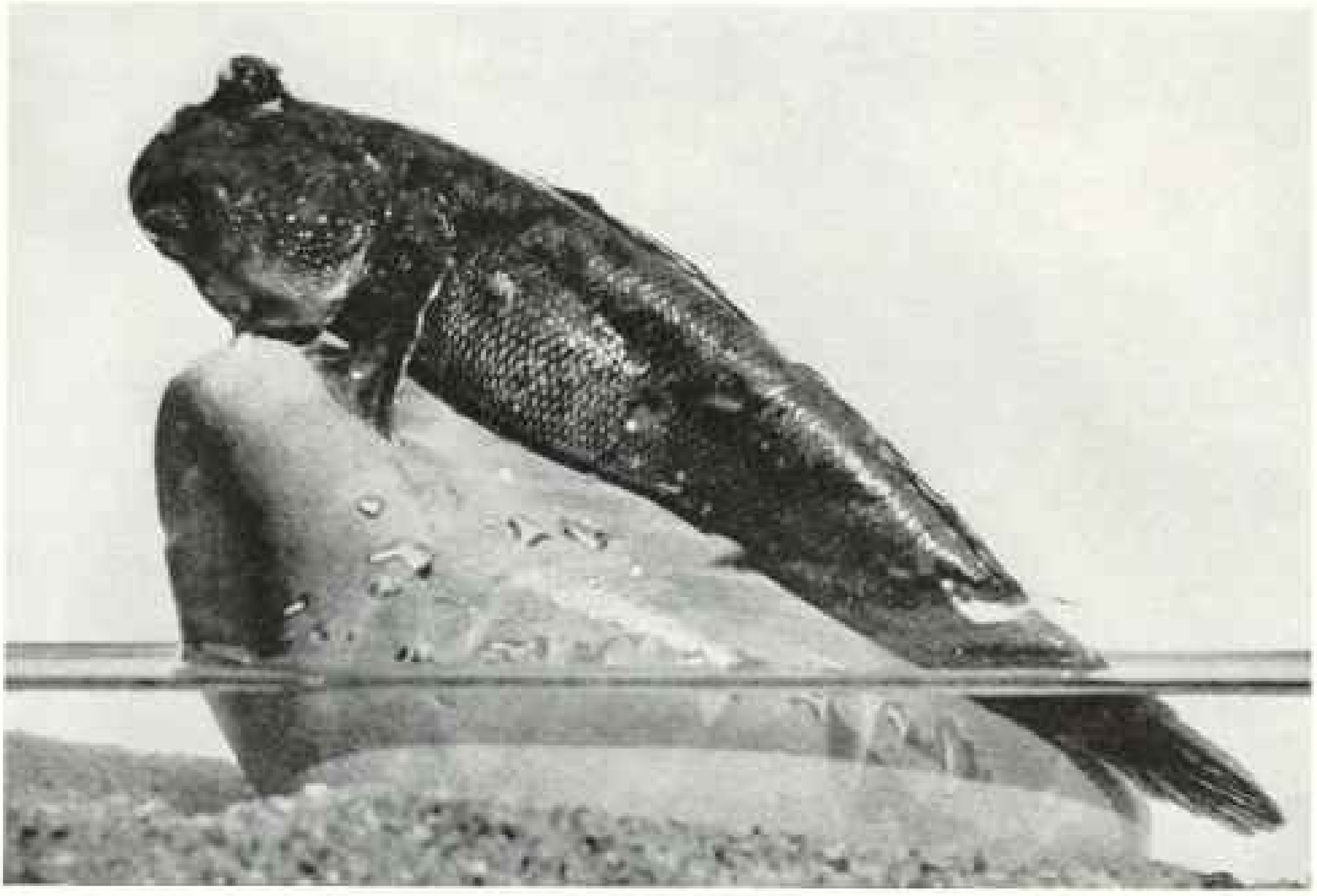
A GREEN TURTLE RAPIDLY DEPOSITS "PING-PONG BALL" EGGS BY THE DOZEN

Resting in the sand, the female scoops out a hole about a foot deep. Here her rear flippers have been drawn aside, revealing the eggs and ovipositor. After laying, she covers the setting with sand and departs. The young make their way alone to the sea. Many fall prey to gulls.



Tiny Polyps Build 80,000 Square Miles of Coral Wonderworld

Infinite numbers of minute marine animals, called polyps, built and are still building the Great Barrier Reef. To date, they have covered an area twice that of the State of Ohio. The reef's multiplicity of low-lying islands and partly submerged bars, extremely hazardous to navigation, is a series of teeming tenements occupied by an amazing variety of fish and plant life. Through uncharted channels, from one end of the reef to the other, Captain James Cook miraculously navigated H. M. S. *Endeavour* in 1770. The quotations on the map are from the quaintly worded journal of this voyage. Now well charted, the Barrier's danger spots are marked by buoys and lights.



Photograph by T. C. Roughley

WITH ITS TAIL IN THE WATER, THE "TREE-CLIMBING" FISH CAN ESCAPE IN A FLASH

The mudskipper often clambers up on the stiltlike roots of mangrove trees, or perches on a rock, tail submerged, to bask in the sun. When the fish skitters over the mud flats of Great Barrier Reef, it is difficult to catch, as the author discovered (page 824). The mudskipper breathes through a primitive "lung" which admits air as well as water into the gill cavities.

but if an attempt is made to remove it by pulling from behind, so secure is the adhesion that the flesh of the fish is likely to tear apart before the disk is detached.

CATCHING A TURTLE WITH A LIVING FISHHOOK

But the chief interest in the suckerfish lies in the fact that it has actually been used by natives as a means of catching larger fish or turtles.

The aborigines of the Barrier Reef, on sighting a turtle, threw a suckerfish overboard with a line attached, first rubbing the disk with sand or the hand to stimulate its instinct for attaching itself.

After the suckerfish had clamped onto the turtle, it could not release its hold so long as the line was kept taut. The size of the fish or turtle that could be captured by this means was limited only by the strength of the line and the breaking strain of the fish itself. A turtle weighing forty pounds has been lifted off the ground by gripping a suckerfish attached to it.

If a suckerfish cannot find a host for its attachment, it is forced to forage for itself, and this it is well able to do. It frequently takes the bait of anglers fishing on the reef, and it is not uncommon to find it attached to the bottom of a launch where it gathers its food by scavenging among the scraps thrown over the side.

A different method of obtaining food is that adopted by the angler fishes sometimes taken on the reef as well as in other parts of the world.

On the top of the head behind the capacious mouth is a stiff rod from which dangles one or several appendages that in some species resemble raw meat. The angler, like the stonefish, squats (no other term so adequately describes its posture) on a rock in a well-camouflaged spot.

A small fish espying the juicy meal, alive and kicking, rushes toward the lure only to discover too late that it has suddenly vanished. In an instant the victim finds itself inside the angler's capacious jaws, whence there is no return. The angler, as its prey approaches the lure, quickly drops the rod along its back and with a snap of its jaws engulfs the victim.

On the Great Barrier Reef the huge,

Photograph by Capt. Frank Hurley

FROM THE BOWSPRIT HE AIMS A HARPOON AT A "MERMAID"

Great patience and dexterity are required, for the dugong is wary and shy (page 843). Once Torres Strait islanders locate a herd, the boat is quietly steered toward it. As an animal rises to breathe, the strike is made. A mad splash, rush, and struggle follow. When the dugong tires, a second harpoon is hurled, ending the battle. Favorite food of the islanders, dugong flesh resembles pork or veal (page 830).

flat, and cumbersome devil ray may reach upward of 15 feet in width and perhaps a ton in weight. It swims by an up-and-down movement of the expansive pectoral fins, or "wings" as they are usually called. When the creature swims at the surface, the wing tips may be seen to project at each upward sweep; these triangular tips are frequently mistaken for the fins of sharks, but the even breaking of the surface in pairs soon dispels the illusion.*

The devil ray is perfectly harmless, its food consisting of small forms of animal life. It does not even possess a barbed spine on its tail, as do most of the sting rays; but it was held in dread by the ancients, who were under the impression that it would wrap its fins around a man and squeeze him to death.

UNROMANTIC "MERMAID" OF THE REEF

The mermaid has existed in man's fancy ever since he went down to the sea in ships, and many were the enchanting tales of these beautiful maidens.

It is now believed by some that the dugong, seen by sailors languishing in a tropical sea on a moonlight night, perhaps clasping a baby to its breast, may have fired the imagination of the more impressionable.

In extenuation it must be remembered that in those days of slow sailing ships the sailors were a long time away from home. But, even so, an intimate glimpse of a dugong's face would indicate that these adventurers were gifted with an imagination beyond the ordinary (page 843).

The dugong, found also in the Indian Ocean and other waters, occurs throughout the whole length of the Great Barrier Reef, where it is usually known as—a siren? a Nereid? a sea nymph? None of these; it goes by the matter-of-fact name of "sea cow." Is our romance altogether dead?

Its color varies from a reddish gray to olive green. It swims by means of the powerful horizontal tail, possibly aided by the pair of flippers that spring from the shoulders and correspond to the fore limbs of land mammals. Of the hind limbs there is no external trace.

If in the summer time you sail over the blue waters of the Barrier Reef, it is not unlikely that from the distance a coral island will appear as if surmounted by a black cloud, while a peculiar faint murmuring reaches your ears.

SEA BIRDS GATHER IN MILLIONS

Gradually, as you approach more closely, the dark cloud resolves itself into an enormous number of birds wheeling and turning as they flutter over the treetops, and the murmuring increases to a raucous, screeching din. You have arrived at an island where terns are breeding. The birds you have seen are probably sooty terns, also called "wide-awakes," the most active of the many species inhabiting the reef.

During the colder months sea birds are widely distributed over the Pacific Ocean, but spring calls them to the islands of the Barrier Reef for mating and nesting. Their numbers are enormous. At North West Islet, in the Capricorn Group, which is only about two and a half miles in circumference, breeding shearwaters, or "muttonbirds," have been estimated by various authorities to number between one and two millions, while the population of the noddy terns nesting at the same time has been placed at about half that number.

Now, these are not small birds; the muttonbird is about the size of a small duck and the noddy tern about the size of a pigeon. It can readily be imagined, therefore, that the muttonbirds, which burrow in the soft, sandy soil, occupy almost every square foot of the island, and the noddies, whose nests are built in trees, use every available branch. A terrific din arises from the island as thousands upon thousands of birds make love.

ANT BABIES USED AS LIVING SHUTTLES

On many of the islands of the Great Barrier Reef you may frequently come across a mass of tangled leaves united at their edges to form a bundle perhaps as big as a football. You have called at the residence of one of the most amazing insects in the world, the green tree ant, or tailor ant.

For pugnacity, for tenacity, for industry, this handsome vivid-green ant probably holds pride of place.

If you would care for a little first-hand knowledge, knock on its front door. One after another the ants will dash out; one after another they will fall on you, on your neck, on your head, on your hands, and with a vicious jab bury their jaws up to the hilt—and stay there.

* See "Devil-Fishing in the Gulf Stream," by John Oliver La Gorce, NATIONAL GEOGRAPHIC MAGAZINE, June, 1919.

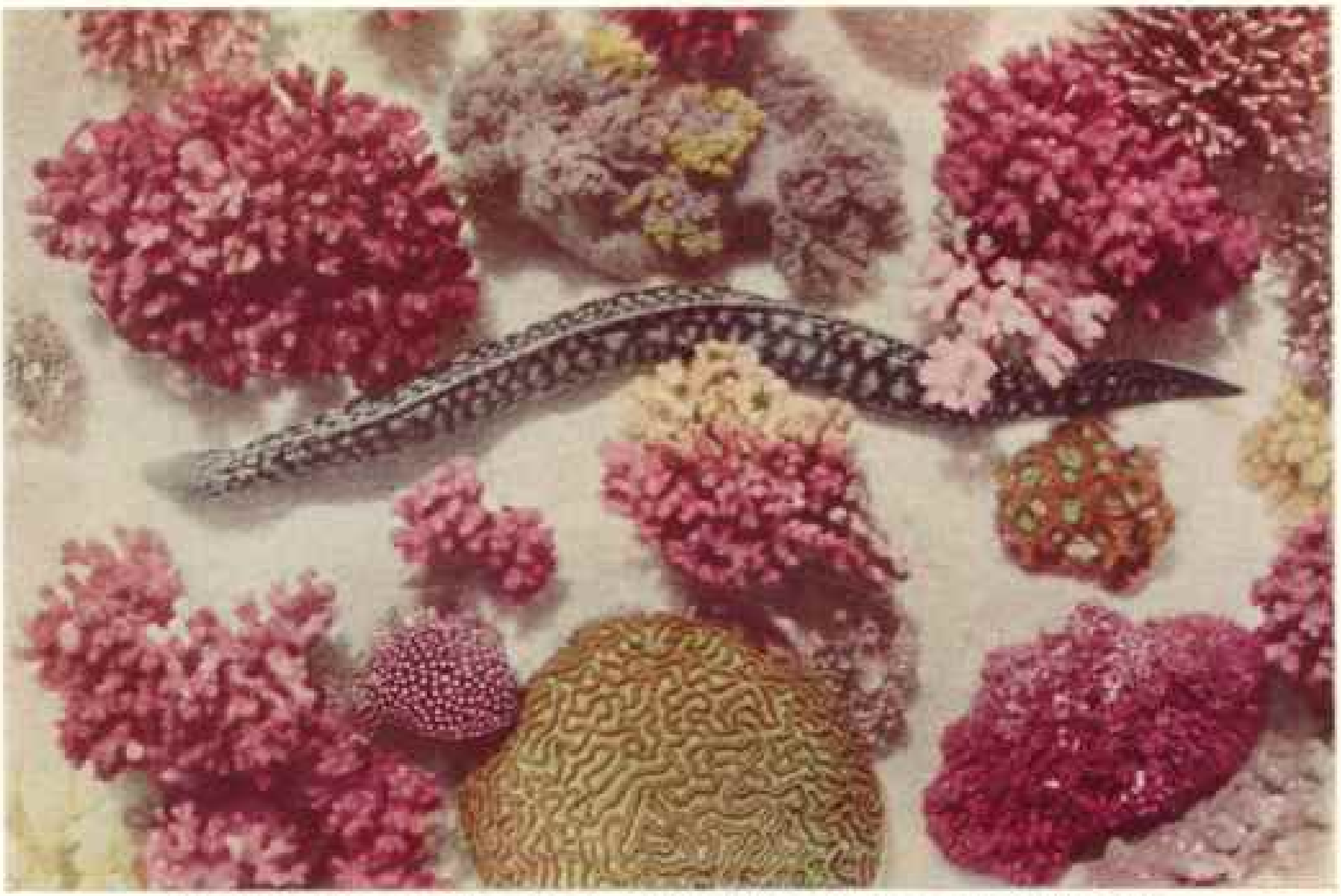
GLIMPSING THE MARVELS OF AUSTRALIA'S GREAT BARRIER REEF

For 1,000 miles this immense formation extends along the northeastern coast of the continent "down under," enclosing an intricate maze of fantastic growths, islets, and shoals. The vast expanse of more than 80,000 square miles, much of it uncharted, is the largest coral reef in the world.

