VOLUME XCIX NUMBER FIVE

THE NATIONAL GEOGRAPHIC MAGAZINE

MAY, 1951

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

$5.00 A YEAR 50c THE COPY

VOL. XCIX, No. 5 WASHINGTON MAY, 1951

THE NATIONAL GEOGRAPHIC MAGAZINE

Mountains Top Off New England

BY F. BARROWS COLTON

With Illustrations by National Geographic Photographer Robert F. Sisson

THOUGH the calendar insisted it was only August 19, a wild and decidedly wintry storm was raging across the 6,288-foot summit of Mount Washington, top of New England.

Well anchored to the rocks though it was, the staunch little tiptop hotel shook, and even the bed in which I slept trembled under the onslaught of the thundering 60-mile-an-hour gale. Outdoors, that unusual night, the thermometer registered well below freezing.

When morning dawned, the whole mountaintop was white with rime. A thick cloud blanketing the bare, rocky summit cut visibility to a few yards.

Yet, out of sight below us, all New England was basking under a hot summer sun shining in a bright-blue sky. Mount Washington was merely throwing one of its frequent tantrums.

Mountain Panorama Unfolds

Then suddenly its anger melted. Holes opened in the cloud, sunlight poured through, the rime began to thaw, and far away to the southeast we could see the Atlantic Ocean gleaming off the distant coast of Maine.

All around us, as the cloud continued to lift, unfolded the splendid panorama of New England's mountains.

Nearest rose the stupendous, hulking shoulders of the Presidential Range, bare and gray like the backs of gigantic elephants. Beyond, in all directions, the other peaks and ridges of the White Mountains rolled away in wave on wave, spilling over New Hampshire's eastern border into Maine (pages 566-7).*

Still farther to the west rose the softer ranges of Vermont's Green Mountains, like parallel furrows in a giant's plowed field. Barely visible on the western horizon were the sharp cones of some of New York's Adirondacks, 130 miles away.

Through five States New England's mountains thrust up a rocky backbone 500 miles long (map, p. 569). This ridgepole of Yankeeland runs from the gentle wooded ridges of western Connecticut and Massachusetts north through the entire length of Vermont, turns off across northern New Hampshire, and ends with the stark, lonely monolith of Mount Katahdin, jutting up out of the vast rolling wilderness of central Maine (pages 598-9).

Vermont Was Independent Nation

Colorful past and busy present vie for the spotlight in this far-flung mountain world.

Here, though few Americans realize it, the State of Vermont flourished as an independent nation for 14 years, complete with its own coinage, postal system, and army, before its admission to the Union in 1791.† If necessary to defend this independence, wrote doughty old Ethan Allen, "I will retire with hardy Green Mountain Boys to the desolate Caverns of the Mountains, and from there wage war with Human nature at large!"

Through these mountains raiding Indians dragged off half-frozen captives to Canada in the dead of winter; here debt-harassed veterans of Washington's army staged Shays' Rebellion; here in the roaring days of Maine's lumber boom, in the early 1800's, one man bought a million acres of virgin pine and

* See "From Notch to Notch in the White Mountains," by Leonard C. Roy, NATIONAL GEOGRAPHIC MAGAZINE, July, 1937.

† See "Green Mountain State," by Herbert Corey, NATIONAL GEOGRAPHIC MAGAZINE, March, 1927.

spruce for only a few cents an acre. Lumber barons built up great fortunes.

Many New England pioneers hacked out farms high on the hill slopes. When the thin, rocky soil failed to support their big families, the surplus boys and girls left home to help settle the Middle and Far West.

Today rich dairy herds graze on these hill farms, from which vast quantities of milk flow daily by tank truck and railway to Boston, New York, and other cities of the Northeast. Vermont alone, which has more cattle than people, exports to other States 85 percent of its total milk production, which approaches two million quarts a day.

Bustling quarries and stone-cutting plants make the area around Barre, Vermont, the "Granite Center of the World." Maine's forests turn out enough newsprint paper every day to make a two-foot-wide strip around the earth.

In these busy mountains people do everything from running skiing schools and selling antiques to carving marble and making maple sugar. And all this highland region is a year-round mecca for hundreds of thousands of vacationists, skiers, hikers, campers, fishermen, and hunters from the crowded cities of the Northeast. Two national forests, in New Hampshire and Vermont, help preserve timber, water resources, wildlife, and natural beauty.

Far Older than Rockies

When westerners brag about the greater heights of their Rockies, Yankees remind them that New England's mountains are older by many millions of years, and originally probably towered as high as the present-day Alps. Mount Washington, only 396 feet lower than North Carolina's Mount Mitchell, still is one of the highest peaks east of the Mississippi.