Autochromes Lumiere by T. C. Roughley

WITH A BALLET DANCER'S GRACE, THE SEA SLUG FLUTTERS ITS RICH CLOAK

Brilliant edges of the mantle flow and undulate as the gaily-hued nudibranch glides through the waters of Great Barrier Reef. The life-size photograph, made while the naked mollusk was alive, has caught all the original beauty and coloring.



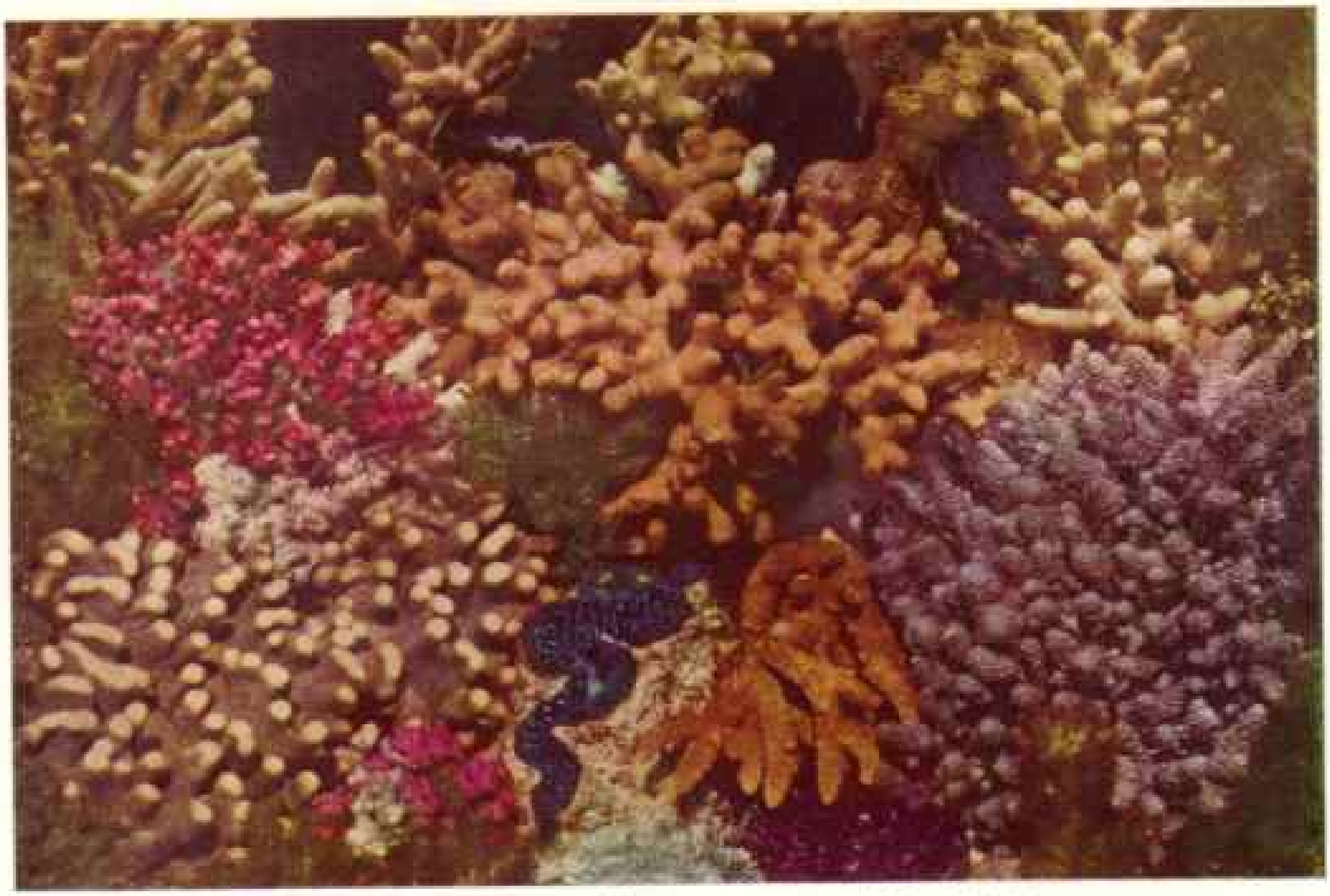
NEPTUNE DISPLAYS "COSTUME JEWELRY" IN A SHALLOW CORAL POOL

A reef eel, stretched at ease in the warm water, resembles an ornamental pin for milady's gown. All about are fantastic polyps, which measure up to Dame Fashion's latest whims in brooches.

© National Geographic Society Autochromes Lumière by T. C. Knubley

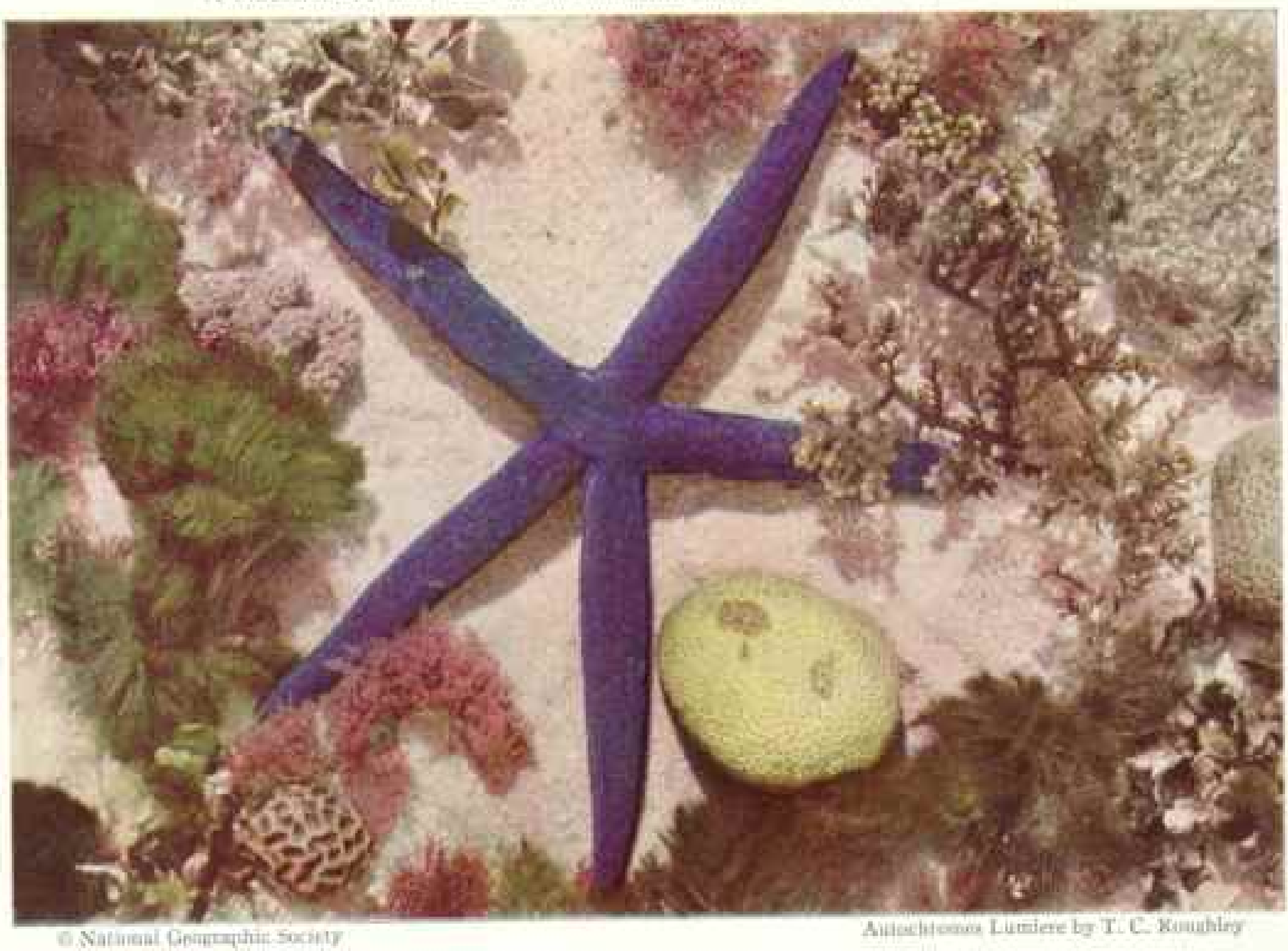
HUMBLE CLAMS DON SINUOUS MANTLES OF OLIVE GREEN OR MIDNIGHT BLUE

Great Barrier Reef teems with clams. Some wear cloaks of rich purple, fawn, or brown, or mottled combinations of such hues, intermingled with solerer tints. All have the appearance of softest velvet.



MULTIHUED "SHRUBS" EMBELLISH A CORAL GROTTO

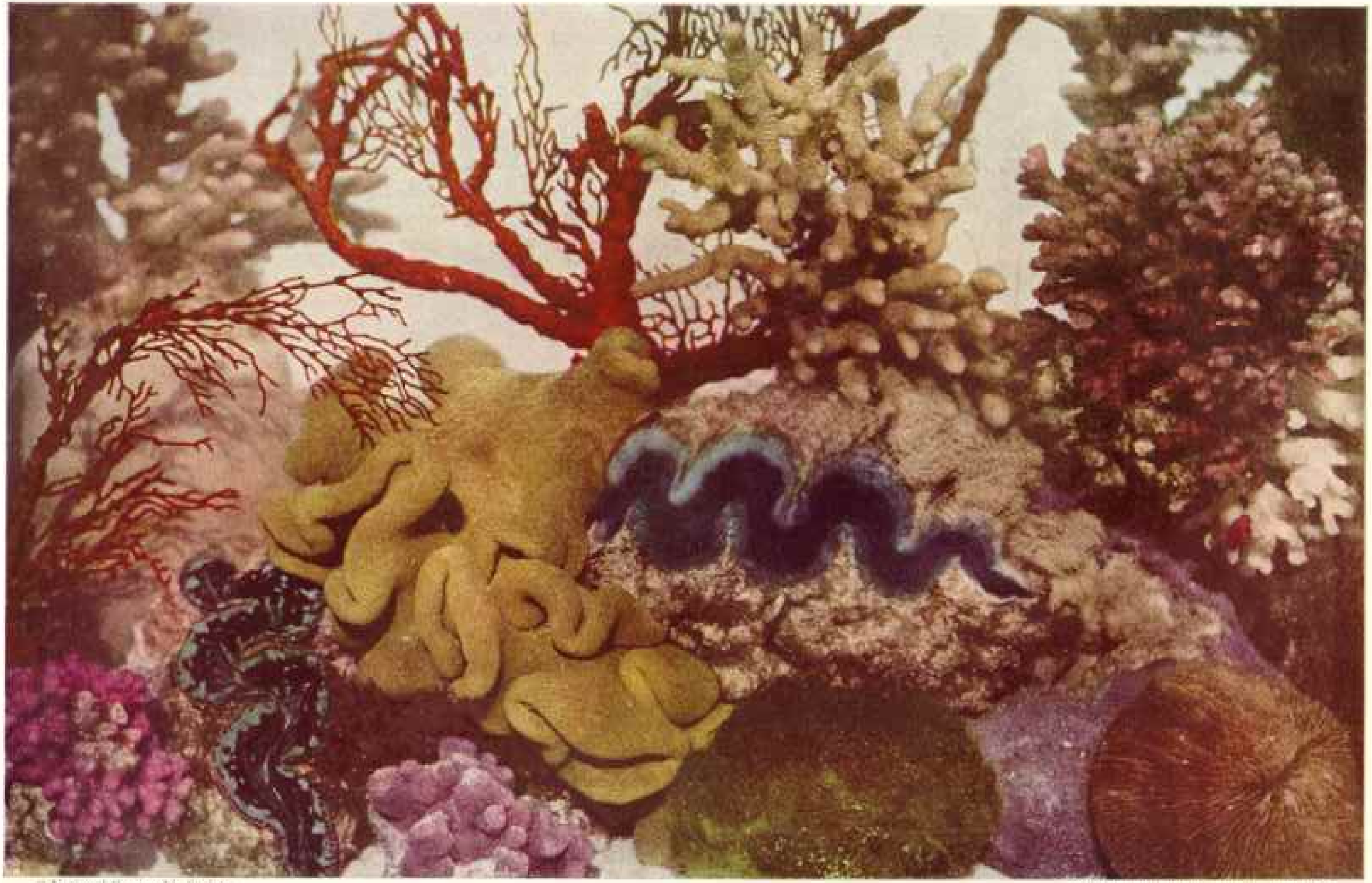
Pale green stems are tipped with "buds," apparently about to burst into bloom. Shapes and colors are limitless. A blue-cloaked clam rests in the miniature undersea "forest" (lower center).



Autochrome Lumiere by T. C. Knubley

SLUGGISHLY THE SEA STAR CRAWLS ALONG THE SAND ON SUCTION TUBE FEET

Junction of the five long arms forms the small body. Unlike other starfish, this blue member of the family, shown at one-half its natural size, comes into the open during daylight.



Autochrome Lumière by T. C. Roughley

NATURE BUILDS A SURREALIST CORAL GARDEN ON THE BOTTOM OF THE SEA

Here, outside Great Barrier Reef, in placid water twenty to thirty feet deep, churning waves never batter the coral and the air does not exert its retarding influence. As a result, the growths reach a size and profusion not attained in shallow lagoons.

MOVING DAY IS FORCED UPON A RED HERMIT CRAB

The author took the big "beachcomber" from a bailer shell, into which it had wedged its shell-less abdomen. From birth to death, the hermit crab changes homes frequently, moving into larger quarters as it grows.

Autochromes Lumiere by T. C. Roughley

IN A BORROWED FORTRESS, THE HERMIT CRAB FEELS SECURE

Soft abdomen is firmly wedged into a false helmet shell. Big, strong nippers protect against frontal attacks. Grotesque and comic contortions accompanied the crab's efforts to push its way into the haven in reverse gear.

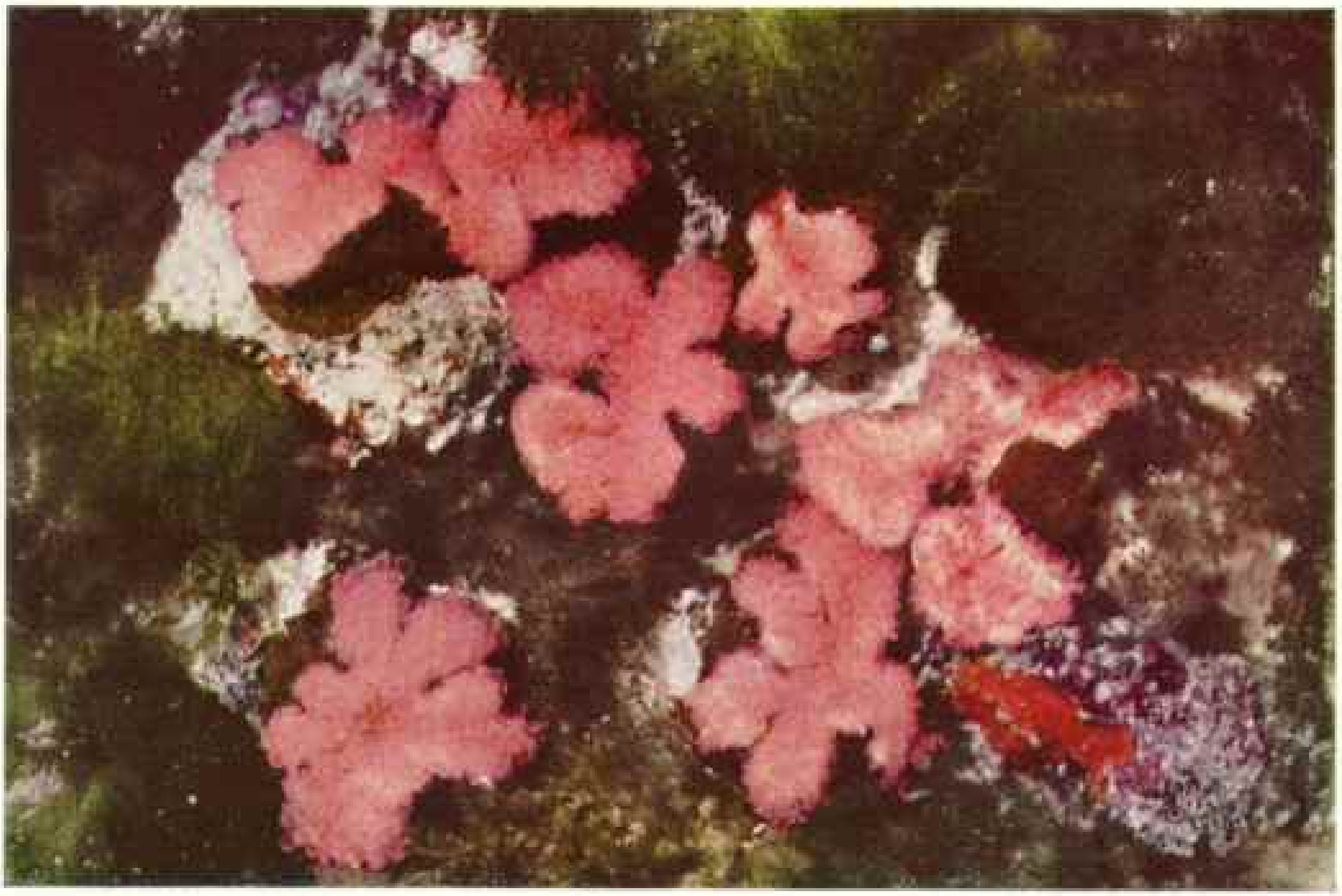
"SOFT" CORALS RESEMBLING GIANT WARTS BASK IN A GARDEN OF SEAWEEDS

Expansive surfaces of the alcyonarians are finely pitted and leathery in texture, with convoluted or folded edges. These creatures are unable to develop the lime which gives the hard coral its rigid supporting skeleton.

 Anemonium Lumiere by T. C. Roughley

NOT A PURPLE CHRYSANTHEMUM, BUT A SEA ANEMONE

These "flowers" of Great Barrier Reef really are animals. Dainty "petals" are tentacles, reaching out for food. Soft and fleshy bodies, usually cylindrical in shape, anchor themselves to the surface of rocks.



STINGING CELLS IN THE "PETALS" OF THE SEA ANEMONE PARALYZE ITS PREY

Batteries of darts stun unwary shrimps and other small marine creatures. The helpless "catch" then is passed from tentacle to tentacle, into the "sea flower's" wide-open mouth.

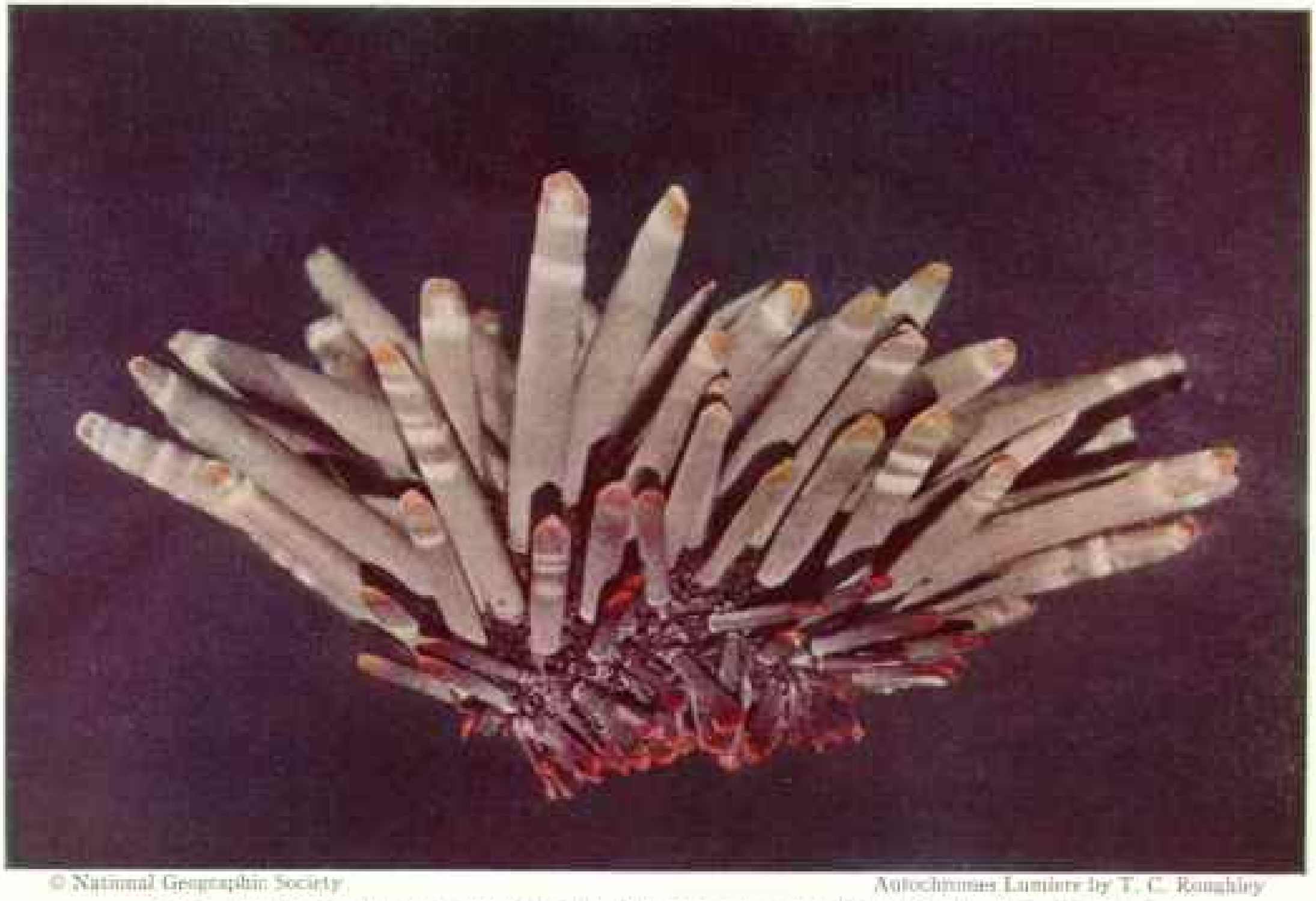
 Autochromes Lumière by T. C. Roughley

SOFT AS THISTLEDOWN, AN ANEMONE BASKS NEAR A LEATHERY SEA STAR

Myriad starfish vary from less than an ounce to several pounds, and from a diameter of less than an inch to more than a foot. If a sea star is cut in half, each part can develop into a complete creature.

LIKE ITS NAMESAKE, THE MANTIS SHRIMP IS A HYPOCRITE

Nippers poised in reverent attitude bear a strange resemblance to those of the praying mantis. When the claws strike with lightninglike rapidity at their prey, folding together like blades of a pocketknife, all appearance of piety and devotion vanishes.



 Autochromes Lumière by T. C. Roughley

ARMATURE OF STUBBY SPINES PROTECTS THE SLATE-PENCIL SEA URCHIN

Small fish sometimes seek safety among the "pencils," which are strong and bluntly pointed. The almost invulnerable creature crawls about slowly on tube feet, aided by the spines, which work on ball-and-socket joints under muscular control.

Why all this fury? What is there about this insect's home that it takes such pains to protect?

If you are patient—and careful—you may be fortunate enough to see the industrious creature at work. It has eggs and young ones to protect; it must make them snug and comfortable, and provide them with shelter from the rain, and it accomplishes this by joining many leaves together.

A close examination of the nest will reveal that the leaves are all firmly bound with a fine but strong silk. But these ants are unable to produce silk. Whence, then, do they obtain it? From the babies, which they use as a weaver uses a shuttle.*

When active nest-building operations are in progress, a whole army of ants will line up on the edge of a leaf. Gripping it securely with their legs, they stretch up and seize another leaf in their jaws. All heave together and draw the leaf down till it is close to the one they are standing on. Other workers rush to the nursery, grab the young ones around the middle with their mouths pointing forward, and hurry back.

Now, these larvae are ready to secrete from their mouths a sticky fluid which hardens on exposure to air and is woven into a silky cocoon; in this they would lie till they were ready to develop into adult ants. But the secretion is valuable to the community for other purposes. The adult ants jab the mouths of the babies against the edge of the upper leaf, then against the lower leaf, uniting the two by a silky thread; again and again they thrust the baby upward and downward to weave a fine web which forms a union between the leaves.

When this living shuttle is exhausted of its supplies, the ant rushes back to the nursery, dumps it down without ceremony, and, grabbing another, returns to its task, using baby after baby till the job is completed.

To draw the leaves together, the ants often form living chains, or hauling ropes, then heave in unison.

THE SPIDER THAT "FISHES"

I wonder what the average angler would say if he were offered a bait which not only attracted fish from far and near, but so tenaciously stuck to them as soon as it touched them that they could be hauled in without chance of escape. Of course he wouldn't believe it, but there is a spider occasionally found on some of the islands of the Great Barrier Reef which "fishes" in just that manner.

This spider, which goes under the name of the "queen of the spinners," or the "magnificent spider," spins at night a tightrope between two branches of a tree and from this it hangs suspended. It then lets down a fine but strong thread, at the end of which is an extremely sticky globule with perhaps one or two smaller ones a little higher on the line.

Holding the line with one of its front legs, the spider waits and watches. It usually has not long to wait, for there appears to be some irresistible attraction for certain moths in that lure. One comes fluttering along, and at its approach the spider whirls the line and the bait most frantically, for some reason. Perhaps the moth, like many fish, prefers a moving bait. In any event, the lure proves too strong; the moth touches it and sticks fast.

As soon as the moth is trapped, the spider hauls up its line, injects a drop of deadly venom, tidily binds its prey into a compact bundle, and quietly begins its meal; or the "fisherman" may rebait the line and continue fishing.

BEWARE THE BRISTLE WORM

After a few days' exploration of the reef at Heron Islet, the tip of the index finger of my right hand became numbed following an aggravating irritation. This puzzled me greatly, for I had handled no specimens except with thick leather gloves.

Then one day I was on the reef with Captain Poulson, who leases the island, and on turning over a stone I came across a worm about a foot long. I had handled hundreds of apparently similar worms on the coast of New South Wales where they are used extensively as bait. Grasping this one lightly between my gloved fingers, I threw it across to Captain Poulson, telling him to keep it for bait (page 841).

"You are not asking me to pick that up, are you?" he replied.

"Why not?" I asked. "It's wonderful bait."

"I'm not touching that," he said. "It's a mass of prickles."

Taking off my glove, I found hundreds of fine white spines embedded in the tip of my index finger; the leather glove had offered no resistance to them at all. If there is anything in the world sharper than the

*Tailor ants are found throughout the Old World Tropics. See "Stalking Ants, Savage and Civilized," by W. M. Mann, NATIONAL GEOGRAPHIC MAGAZINE, August, 1934.