Only an hour's drive from teeming New York City, Connecticut has 500 miles of marked hiking trails. Here the 2,000-mile Appalachian Trail enters New England's mountains and winds across them all the way to Mount Katahdin in Maine.*

Iron mines once flourished in the Connecticut and Massachusetts hills. Near Mount Riga, Connecticut, is the abandoned smelter and ghost mining camp where tradition says anchors of the frigate USS *Constitution* were forged. An arsenal near by made cannon, cannon balls, and shells for the Revolutionary Army. Today these mines are dead, but thrifty Yankees still get cash out of some of them by selling the old slag heaps as raw material for modern rock-wool insulation.

Northward the Connecticut highlands merge into Massachusetts' Berkshires, of which the highest is bare-topped Greylock, 3,491 feet, named for the snowy crest it wears in winter (page 571).

A graceful 105-foot granite tower on the summit honors the Bay State's dead of all wars, and from its top shines a memorial beacon visible for 70 miles on a clear night. When birds are migrating in spring and fall, the light is thoughtfully turned off to avoid confusing the traveling flocks.

On Greylock at evening may be heard the thin, wiry notes of rare Bicknell's thrush. This is believed to be its only breeding place in the entire State.

Hoosac Tunnel Epic of Railroading

Through the rocky core of near-by Hoosac Range bores the Boston and Maine Railroad's Hoosac Tunnel, considered a wonder of the age when it was constructed, and even today the third longest in the United States. In 1851 bold engineers, seeking to give Boston a railroad link to the West without climbing over the Berkshires, started digging the 4¾-mile tube with the only tools then available—pickaxes, hand-driven drills, and black powder.

It took 24 years to finish the job, and 195 men lost their lives in explosions, by drowning in subterranean floods, by falls of heavy timbers, and in other accidents. When a man was killed, other workers on the shift would quit for good, and new laborers would have to be recruited.

While a 1,000-foot ventilation shaft was being sunk, fire destroyed a storage platform, dropping a deadly hail of heavy steel drills, hammers, and chisels that killed 13 men working 583 feet below.

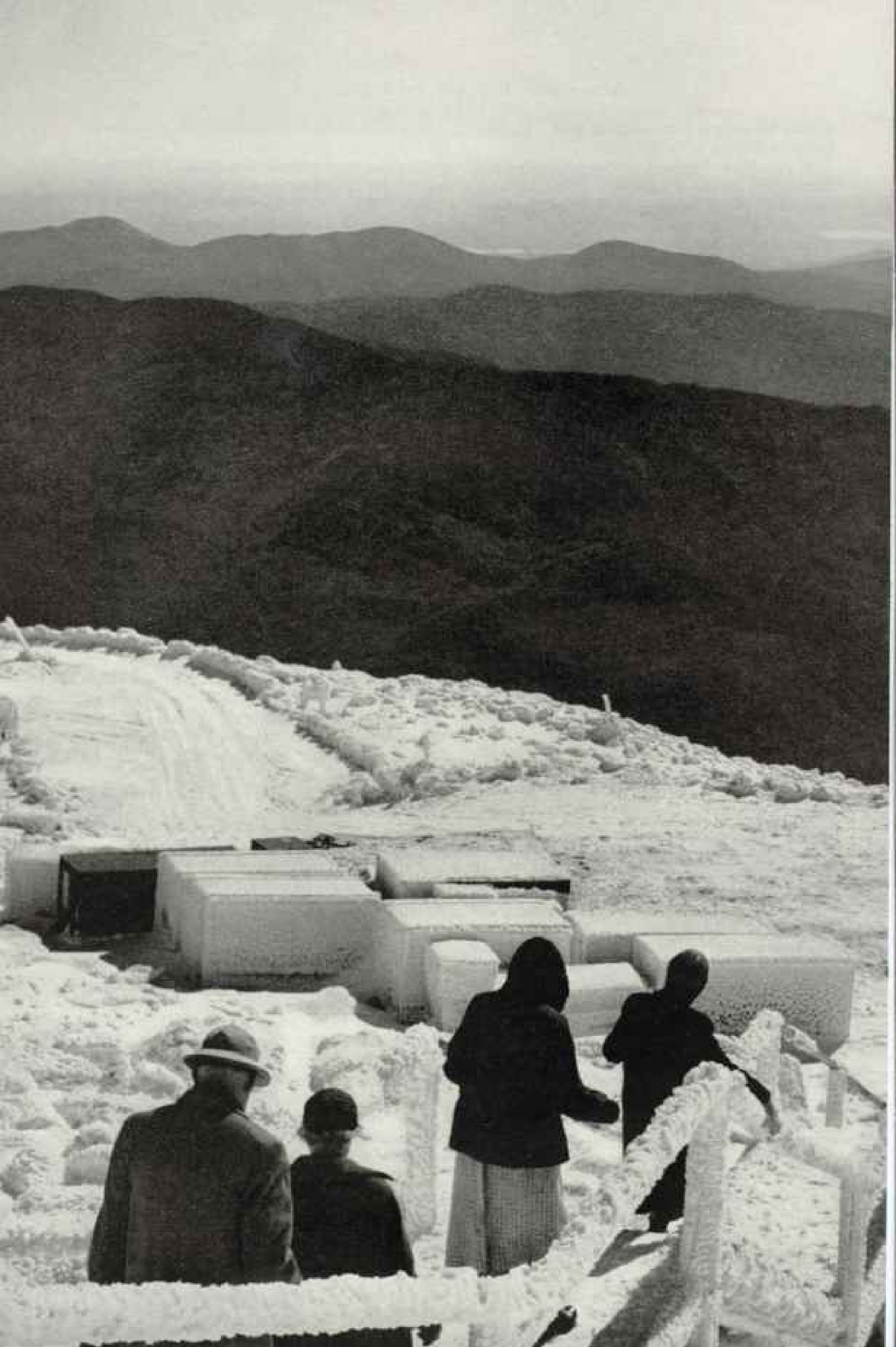
In 1866 power drills and nitroglycerine were introduced for the first time on a large scale in America. They sped construction, but not until February 9, 1875, did the first locomotive puff through from end to end.