Photograph by T. C. Roughley

THIS EIGHT-ARMED OCTOPUS WILL SOON BE GOOD FISH BAIT

The Australian tribesman speared the bulgy-eyed creature as it lurked in a pool, on the lookout for passing fish and crabs. To catch its prey, the octopus whips out its long arms and "hooks" the victim with its suckers. Then the quarry is dragged into the den and bitten to death with the parrotlike beak (page 842).

bristles of this worm I would like to see it, but please hand it to me on a plate. The tip of my finger remained partially numbed for six weeks.

BATHERS RIDE SWIMMING TURTLES

Turtle riding is regarded as one of the attractions of the reef during the summer months, when the females come ashore to lay their eggs (pages 824 and 826). As they make their way back toward the sea, huge turtles weighing several hundred pounds may be seen carrying riders of both sexes.

It is easy enough to ride a turtle over sand, but to retain your seat when the creature reaches the sea is another matter. You must keep its head above water by sitting well aft; otherwise it will plunge below to your complete discomfiture and the delight of your fellows.

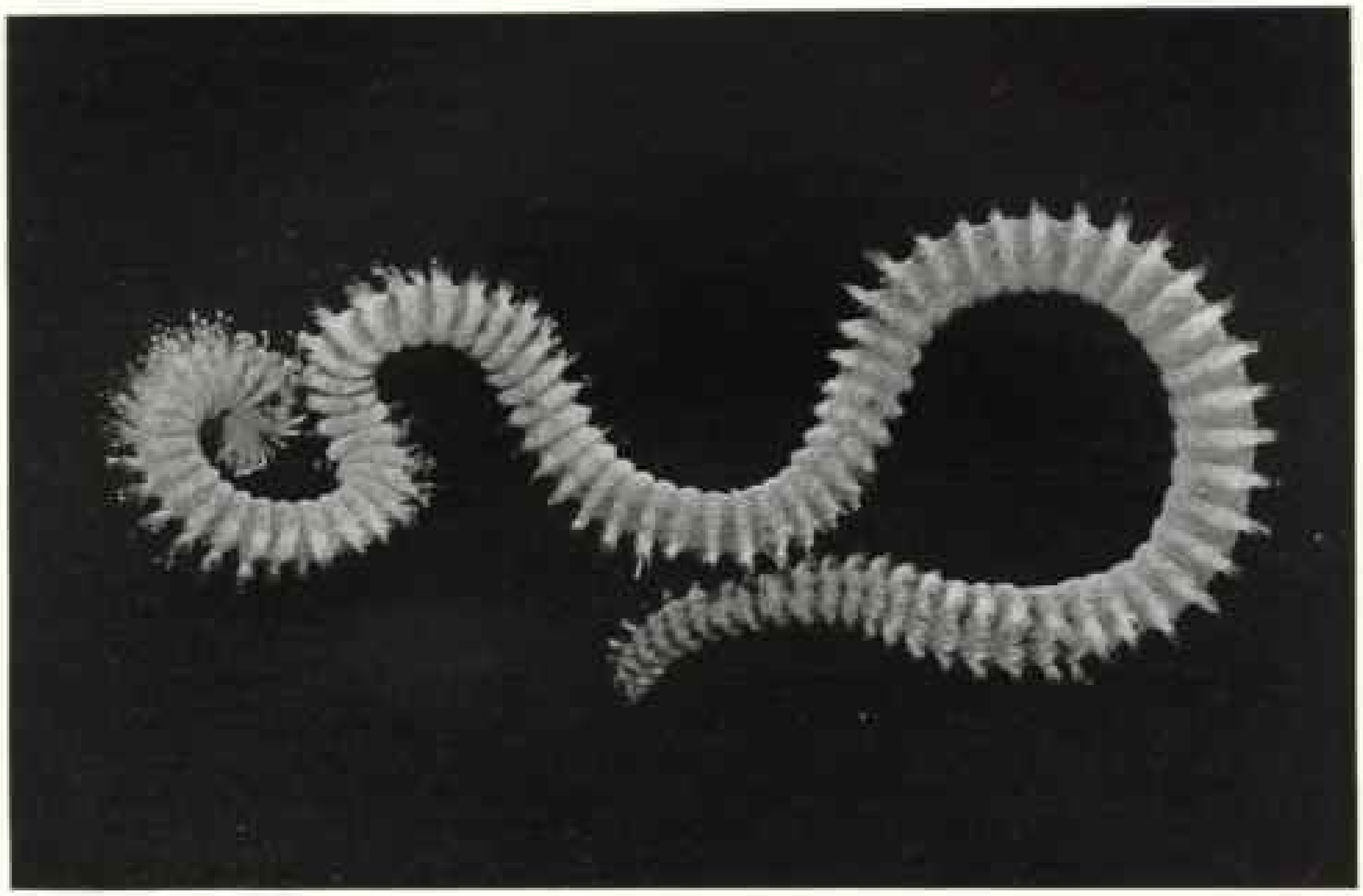
REGIMENTS OF SOLDIER CRABS

And then there are the crabs—giant crabs, pygmy crabs, hermit crabs (Color Plate V), crabs that feign death, crabs that cultivate gardens on their backs by way of camouflage.

Consider the soldier crabs. It is not necessary to seek these creatures in the water, for whole armies of them may at times be found on the sand when the tide is out. Armies? Yes, the name "soldier crab" has been bestowed because of their habit of marching in formation. In battalions they march, now in line, now in mass formation, swaying and turning like an army at exercises.

But when you approach them you promptly find their maneuvers are a sham; their morale is shattered in an instant and they retreat like a disordered rabble, each for himself and the devil take the hindmost. If those in front move too slowly, then those behind climb over them until the retreat becomes a confused mass of crabs.

Without shot or shell, their numbers dwindle rapidly until, if the pursuit is carried far enough, not a single crab of the thousands remains. They have dug themselves in. And what diggers! Reaching a spot where the sand is wet, they disappear like magic; digging with the legs of one side, they burrow like a corkscrew into the sand in a few seconds.



SPINY ARMOR OF THE BRISTLE WORM CAN PIERCE LEATHER GLOVES

Once the author picked up one of the worms on the reef at Heron Islet. Later, when the index finger became irritated, he removed his glove and found hundreds of fine, white, needle-sharp spines embedded in his finger (page 859).

Photographs by T. C. Roughley

CLAMS FIND HAVEN IN THE UPPER SURFACE OF A BRAIN CORAL

These six-inch clams with brightly colored mantle edges are found nearly everywhere on Great Barrier Reef. In their earliest stages of growth they are free-swimming. Later they attach themselves to the hard surface of the coral.

A deadly enemy of crabs is the octopus. Lurking in crevices, this sly and crafty creature waits patiently for a crab to pass his way; a long arm shoots out and the struggling crab, stuck fast to the suckers that stud its lower surface, is dragged into the den. I have several times seen fights between octopuses and crabs, and the octopus always won.

One of the crab's interesting relatives is the mantis prawn, or mantis shrimp, as it is frequently called (Plate VIII). This fierce and active creature gets its name from the resemblance of its claws and the manner of their use to those of the devout but hypocritical praying mantis. Its claws fold together like the blades of a pocketknife.

These claws or nippers strike with lightninglike rapidity and their power is remarkable. Once when I was about to photograph a six-inch specimen in a dish of water, I touched the front of it with a glass rod to alter its position and it promptly knocked the rod out of my hand. One has been known, when dropped into a glass tube filled with alcohol, to shatter the tube with a blow.

If handled, the creature can inflict a nasty wound. In Bermuda and the West Indies this reputation is responsible for its name of "split thumb." It eats live fish and prawns and is very partial to newly molted crabs. It usually lies inside the mouth of its burrow with its head and claws projecting, ready in an instant to grab an unwary victim.

A GIANT CLAM MAY TRAP A MAN

Widely distributed throughout the northern half of the Great Barrier Reef is the giant clam, easily the largest shellfish in the world (page 849).

The two valves of the shell are pulled together by a central adductor muscle which may measure up to six inches in diameter. With a direct pull between the two valves, the power of this muscle is enormous. Naked divers are reputed to have been trapped by inadvertently stepping between the wide-open shells, which, closing, have gripped their feet as in a vise.

This is entirely possible, for the power of a man is far inadequate to force the shells apart without mechanical aid.

There is no risk of being trapped by a shell that is growing in an isolated situation. Such an object is far too conspicuous. But the identity of older specimens may be lost when covered by an abundance of marine growths and by corals growing up about them. Then it is certainly possible for a barefooted native to step accidentally into the twelve-inch gape of a camouflaged shell.

However, the chances against all these conditions occurring at one time are so great that, in my opinion, the number of fatalities caused by their agency has been greatly exaggerated.

MAROONED ON A REEF

Once during a stay at Heron Islet I had rather an eventful day, which nearly ended in tragedy. A boat party had decided to spend the day fishing on a ground some miles away, and it was arranged that I should be dropped on a reef, which submerges to a depth of several feet at high tide, to do some collecting and to photograph some of the beautiful mauve corals that abound there.

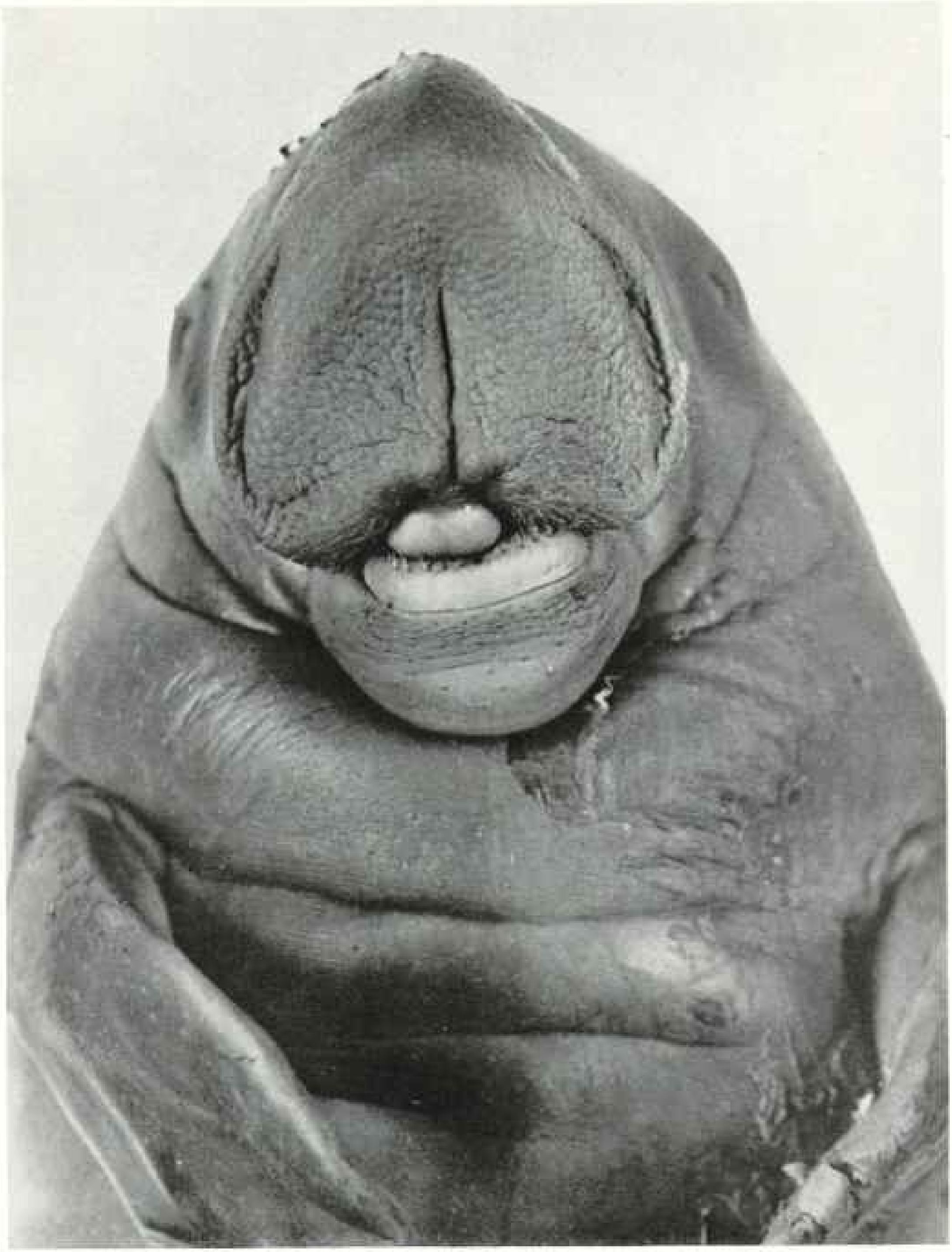
When we arrived the tide was fairly low, and I was rowed ashore in a dinghy. I made for a large niggerhead coral close by and decided to establish this as my base. After landing me, the fishermen left in the launch with the understanding that they were to pick me up later in the day.

I was lying on the edge of a coral pool when I saw, far off, what appeared to be a huge bird jump with outstretched wings high in the air. It was a giant devil ray leaping in panic to escape the attack of some enemy beneath. This was quickly followed by whale after whale, which, leaping and turning, their white bellies flashing in the sunlight, threw up huge clouds of spray as they struck the water with a report like a cannon shot.

The distance was far too great for me to determine the cause, but, although I believe that large sharks will attack whales in these waters, I cannot conceive that such turmoil could have been caused by other than killer whales, which continually harass their larger relatives as they return to Antarctic waters with their calves.*

As the day wore on, the tide began to flow over the reef edge and made further observations impossible. Hastening to my niggerhead base, I arrived just in time to save one of my cameras, resting on a low-lying ledge, from being washed away.

* See "Whales, Giants of the Sea," by Remington Kellogg, NATIONAL GEOGRAPHIC MAGAZINE, January, 1940.



Photograph by T. C. Roughley

AN INTIMATE STUDY OF A "MERMAID"

In early days of sail, seamen mistook the dugong for a mermaid. The bulky animal, lolling in shallow water, suggested a siren or sea nymph when seen at a great distance. But a close-up would dispel the ardor of the most romantic tar. Sailors today call this relative of the elephant a "sea cow" (page 830). It grows to a length of nine feet and often weighs half a ton. Like other aquatic mammals, it must come to the surface to breathe, although its large lungs enable it to stay under water for many minutes. The harmless dugong is a vegetarian and browses lazily on sea grass, abundant in shallow waters of the Tropics.