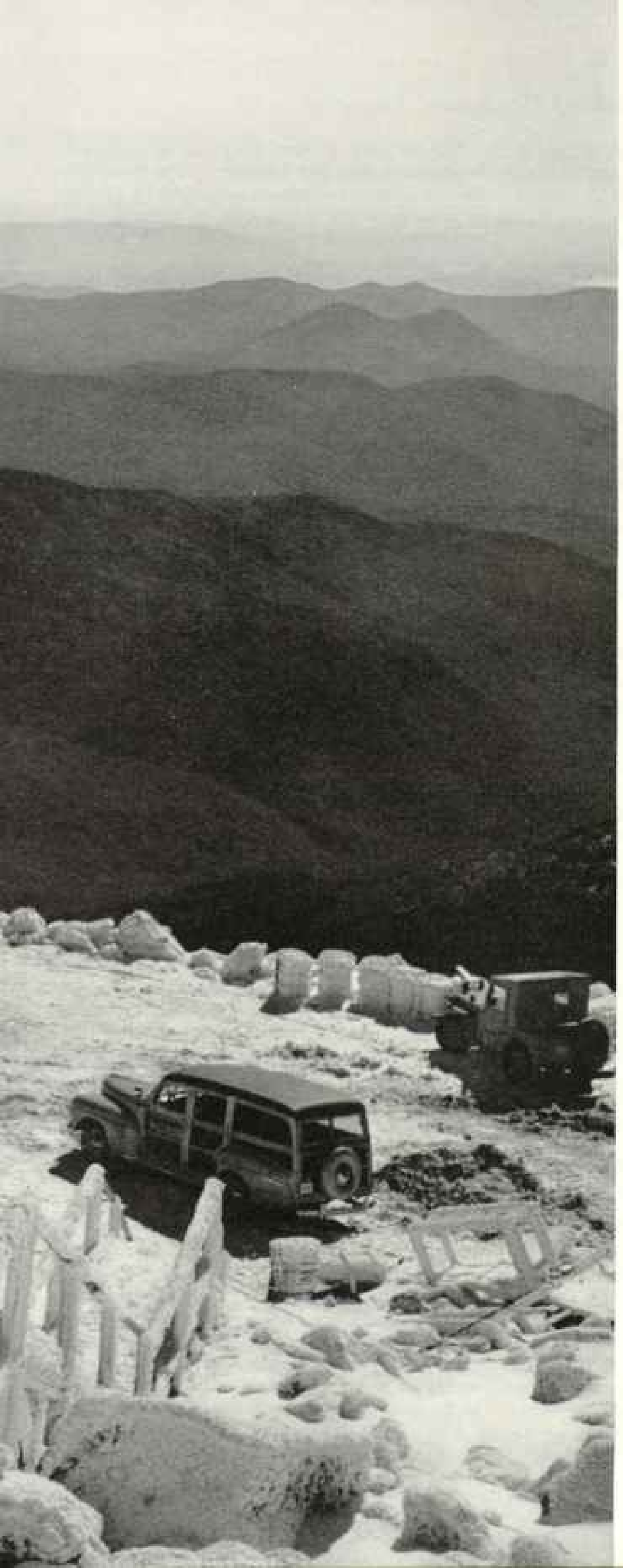
First great railroad tunnel built in this country, the Hoosac was the longest in the United States until 1928, when the Moffat Tunnel in Colorado, 6.2 miles long, was completed. The Cascade Tunnel in Washington, 7.8 miles, is now America's longest.

Cradled in the loftiest part of the Berkshires, in the extreme northwest corner of Massachusetts, is proud old Williams College, founded in 1793 on what then was almost the

* See "Skyline Trail from Maine to Georgia," by Andrew H. Brown, National Geographic Magazine, August, 1949.