Photograph from J. R. Heaps

ROPES AROUND THEIR FLIPPERS COAX BALKY TURTLES ASHORE AT HERON ISLET

The big fellows are caught at sea, except during the breeding season. As the boat approaches a swimming turtle, an islander harpoons the quarry, which dives to escape. A man immediately swims down after it, tying a rope to a fore flipper. As the reptile is pulled alongside, other men jump into the sea to help, and the catch is rolled aboard, bottom side up.

Photograph by T. C. Roughley

AN EARLY-MORNING DIP IN THE SPARKLING WATER PRECEDES STUDY ON GREAT BARRIER REEF

Photograph by T. C. Roumbley

A SAND CRAB'S POWERFUL NIPPER WARNS ENEMIES TO KEEP AWAY

Seldom is this wary sentinel seen in the daytime around Great Barrier Reef, for keen-eyed birds would swoop down upon it (page 840). Burrows sometimes extend three or four feet into the sand and then run horizontally for a longer distance. When digging, the crab throws the sand out to form a fan-shaped mound. To keep the home from caving in, it pats the walls with its larger nipper or presses the sand in place with its back.

Photograph by Otho Welsh

AN ARDENT COLLECTOR HUNTS REEF TREASURES, RAIN OR SHINE

Dipping deep into a pool, he finds brilliant coral specimens. Many formations near the surface are dull in color, because exposure at low tide to sun and air soon kills the coral.

Photograph by T. C. Roughley

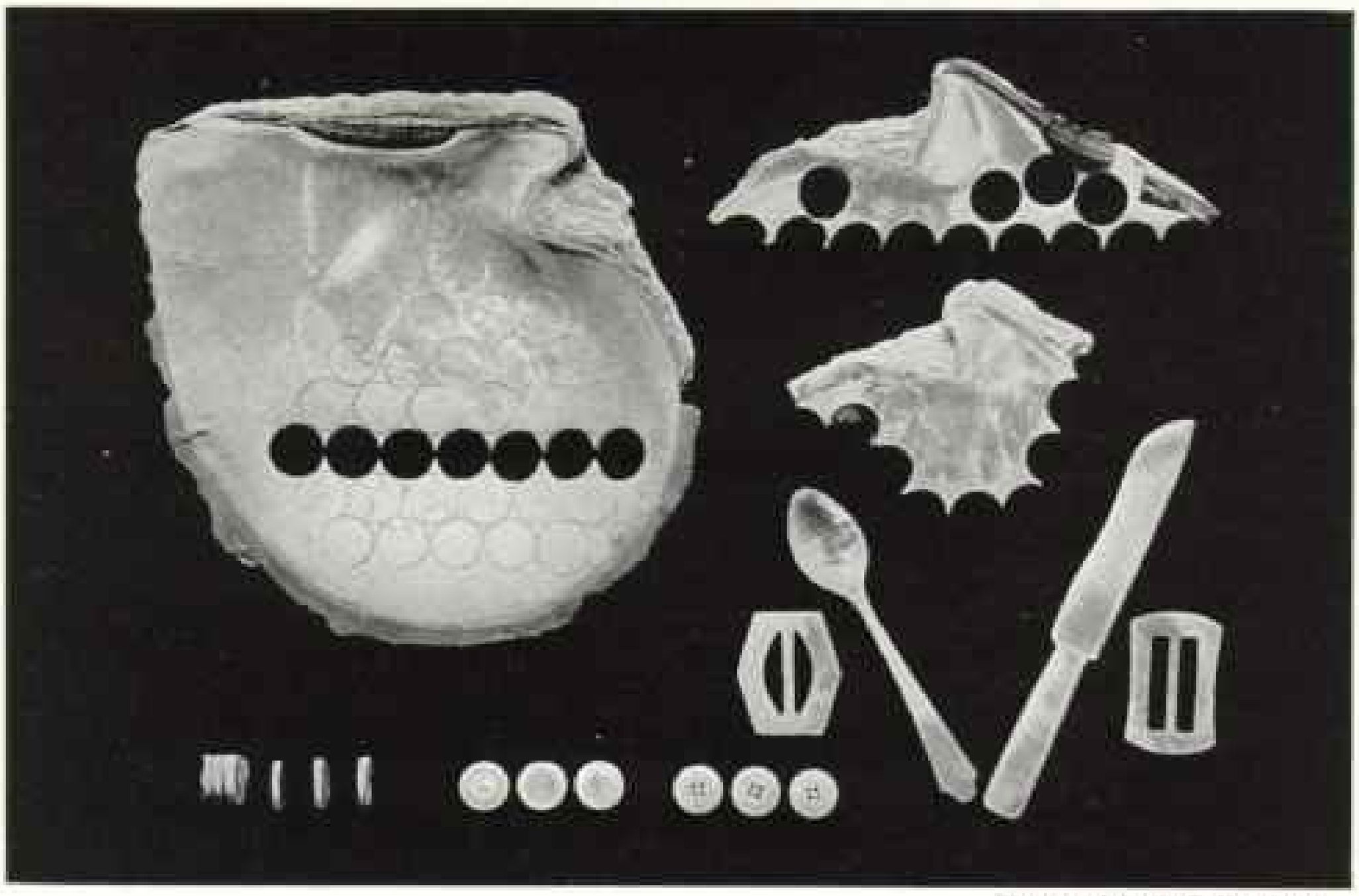
OYSTERS CLUSTER ON A LARGE CORAL BOULDER, WASHED UP BY A CYCLONE

This brain coral grew on the outer slope of the reef. It was rolled up by the waves to the reef crest, where it died from exposure to air. These formations, when submerged at high tide, are a menace to ships. On such a "niggerhead" coral the author, preoccupied with studies of reef life, was marooned by a rising tide. He was rescued by other members of the expedition, who pulled alongside in a dinghy, just as the water was reaching the top (page 842).

Photograph by Capt. Frank Hurley

PEARL SHELL—GREAT BARRIER REEF'S RICHEST TREASURE

Workers pack the shell for export from Thursday Island. Hunting for pearls is incidental, although some large gems have been found. Most famous was a 100-grain, drop-shaped beauty, about the size of a sparrow's egg, valued at $55,000.



Photograph by T. C. Roughley

BUTTONS AND KNICKKNACKS COME FROM LUSTROUS PEARL SHELL

Sixty years ago mother-of-pearl was obtained merely by wading out to shallow beds on Great Barrier Reef. So great was the demand that the near-by supply was soon exhausted. Today helmeted divers go pearling in deep beds far offshore (page 850).

Quickly I transferred all my gear to the top of the coral growth and sat beside it.

I began to wonder what had happened to the launch. Suppose they couldn't start that engine. . . .

SHARKS, AND STEADILY RISING WATERS

The sun, a ball of fire, sank below the horizon. It was all very beautiful, but my niggerhead, weathered into crags, was far from comfortable and I began to feel cramped. It was now half under water; at full tide it would be submerged to a depth of several feet, and the tide was rising rapidly, relentlessly. Every now and again, a wave bigger than its fellows would dash against the rock and shake it, throwing a shower of spray over me and my cameras.

Photograph by T. C. Roughley

SIESTA IN THE JAWS OF A GIANT CLAM SHELL

The big shellfish was a menace to naked divers when it was alive on the Barrier Reef. It was powerful enough to grab an unwary swimmer's foot and hold it in a vise-like grip (page 842). This variety of shellfish is the largest in the world, sometimes reaching a length of four and a half feet, and a weight of 500 pounds. Islanders often use the shells to store fresh water.

About twenty yards away several large triangular fins were slowly cleaving the water in a semicircle; I began to imagine that the sharks just beneath the surface were grinning at me.

As I watched them, fascinated, I thought that, after all, their race owed me nothing, for had I not for many years advocated their wholesale destruction for the commercial products they yielded? For years I had been striving to develop an industry that would lead to their slaughter without any show of mercy.*

A large devil ray, the tips of its expansive fins breaking the water together as they rhythmically reached the top of their sweep, passed by. Thank heaven, devil rays were harmless.

From the ray my eyes searched the sea, now a deep grayish blue in the dusk. The water was very close to the surface of the rock. I stood up, the better to see, the better to be seen. I was a mere speck in the ocean vastness; not another object broke the surface—except those fins. They began to annoy me.

Suddenly, from out the dusk, cheers rent

* See "Shark Fishing, an Australian Industry," by Norman Ellison, NATIONAL GEOGRAPHIC MAGAZINE, September, 1932.

the air, and I saw the hazy outline of the launch. Quickly a dinghy pulled in alongside me and in a few minutes I was safely on board, to find everybody very relieved. Some had despaired of locating me in the gathering darkness.

It was an unenviable experience, but I learned a lesson—never to land on a reef which is covered at high tide without a dinghy always handy.

FIGHTING GAME FISH OF THE REEF

The principal sporting fish of the Great Barrier Reef is the Spanish mackerel. A specimen said to have weighed 121 pounds has been caught by a professional fisherman, and mackerel of more than sixty pounds have been landed by amateurs.

Other fighters are the queenfish, which is shaped like the mackerel but more closely allied to the kingfish and trevally; the turrum, a giant trevally which attains a weight of upward of seventy pounds; and the giant pike, a pugnacious fish with long, needlelike teeth. Many game fish of the reef are also familiar to American anglers in the Gulf Stream.

Wealth from the reef takes many forms, but its richest treasure is the pearl shell used in making buttons and numerous other articles. Although valuable pearls have been obtained from these waters, the shell is the principal objective (page 848).

DANGERS OF A PEARL DIVER'S LIFE

Pearling is a hazardous occupation. The diver's career is usually ended at forty, and every year witnesses its crop of casualties. Risks are run, whether the diver is working naked in shallow water, when he is exposed to the attacks of sharks and giant groupers, or whether he is working in a diving suit, when his air line may be fouled by a grouper or a devil ray. He may, when on a rich ground, stay below longer than is safe, or he may go to a depth below the safety zone and, coming to the surface too rapidly, arrive in a crippled condition.

There is a prevalent impression that sharks will not attack black people. Unfortunately there is no truth in it, for sharks will, and all too frequently do, attack native divers; at least six cases have been recorded on the pearling and trochus grounds during recent years.

Probably the most extraordinary of all recorded shark attacks occurred in 1914. A Thursday Island native, known familiarly as "Treacle" or "Teapot," suddenly found his head inside a shark's jaws. Its teeth gripped him tightly around the neck and caused a dreadful wound; but apparently, as the shark opened its mouth to gulp him, he pulled his head away and, swimming frantically, made his escape. A photograph of this native was taken as he was convalescing in a hospital and shows prominently the scars left on his neck by the shark's teeth.

Although the records show that attacks by giant groupers, which frequently grow to a weight of several hundred pounds, are much less common than those by sharks, the divers fear them no less, for they are more insidious in their methods and are less easily scared. They may lurk in a dark cavern and rush the diver before he is aware of their approach, or they may stalk him with cold persistence, undeterred by the rush of bubbles to the surface.

"PEARL" BUTTONS FROM TROCHUS

If you examine the pearl buttons you are wearing, you may possibly see that the rougher undersurface is streaked with red, brown, or green; if so, you are wearing buttons made not from real pearl shell but from that known as "trochus," the gathering of which forms the second largest industry of the Barrier Reef.

On account of the comparatively shallow water, diving suits are not used. The natives wear only a pair of water goggles. Carrying a bag to hold the trochus, they dive overboard and swim to the bottom, where they remain usually about two minutes. The shells are boiled and the shellfish inside is eaten by the crews or smoked for sale in China or Singapore, where it is relished in soups and stews.

Innumerable are the birds, beasts, and fishes of the reef which awaken in the beholder a realization of the wonders of Nature here so lavishly displayed.

Notice of change of address of your NATIONAL GEOGRAPHIC MAGAZINE *should be received in the offices of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your August number, The Society should be notified of your new address not later than July first.*

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To carry out the purposes for which it was founded fifty-two years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material which The Magazine can use, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches have solved secrets that have puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

The National Geographic Society-U. S. Navy Expedition camped on desert Canton Island in mid-Pacific and successfully photographed and observed the solar eclipse of 1937. The Society has taken part in many projects to increase knowledge of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

The world's largest ice field and glacial system outside the Polar regions was discovered in Alaska by Bradford Washburn while making explorations for The Society and the Harvard Institute of Exploration, 1937-8.

REMEMBER when we snapped this, mother? Was it last summer, or was it really 1923? I can see him now, chasing those waves. He wasn't afraid of anything. Still isn't.

Sometimes, though, I wish I'd been smarter or richer. I'd have enjoyed smoothing some of the bumps for him. He wanted a lot of things he never got, and never asked for.

Not that it would have made any difference between us. He understands. We could give him some little gadget tomorrow. Or nothing at all. He wouldn't mind.

But tomorrow's going to be our big day as well as his. I'm going to be just as excited as he is when we give him his Hamilton.

He'll say, "Dad! Mom! You foolish people, you needn't have done so much." And I'll probably say, "Forget it, son." But none of us ever will.