← **Skiers Fly on Hickory Wings. Record Berlin, New Hampshire, Jump Is 262 Feet**





Mountain Ranges Roll to the Horizon: the Panorama from Mount Washington

With exceptional visibility, the view from Yankeeland's apex extends about 130 miles. To the west, one may look across Vermont and Lake Champlain to New York's Adirondacks. The view north carries into Canada. Atlantic's flashing lighthouses and the lights of Portland, Maine, may be seen to the southeast. The southerly view reveals the Isles of Shoals off New Hampshire's coast (map, page 569).

Here, on an average day, Washington looks some 50 miles east-southeast into Maine. In the foreground, Wildcat Mountain drops into shadowy Pinkham Notch. Tuckerman Ravine, on the immediate right, is famous for its late spring skiing.

Black Mountain occupies the second horizontal ridge. The third ridge shows (left to right) South Baldface, Sable Mountain, Kezar Lake, Chandler Mountain, and Kezar Pond. The long bulk of Pleasant Mountain rises in the distance, and just above its top Sebago Lake appears as a narrow white streak.

It is late September, and a 5-inch snow blankets the mountaintop. These visitors, having inspected the cog-railway terminal, descend to their station wagon (pages 563, 583, 592, 593, 594). They will drive down the carriage road (left).

Snow-encrusted crates contained jet-aircraft engines which the Air Force and Navy tested under Washington's worst icing conditions.

frontier, with money left by Col. Ephraim Williams, killed in the French and Indian War. Wooded slopes climbing high all around the lovely tree-shaded campus show why Williams's favorite song is "The Mountains":

> O proudly rise the monarchs of our mountain land,
> With their kingly forest robes to the sky . . .
>
> The mountains! the mountains! we greet them with a song
> Whose echoes, rebounding their woodland heights along . . .

It was a Williams professor of 100 years ago who inspired that famous saying, "The ideal college is Mark Hopkins on one end of a log and a student on the other." Professor Hopkins, later president of Williams, helped develop the ideal of liberal education fostered to this day in most small New England colleges—close contact between teacher and student, free discussion, and independent thinking (page 585).

Birthplace of American Foreign Missions

In 1806, on this then-remote mountain campus, was born another ideal with world-wide influence, the American Protestant foreign missions movement. During a thunderstorm one afternoon, five Williams students took refuge under a haystack, and their conversation there inspired them all to pledge their lives to foreign missionary work. Out of this grew the present-day North American Protestant foreign missions program, which in the year before the Korean war resulted in the expenditure of over $54,000,000 to support the work of 15,500 Americans and Canadians overseas and 76,000 native workers.

In 1801 a Yankee named Zenas Crane set up a mill in the Berkshires to make paper from the rags he collected from country housewives.

Today, whether you carry $1 or $1000 bills in your wallet, they're all engraved on special paper made in Dalton, Massachusetts, by the fifth generation of Zenas Crane's descendants. In the past 100 years Crane's has made paper for bank notes and securities of countries occupying more than half the globe.

Changing Styles in Stationery

Uncle Sam's currency paper is produced by a secret process in Crane's "government mill," from which armed guards exclude all visitors. Half linen and half cotton, it is the most durable paper that can be used for currency and is impregnated with fine red and blue silk threads that make it difficult to counterfeit.

Paper for stock certificates, bonds, insurance policies, deeds, note paper, wedding invitations, and the like also is made by Crane's.

"Styles vary in stationery, as in clothes," Winthrop Crane 3rd told me. "For instance, the black-bordered papers once used by people in mourning are going out of fashion, but wedding forms have not changed for several generations.

"People in the Southwest generally buy more brightly colored note papers than easterners, who stick to whites and muted shades. The westerners, we think, are perhaps unconsciously influenced by the stronger coloring of their scenery."

Across the Berkshires today can still be traced the "Great Road" over which, in January, 1776, toiled a long train of ox-drawn sleds loaded with more than 50 cannon captured at Fort Ticonderoga on Lake Champlain. Col. Henry Knox and his Continental artillerymen dragged these guns all the way to Boston, mounted them on near-by Dorchester Heights, and thus forced Lord Howe's British garrison to evacuate the city.

In 1777, after Burgoyne's surrender at Saratoga, forlorn files of Hessian prisoners were marched over this same mountain track. Along its route today, among the quiet forest-clad hills, stone walls, and rocky farms, one can almost hear again the hoarse shouts of Colonel Knox's ox drivers, the creak of sled runners under the weight of the cannon, the shuffle of marching prisoners' feet.

Artificial Lightning Aids Research

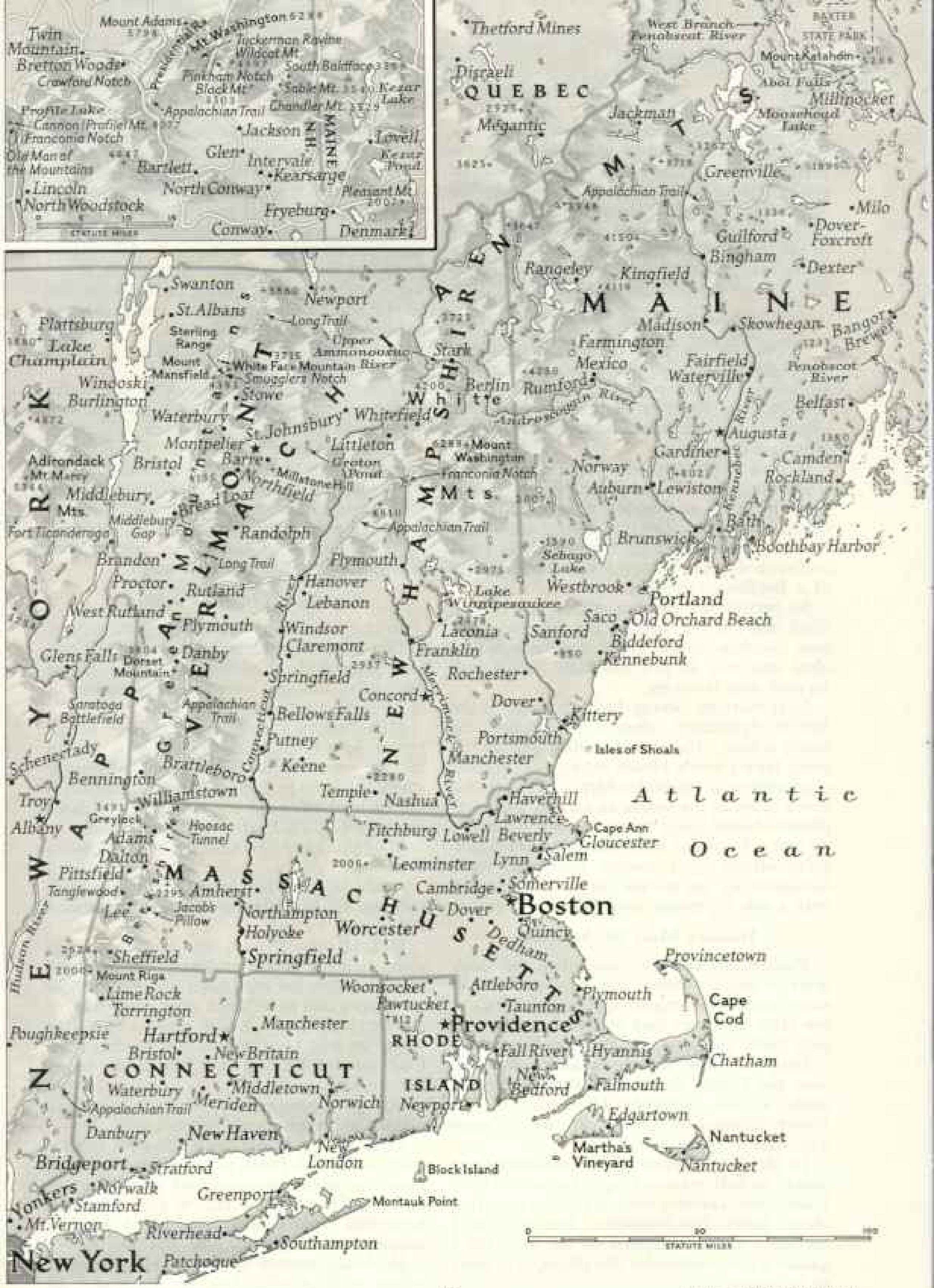
In bustling modern Pittsfield, near by, I stood on a balcony in the General Electric Company's "high voltage hall" and watched a 50-foot bolt of artificial lightning, largest ever created by man, flash and crash between two huge impulse generators (page 589).

Scientists use this 15-million-volt "man-made lightning" to learn better how to protect electric power transmission lines and power plants from damage by natural lightning bolts.*

General Electric also runs, in Pittsfield, the world's largest electrical transformer plant. Millions of transformers made here are working in electrical systems all over the world.

Nowhere is there anything quite like the annual Berkshire Music Festival, which in 1950 drew 170,000 music lovers and musicians to the Berkshire Hills. At Tanglewood, the lovely 210-acre estate where Nathaniel Hawthorne entertained children with *Tanglewood Tales*, the Boston Symphony Orchestra conducts its yearly Music Center, playing a series of superb concerts and operating a world-famous summer school of music.

* See "Lightning in Action," by F. Barrows Colton, National Geographic Magazine, June, 1950.