* * *

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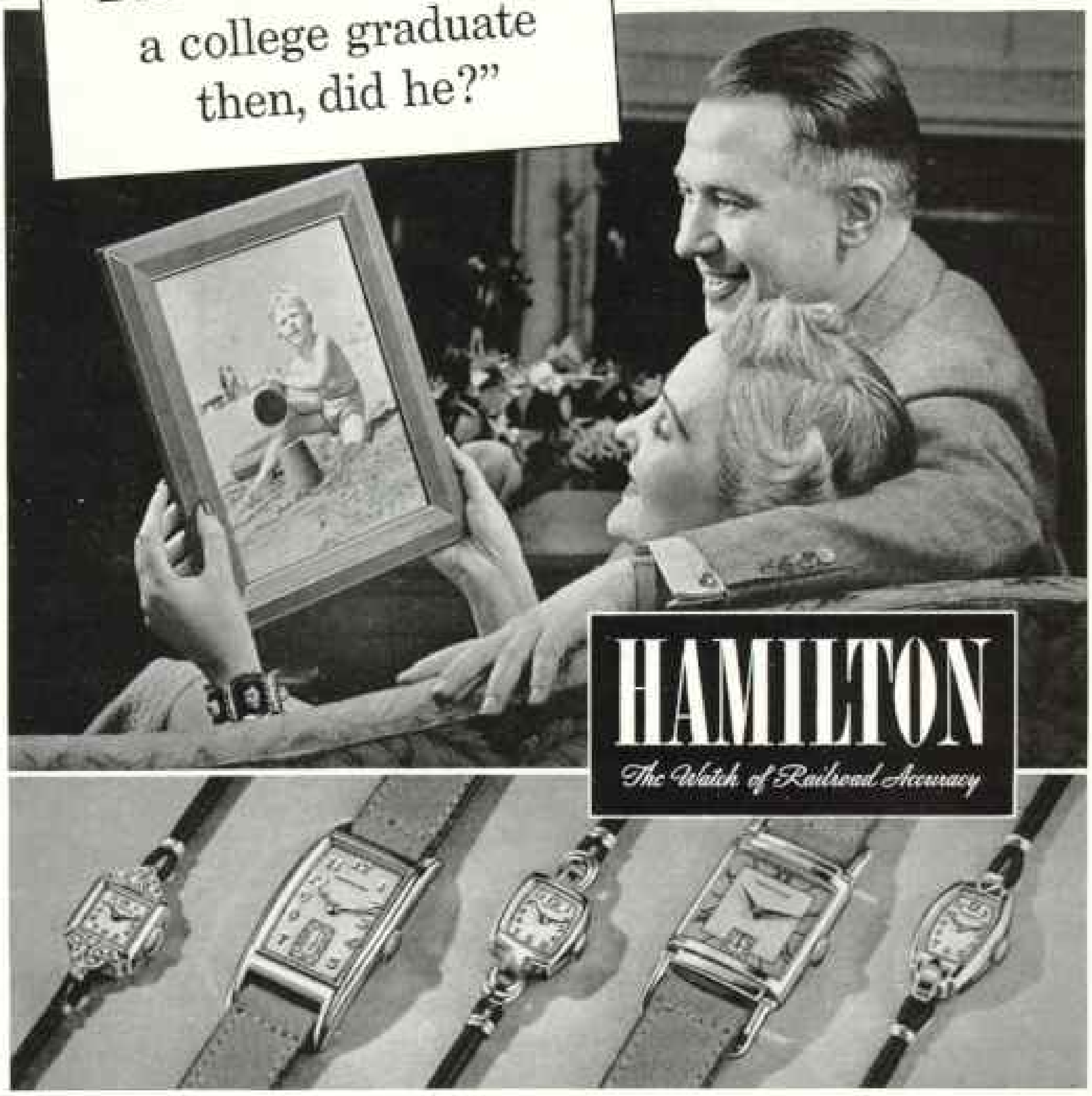

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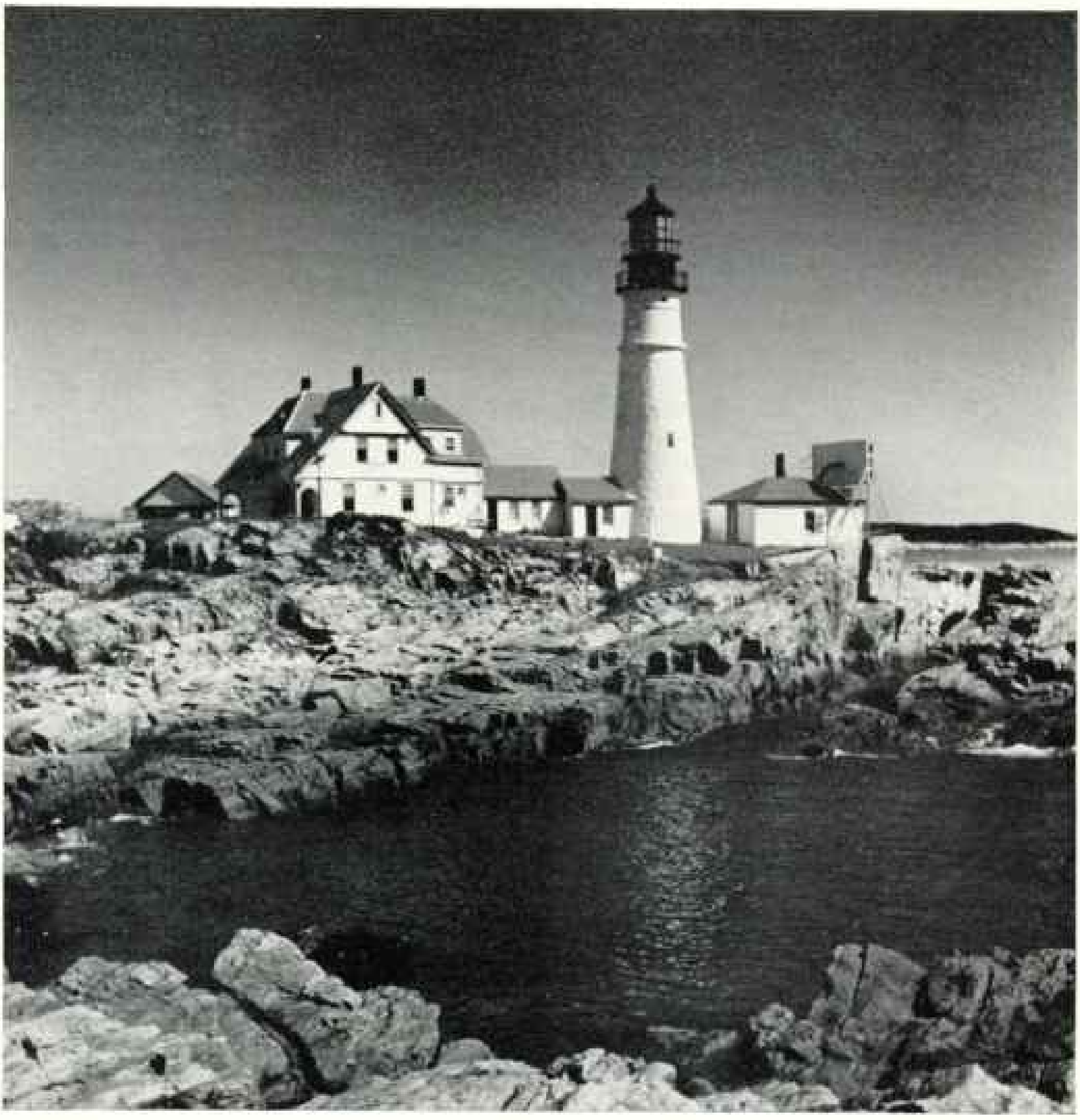

A Lighthouse Worth Taking Home!

IN TAKING HOME SCENES like this Maine lighthouse, be sure you do them justice. Take them on *dependable* Agfa Film!

Agfa's famous "extra margin of quality" helps you get best results under ordinary conditions . . . and *surprisingly good* results even when conditions are far from favorable.

Agfa Films include Plenachrome and Super Plenachrome, for general use; Superpan Supreme, for day and night use, indoors or out; Superpan Press, for utmost speed . . . and many others.

Use Agfa Film . . . and get better pictures. Every roll of Agfa Film is guaranteed: "Pictures that satisfy or a new roll free!" *Agfa Ansco, Binghamton, New York. Made in U. S. A.*

Agfa Film

The only film that guarantees "Pictures that satisfy or a new roll free!"

Doing Business In 35 Languages

by Westinghouse

• *To youngsters or oldsters* whose hobby is collecting stamps, the incoming mail department of our export company would very likely prove a paradise.

• *A single day's mail* will bring letters from as many as twenty-five countries. In the course of a year, correspondence is received from practically every country in the world, and it has traveled to us by every conceivable mode of transportation from Tibetan runner to air express. It may be penned in anything from a Chinese ideographic script to just plain American English. More than thirty-five different languages will find their way in and out of the mail basket.

• *No doubt* you have heard many men say that their business "is different." But rarely will you find a business right here in our own country that is as really different as that of our people whose responsibility lies in the shipment and sale of our products abroad.

• *Most of these men* have spent years in the field, in Buenos Aires, Singapore, London, Cape Town. They have sold our products in Spanish, French, Portuguese, Swedish and even more remote tongues. They have learned to make change in lira, pesos and shillings as simply as you and I count our change from a dollar bill.

• *During* the past two years we have run an advertising campaign in 95 newspapers in 41 countries. Each advertisement is translated into 7 different languages. 25 entirely different currencies are used to pay for the newspaper space.

• *Climate also plays* an important part in the distribution of our products throughout the world. For instance, a radio set which is perfectly suitable for sale in the United States must be specially designed and treated to stand up under tropical humidities before it is acceptable to countries near the equator.

• *Another product problem* is that of electric voltage and frequency. Here in the United States 110 volt 60 cycle current is standard almost everywhere, but in export territories these voltages range anywhere from 90 to 380 volts, and from 16⅔ to 133 cycles.

• *Add to these problems* the complications of the present world strife. But business goes on as ever, and our export people insist that theirs is the most interesting business in the world.

• *All of the products* that we make, from the grain of wheat lamp for doctors to immense turbines for power companies, find their way to the farthest reaches of the globe. American made products find a ready market abroad. And the fact that these products sell at higher prices in competition with those locally manufactured is a tribute to American craftsmanship and salesmanship.

BUDGET *every day* IN ADVANCE...

THE SIMPLE, EASY, BOTHERLESS WAY is to buy your California fun and excitement in *one package* . . . a Metropolitan Oakland Area *All-Expense* Tour.

840 square miles of the Area's amazing combination of world-famous scenery, of city and country . . . haunts of famous celebrities like Jack London and Joaquin Miller . . . year'round sports, fishing, hunting, yachting, tennis, golf, hiking, riding . . .

Golden Gate Exposition . . . San Francisco and the world's biggest bridges . . . Lake Tahoe, Mother Lode and Mark Twain country . . . Yosemite, Monterey . . . hundreds of fascinating and romantic spots.

All without bother or fuss. Whether you come by auto, air or train, you know *in advance* what to see, and what it will cost.

MAIL COUPON or write today for booklets. Or consult Ask Mr. *Foster Travel Service*, or local travel agent.

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The LINCOLN HIGHWAY

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The "49'ers" . . . the Union Pacific . . . the first transcontinental highway, and many other thrilling chapters in American history lend special significance to touring on this smooth, safe, easy-to-drive route. The all-weather Lincoln Highway crosses the heart of the nation from coast to coast the shortest way—with fine accommodations for your traveling comfort. No steep or hazardous grades—avoids heavy metropolitan traffic.

Drive the Lincoln Highway this year to the east or west.

L US 30 LINCOLN *Memorial* HIGHWAY

Visit the Golden Gate International Exposition, open from May 25 to September 29, on magical Treasure Island in San Francisco Bay. On the Exposition site Bank of America has a complete banking office (the only bank on the Island) to serve you. Travel carefree with Bank of America Travelers Cheques, which you may obtain from authorized banks and travel agents everywhere.

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NATIONAL TRUST & SAVINGS ASSOCIATION
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION
495 branches in California

How *Good* A Daddy Are You?

OH YES . . . you provide three meals . . . a home . . . a car . . . and that's fine! But every father does that if he can.

Those youngsters of yours don't think of you as just an average daddy. They think you're wonderful. Are you?

If a blowout some day rolls your family into the ditch, or crashes them into an oncoming car, or into a post or fence at the side of the road, how will you feel?

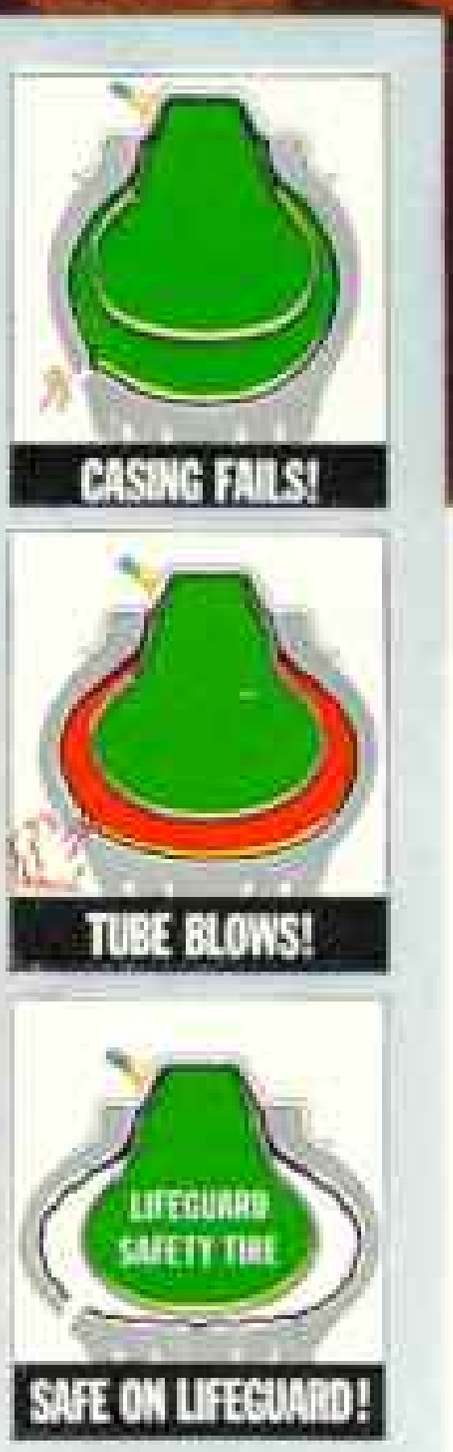
You knew about Goodyear LifeGuards! You knew they make blowouts harmless!

Average folks might say, "Oh, blowouts won't happen to me!" Real fathers say, "I won't take *any* chance I can avoid!"

Blowouts can occur in *any* tire ... old or new. LifeGuards remove the dangers of blowouts because they provide an inner safety tire on which you ride securely in case a blowout happens.

The cost is moderate. And if you balance it against a million dollars worth of adorable child, you'll reach just one decision.

Goodyear or car dealers can give you the story. Get it *today!*

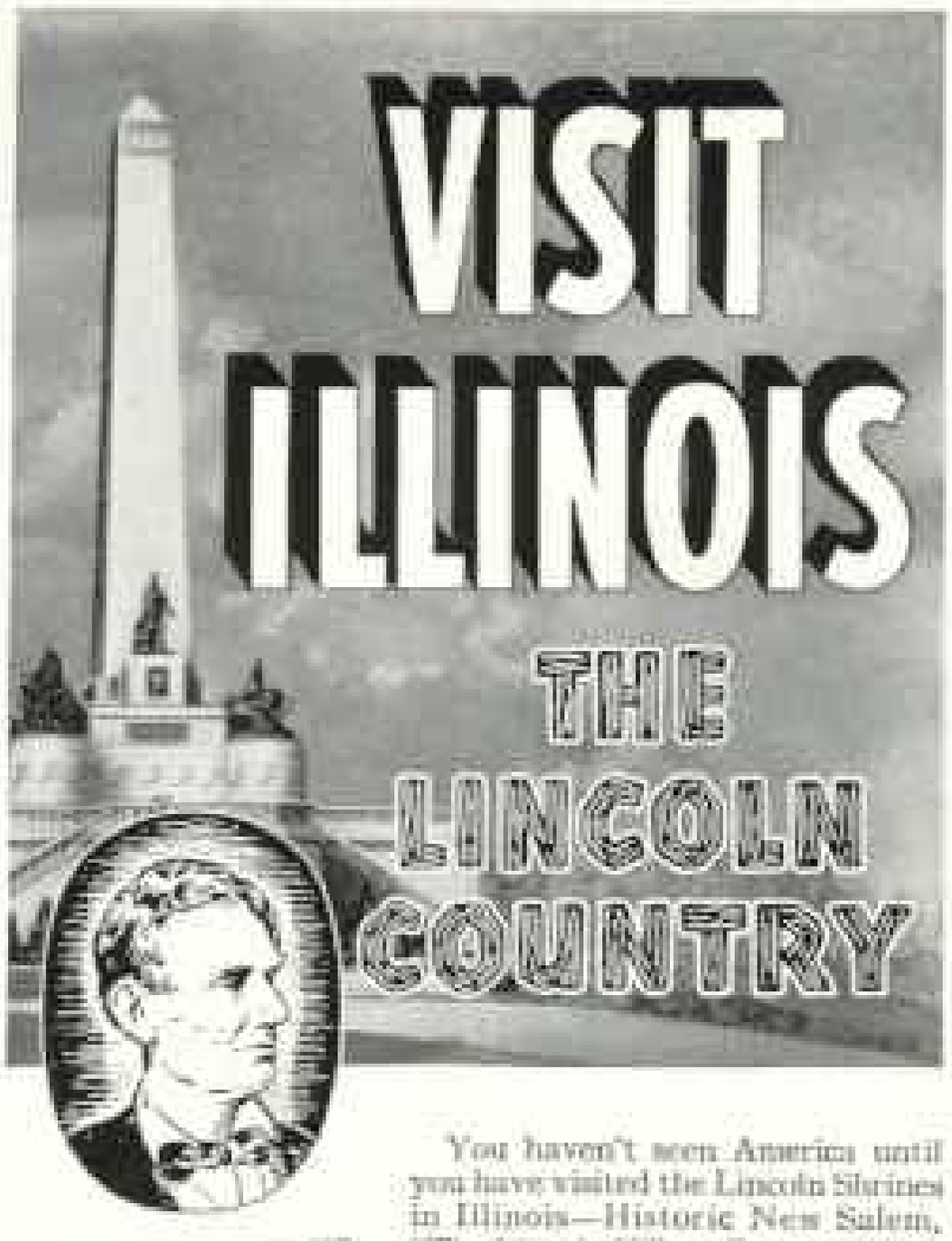


LifeGuard is a 2-ply safety tire inside an extra-sturdy tube. In sizes available, replaces conventional tube. Slow blowouts and tube collapse. LifeGuard remains inflated. You brake and steer safely.

For Complete Motoring Safety... 4-Wheel Brakes... All-Steel Body... Safety Glass... and

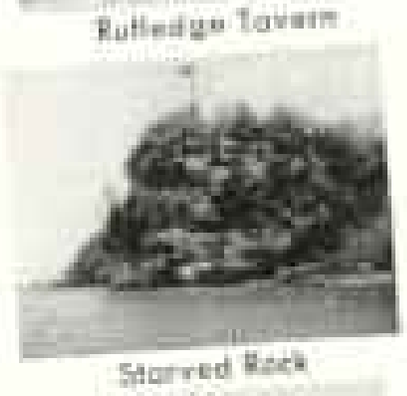
GOODYEAR LIFEGUARDS

LIFESUARD is a trade-mark of The Goodyear Tire & Rubber Company



You haven't seen America until you have visited the Lincoln Shrines in Illinois—Historic New Salem, "The Lincoln Village," recreated exactly as it appeared when Lincoln lived there from 1831 until 1837—the Lincoln Tomb in Springfield—the only home Abraham Lincoln ever owned, preserved as a perpetual memorial—and the many statues, and markers throughout the State.


Rutledge Tavern


Starved Rock


Beaches and Parks

ILLINOIS

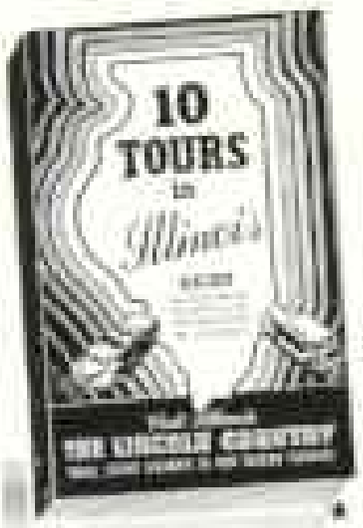
SCENIC BEAUTIES

Visit General Grant's Home. See the prehistoric Indian Mounds. View the spot where white man first set foot in Illinois. Explore the amazing canyons in "Giant City."

VISIT CHICAGO

"Wonder City of the World"

See the world-famed museums, beautiful parks and boulevards, enjoy the recreational and summer resort facilities of the Nation's second city, gateway to the northern Illinois "Land of Lakes" region.



FREE BOOK. Send today for your copy of "Ten Tours in Illinois," showing exact routes to follow to see all the points of interest in Illinois.

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SPRINGFIELD, ILLINOIS

Illinois Development Council
Dept. 905, Springfield, Illinois

Gentlemen: Please send me FREE copy of "Ten Tours in Illinois" giving directions for reaching all points of interest.

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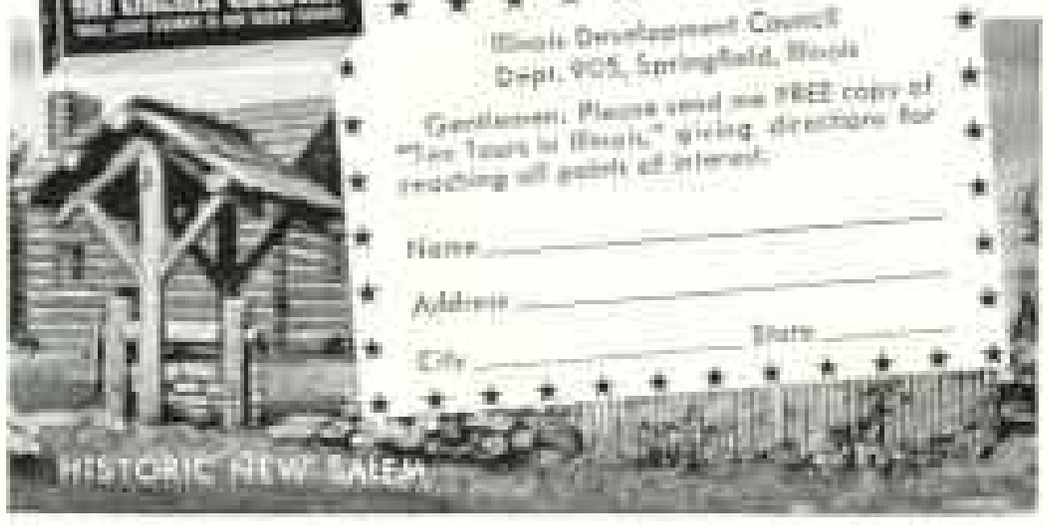

This Year!

Nova Scotia

HOSPITABLE . . . colorful . . . a picturesque historic foreign land close to home. Last month in these pages you read the fascinating story of Canada's lovely Province by the sea. All we wish to add is that Nova Scotia is easy to reach by car, bus, or boat, and . . . so very inexpensive to enjoy. Due to the favorable rate of exchange your American dollar actually buys 10% more vacation! In effect this means every tenth day you spend in Nova Scotia is FREE! Let us help you plan your trip by writing . . .

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See South America by Air!

THIS year enjoy the wonder-vacation of a lifetime—a trip by air to the amazing lands and brilliant cities of South America—to tropical Ecuador, ancient Peru, legendary Bolivia—to sparkling Santiago and sophisticated Buenos Aires.

Romantic names—that come alive as you wing along the direct Panagra Route down South America's west coast. You skirt the Andes, leap the Equator in the wink of an eye—cradled in great American planes, operating on fast and frequent schedules.

Rates are surprisingly low. And there are economical all-expense cruises ranging from a week in Inca-land to 3 to 8 weeks 'round South America. Combination air-sea trips may also be arranged.

Write our New York office for free booklet, illustrated in full color, called "The Panagra Route." For additional information consult your travel agent, any airline office or any Pan American Airways office.

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NATIONAL PARK

Santa Fe

Via the Scout

SWIFT, DOLLAR-SAVING
CHAIR CAR-SLEEPER TRAIN
TO CALIFORNIA

Effective June 2nd, 1940 . . . through *Scout* tourist-sleepers will leave Chicago and Los Angeles *daily*, and arrive Carlsbad, New Mexico, the 2nd morning for a delightful visit to the nearby Carlsbad Caverns National Park.

On this new, low-cost, convenient side trip, you'll motor 22 interesting miles from Carlsbad to the National Park, and spend 5 amazing hours, with guide, exploring the world-famous caverns themselves before returning to Carlsbad and your Santa Fe train.

Plan now to include *both* Carlsbad Caverns and Grand Canyon in your California trip this summer via Santa Fe's popular *Scout!*

• Carlsbad Caverns all-expense side trip (including round trip rail fare from Clovis, N. M., 3 meals, motor and guide service, and entrance fee to the Caverns) costs only $12.50 for chair car passengers; and only $12.50 for tourist-sleeper passengers, plus $1.85 for lower berth.

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Send *Carlsbad Caverns* folder, and *Scout* booklet of natural color photographs.

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SCENIC SUNNY SOUTHWEST

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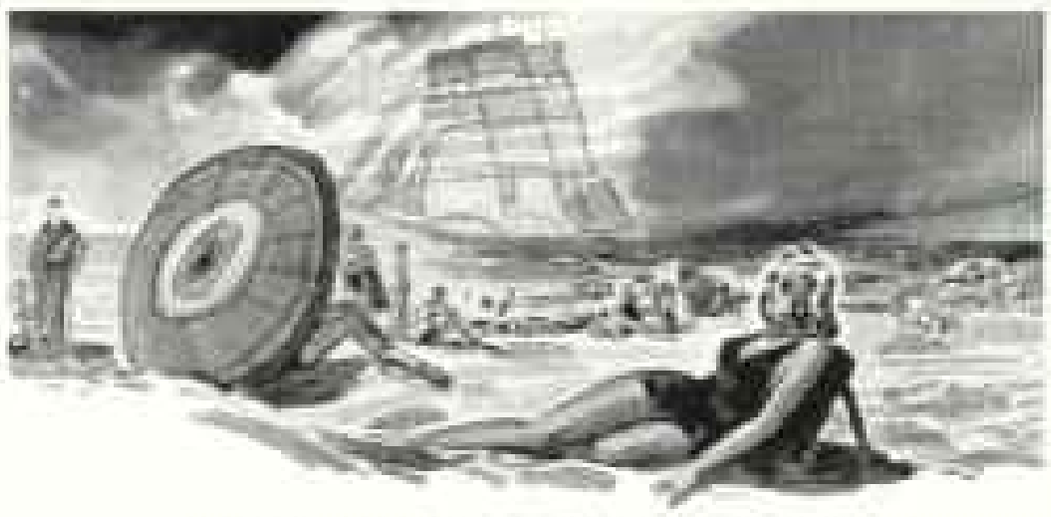
El Paso

EL PASO COUNTY ★ *in the western tip of* Texas

Write the Gateway Club, Room 205 Chamber of Commerce Bldg. El Paso, Texas, for illustrated literature.

SUNSHINE PLAYGROUND OF THE BORDER



OUT PAST THIS INVITING BEACH
TALL YANKEE CLIPPERS SAILED!

TRADITION! Historic tradition! The wavelets murmur it upon tide-washed Massachusetts beaches. It rustles in the trees of the tall, cool Berkshires. It nods to you from bayberry and beach plum on Martha's Vineyard and Nantucket Island. Along the South Shore, the North Shore, in the Pioneer Valley, it calls from every highway. And from every wharf, spire and churchyard it beckons to you in dear old Boston Town.

Come to Massachusetts for your long or short vacation this summer. It'll rekindle your pride of country.

WRITE FOR THIS HANDSOME BOOKLET
"*Play* where America was born—
IN MASSACHUSETTS"

Massachusetts Development and Industrial Commission
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Please send me, free, the above illustrated booklet which gives complete details about vacationing in Massachusetts.

Check here for specific information about: ____ Cape Cod ____ North Shore ____ Berkshires ____ Historic Boston ____ South Shore ____ Pioneer Valley ____ All New England

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All Aboard for All America!

9,000 Miles for $90

That headline means just what it says.

You can step aboard a railroad train in your home town—and put as much as nine thousand miles of America behind you before you return—all for the price of $90, if you ride in comfortable air-conditioned day coaches—or $135.00 (plus $45 for one or two persons in a lower berth)—if you travel in spacious Pullmans.