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Drawn by Herbert E. Eastwood

New England's Rugged Mountain Backbone Helps Mold Its Character

It seemed like circus day when I went to a concert one perfect July afternoon, with the familiar smell of trampled grass, long lines of people buying frankfurters and soft drinks, the sense of excitement in the air.

In the huge Music Shed, shaped like a piece of pie, open on all sides, the 6,000 seats were filling fast. On the stage the 104-piece Boston Symphony Orchestra was tuning up.

Overflow Audience Sits on Grass

Outside on the grass were jammed 8,000 more people clad in sun suits, sun dresses, slacks, and shorts, reclining on blankets, sitting on camp stools or newspapers, munching picnic lunches, knitting, playing cards, and holding hands.

A brass locomotive bell clanged; then guest conductor Serge Koussevitzky strode to the podium amid a thunder of applause and raised his baton. Instantly every sound was hushed. Down came the baton, and the great orchestra crashed into the opening cadences of a Beethoven overture.

So perfect are the acoustics of the Music Shed that far out beyond the fringes of the vast overflow crowd every note sounded as clear and true as if I had been sitting well forward near the stage.

Next morning George Judd, manager of the Boston Symphony, showed me around the music school. Under a spreading oak on the green lawn a lovely blonde sat on a camp chair practicing on a big golden harp. In a secluded shack down in the woods an earnest trombone player blatted away where he would disturb no one. A student orchestra practiced a concerto written by a student composer, while Koussevitzky paced the aisles and listened with a now approving, now pained, expression.

Dancers Must Be Athletes

Yankee farmers who once tilled the stony acres of Jacob's Pillow, not far from Tanglewood, would be amazed at the cavortings of the lithe, muscular men and women who now leap, twirl, and pirouette there every summer.

Here for three months students from all over the United States and abroad come to study at the nonprofit University of the Dance, directed by Ted Shawn, noted American dancer (page 576).

In the little theater where students stage dance recitals approaching Broadway's best, I saw them perform with faultless grace that classic ballet, *Les Sylphides*. Not only did I become a dance enthusiast on the spot, but I gained a new respect for the physique it takes to be a dancer.

"Commando training is a cinch compared with the workouts these people get," a staff member told me.

"Their day starts with one hour of body conditioning, the most rigorous calisthenics ever devised. Then comes an hour and a half of practice in classical ballet, followed by an equal period of modern dancing. After lunch there is a session in ethnologic, or folk, dancing. And on evenings when there's no recital in the theater, there are two hours of compulsory rehearsal of the day's work! By that time everybody's ready to hit the hay in 'ballet alley,' our dormitory!"

Director Ted Shawn, who at 59 still walks with the light-footed grace of a track athlete and dances in many of the recitals, told me:

"Our institution is unique in the world in offering a completely rounded course in all phases of the dance. Here we teach ballet, folk, modern, and classical dancing; the relation of the dance to music, and to drama—that is, the use of the human body as an instrument of emotional expression."

Coolidge Birthplace a Shrine

In sharp contrast with the busy Berkshires is tiny Plymouth, birthplace of Calvin Coolidge, almost lost among Vermont's Green Mountains but still sought out by thousands of reverent visitors.

Miss Aurora Pierce, the Coolidge housekeeper, spry despite her 80-odd years, showed me the room in the modest old homestead where the Yankee President was administered the oath of office by his father before dawn on August 3, 1923, after Harding's death.

"Did you know Mr. Coolidge well?" I asked her.

"Nobody knew him really well. He didn't talk much. But when he did, you understood it!"

Mrs. Herman Pelkey, who runs the village store, told me how President Coolidge would sit and watch the local boys pitch horseshoes all evening and never say a word. She showed me the little room in the rear of the store where he was born, and where he and Mrs. Coolidge once hid to play a joke on the Secret Service men.

Strange creatures once roamed Vermont's mountains, some people will tell you.

Years ago my father and uncle went to their camp on Groton Pond, in the heart of a lonely mountain wilderness, and took along Joe Leblanc, a French Canadian, to chop firewood. Returning from fishing, they found Joe had disappeared, leaving his coat, hat, and ax.

He finally turned up at a near-by sawmill village with a wild look in his eyes. In the woods, he said, he had seen the awful

Kodachrome by Robert F. Sisson

Pavement-tired Feet Escape on New England's Trails; Cares Vanish in the Mountains

This is 3,491-foot Greylock, loftiest of the Berkshires. Worn down by age, it is a dwarf compared with the younger Rockies. Here scientists, seeding clouds with dry ice, produced the first man-made snowstorm in 1946.