You can take sixty days to do it—go by any established route—stop off wherever you wish.

See with your own eyes the grandeur of this land you live in—there's no other nation like it in the world.

So think of the things you'd like to see—the New York World's Fair—the Golden Gate exposition—the multicolored canyons carved by western rivers and the man-made canyons of Manhattan—elm-shaded villages of New England and sun-drenched pueblos of the southwest—the unspoiled natural wonders of the great National Parks and the sophistication of storied cities you've read about—the shores of the Atlantic, Pacific, the Gulf of Mexico, and those inland seas, the Great Lakes—the land of Dixie and the great Northwest—the towering Rockies and the forest-clad ranges of the East—landmarks hallowed in your nation's history—and landmarks of a civilization so old it has been forgotten.

All these and more can be included in a vacation which starts the moment you step aboard a train.

It's the kind of vacation you've always dreamed of taking—and now the American railroads are ready to make it come true.

And in addition to the fascinating places you will see, you'll find new interest and luxury in today's trains, with their modern roomy coach and Pullman equipment—smart styling—ever faster schedules—and air-conditioned comfort and cleanliness.

Better talk it over with your local ticket agent now. He will help you take full advantage of this golden opportunity.

ASSOCIATION OF AMERICAN RAILROADS WASHINGTON, D. C.

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THE GREAT LAKES

LET the breezes of the GREAT LAKES add to your vacation pleasures. If you are bound for the World's Fairs, put the Lakes on your route—enjoy a refreshing cruise on your way. See the rugged grandeur of Georgian Bay. D & C mid-week cruises carry you away to beautiful, historic Mackinac Island, The Soo, Georgian Bay and Midland, Ontario. Or enjoy a week-end of relaxation on the low-cost all-expense Mackinac Island cruise. Popular all-expense cruises also sail from Detroit for Niagara Falls, from Cleveland and Buffalo to Greenfield Village at Dearborn, Michigan.

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• You can take your car on the ship for a moderate charge.

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. . . bring back the high lights in FILMO movies

WHEN homeward bound on the last day of your vacation—would it mean anything to you to know that you had captured forever the priceless high lights of the trip? When next December's chilling blasts are howling around the chimney corner—would you enjoy taking your vacation again from your easy chair? Thousands of men and women like you think so, too. Act on our suggestion. Take a Filmo with you. You'll thank us for the idea some day.

Just remember that you *don't* have to be an expert to make good movies with a Filmo. Take the palm-size Filmo 8, for example. Just press the button—*what you see, you get.* And with this marvelous little camera, precision-built by the makers of Hollywood professional movie equipment—you can *get what you want* . . . in black-and-white or full, natural color . . . indoors or out . . . in slow motion, too.

Filmo 8 has extra speeds, device for animating cartoons, provision for special lenses—everything you need in your personal movie camera, now or later. It is a *basic* camera that your skill won't outgrow. See it today at your camera dealer's. Buy it on easy terms. Take it with you. Bell & Howell Company, Chicago; New York; Hollywood; London. *Established 1907.*

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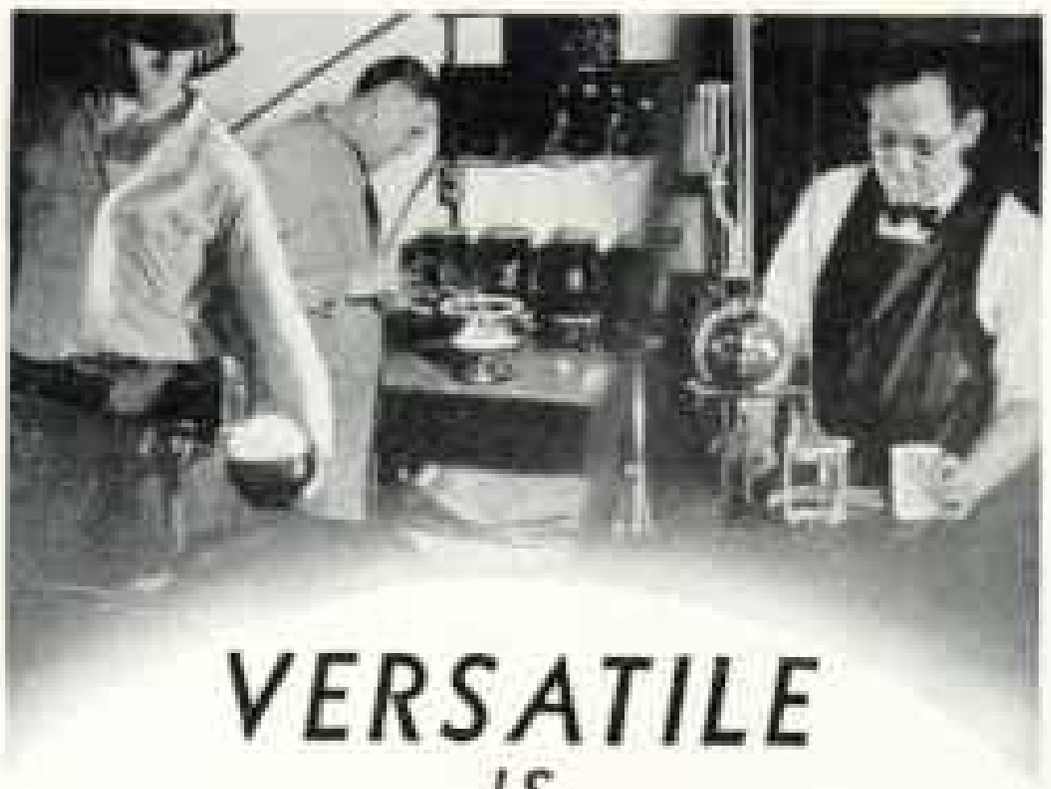

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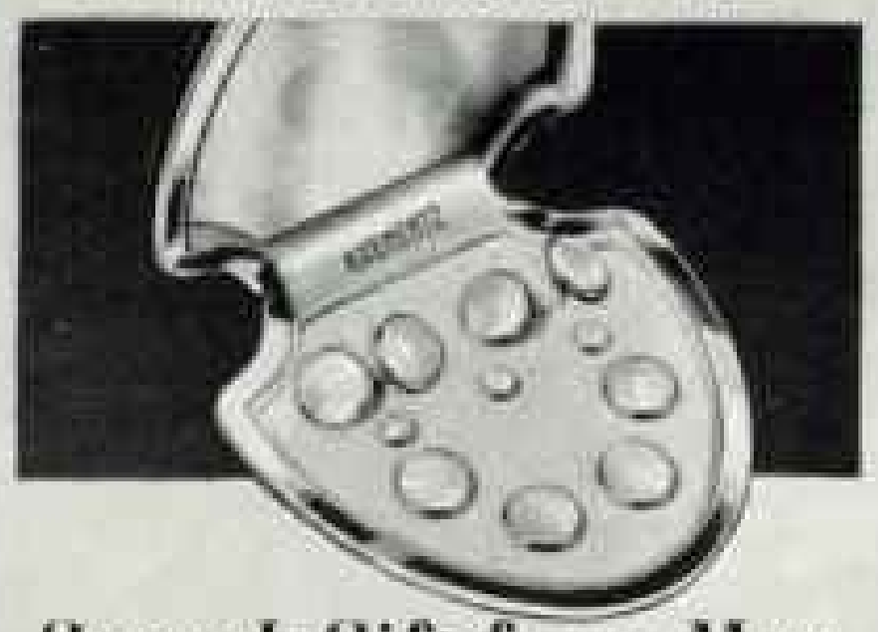
FOR WHITE TIE EVENING WEAR . . . $10.00



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Just add up the features the new Unisteel Turret Top Body by Fisher brings the Oldsmobile Custom 8 Cruiser below: a wider front seat and a wider windshield; an 18% larger back window; stronger, double-wall steel construction; and the use of safer, clear-vision, Hi-Test Safety Plate Glass *not only in the windshield — but in all door windows and Ventipanes, too.*

"Bigger and Better in Everything"™ — that's how its owners describe the 1940 Oldsmobile with its new Unisteel Body by Fisher.

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The Progressive

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Union Pacific Railroad, Omaha, Nebr.

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Ride, play golf, swim, fish for trout in well-stocked lakes and streams. Or just rest and relax. Nights are cool and there are no mosquitoes. . . . South Dakota's facilities for lodging are among the nation's finest, and you will like our hospitality.

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YOUR CAMERA can do as well!

You're probably thrilled when you happen to get a picture as good as this . . . but actually, you can do it every time. Every picture you take with your camera will be as sharp, as rich in detail, if you use a WESTON Exposure Meter. Just point this compact meter at the scene and it gives the correct camera settings to use. Even pictures taken indoors, or under the most difficult light conditions outdoors, will be correctly exposed. Extremely compact, the WESTON can be used with all still and movie cameras, and all film, including color. See all models at your dealer's today, or write for literature. Weston Electrical Instrument Corporation, 584 Frelinghuysen Avenue, Newark, New Jersey.

INSURES PERFECT PICTURES WITH YOUR CAMERA

The Strawberry Festival

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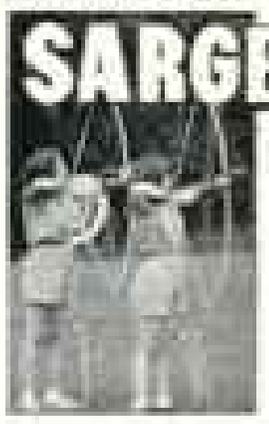

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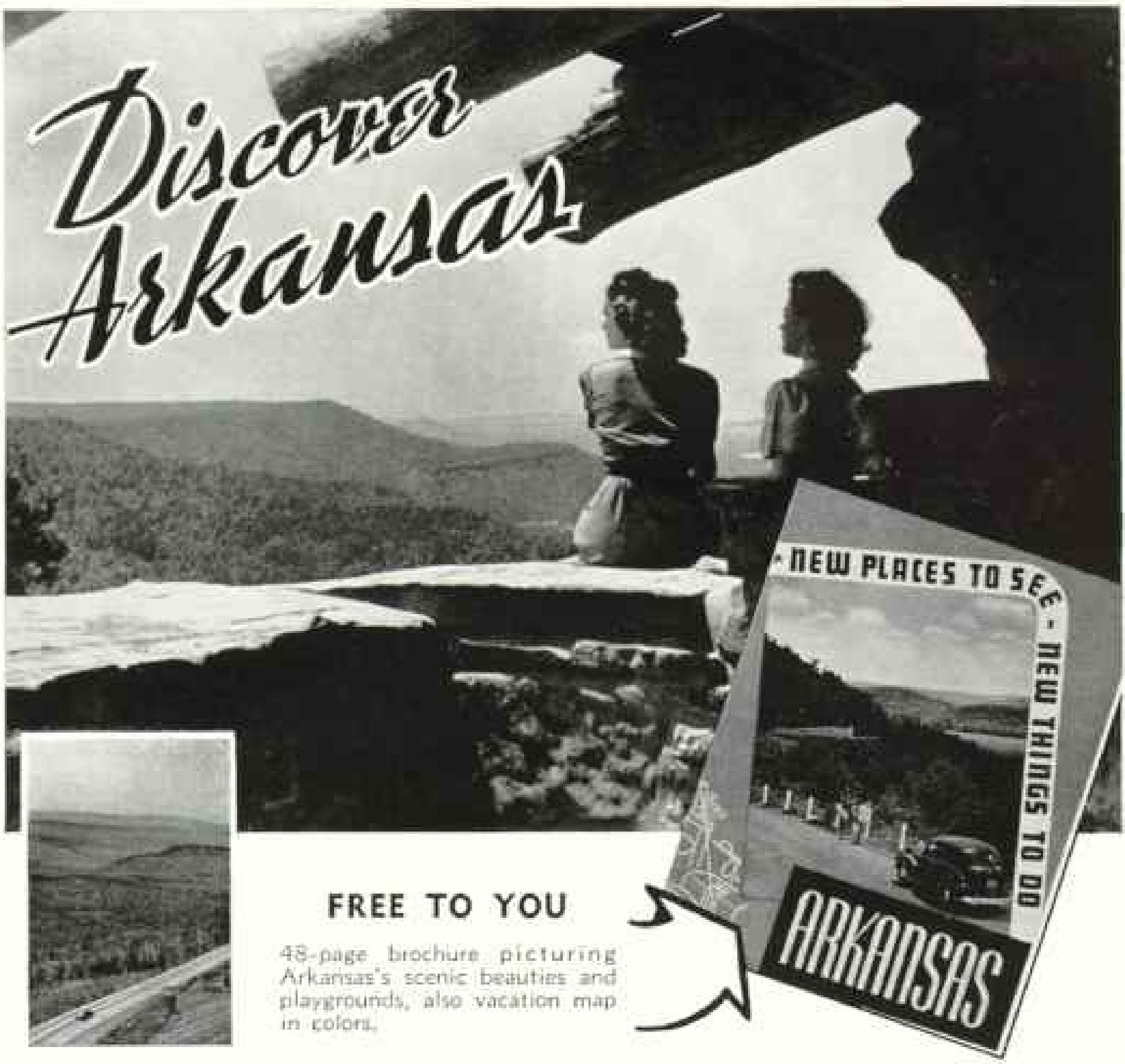

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Sometimes what may appear like a gruff or hasty manner is not meant that way at all, but is simply carelessness or thoughtlessness.

Since this is the age of quizzes, how about a short one on some points of telephone usage?

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The proper way to use the telephone for best results is to hold the transmitter directly in front of the lips while you are talking.

Do You Speak Pleasantly?

It may be your best friend or best customer. Greet him as pleasantly as you would face to face. Pleasant people get the most fun out of life.

Do You Hang Up Gently?

Thoughtlessly slamming the receiver may seem discourteous to the person to whom you have been talking. It's better to hang up gently.

Do You Talk Naturally?

Normal tone of voice is best. Whispered words are indistinct. Shouting distorts the voice and may make it gruff and unpleasant.

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Delay in answering may mean that you miss an important call. The person calling may decide that no one is there and hang up.

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