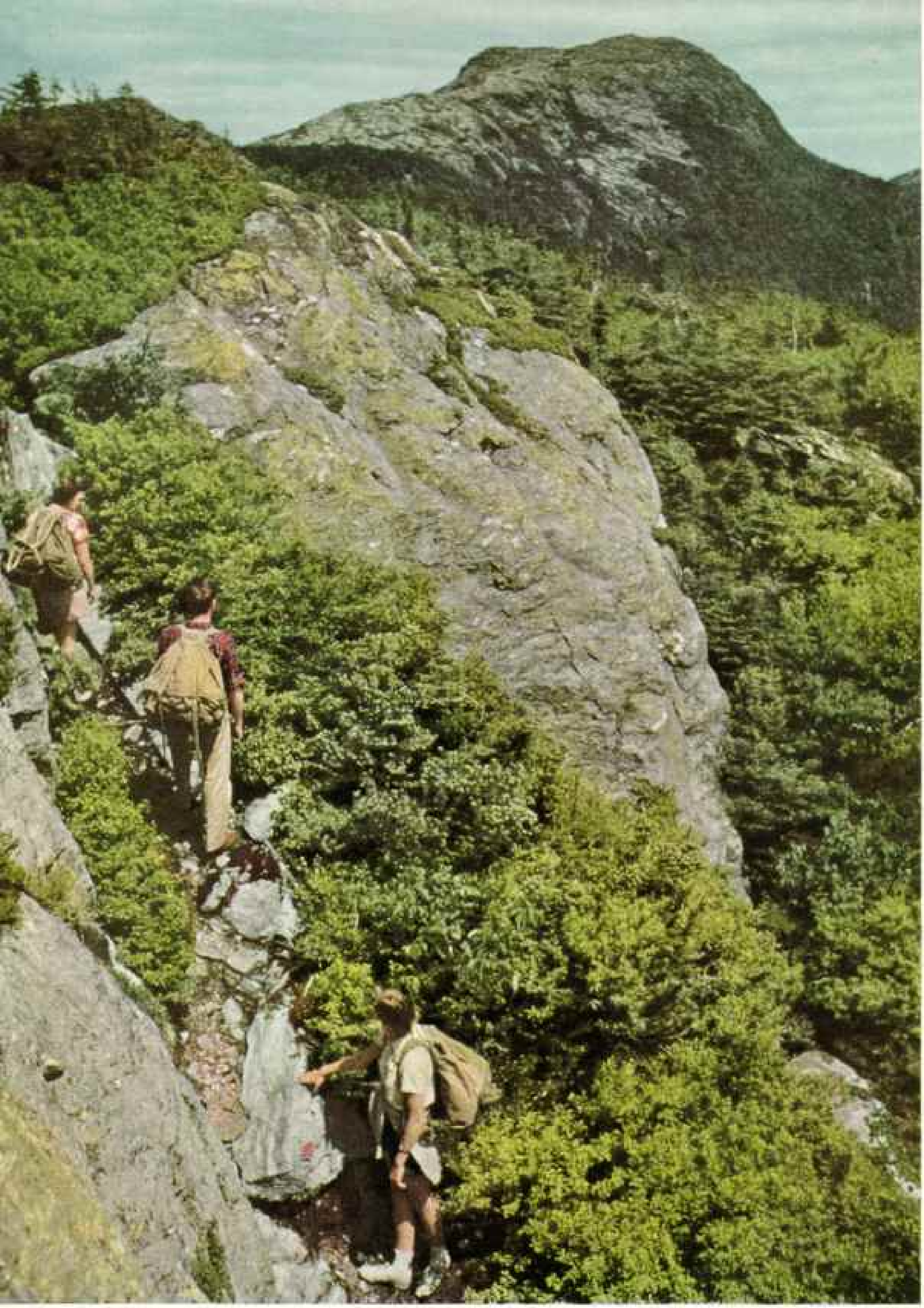
Kodachrome by Robert F. Sisson

Stowe, Vermont, Among the Enfolding Green Mountains, Typifies New England's Neat Hill Villages

For 100 years majestic scenery has drawn visitors here in summer. Now the skiing craze attracts crowds in winter. Sterling Range, White Face Mountain, and Smugglers Notch loom in the background. Mount Mansfield exposes a slope on the extreme left.

Horses Strain, Teamsters Shout, and Solid Stone Moves. The Winners Pulled 9,700 Pounds at This Adams, Massachusetts, Contest

Kodachrome by Robert F. Sisson



Kodachrome by Robert F. Sisson

Panting Hikers Scan Mount Mansfield's Craggy Summit, Jutting 4,393 Feet into Vermont Sky

Kodachromes by Robert F. Sisson

▲ Masses of Mountain Laurel Perfume the Berkshire Hills in June

Below: Subarctic conditions are duplicated on the upper life zones of 6,288-foot Mount Washington, New Hampshire, where the wind sometimes exceeds 200 miles an hour and the mercury sinks to 46 below zero. Alpine azalea *(Loiseleuria)* (upper left) normally ranges from Alaska and Greenland south to Newfoundland, Quebec, and Alberta. In the United States it grows only on upper New England's mountains. The key indicates the tininess of its blossoms. Bog laurel *(Kalmia polifolia)*, in the lower left, ranges north to Labrador; and Labrador tea *(Ledum)*, on the right, to Greenland. Both extend south to Pennsylvania and Michigan. They thrive in poor drainage.

Kodachrome by Robert F. Sisson

Autochrome by Franklin Price Knott

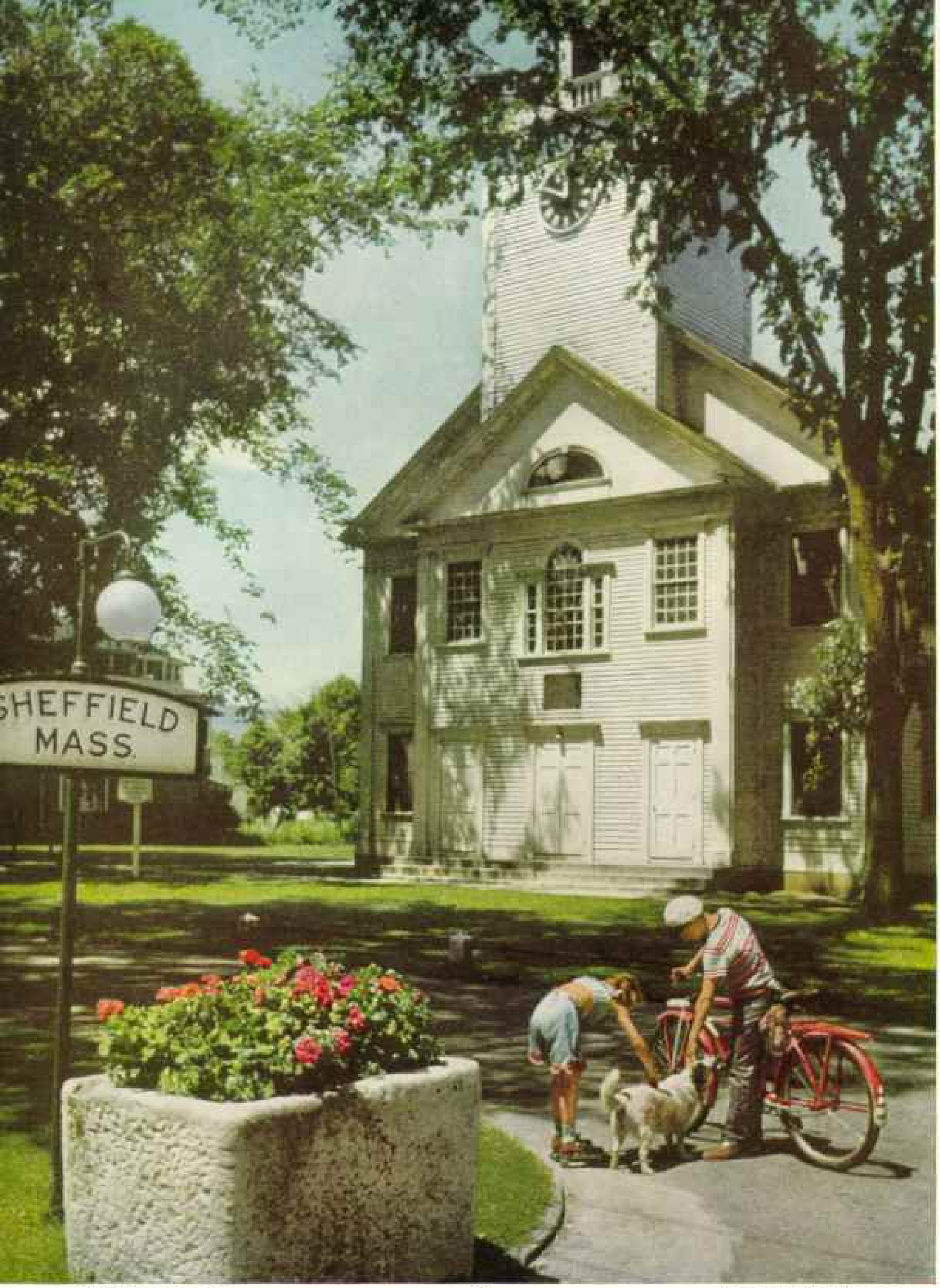
Ted Shawn (Left) Dances as Vigorously Today as He Did in 1916 (Right)

Mr. Shawn, at 59 years, conditions himself like an athlete. Each summer he directs the University of the Dance at Jacob's Pillow, near Lee, Massachusetts. Right: With Ruth St. Denis, he demonstrated an East Indian dance for the April, 1916, NATIONAL GEOGRAPHIC MAGAZINE, its first issue illustrated with natural color.

Morris Wallach Prints Linens with Old-time Blocks He Collected in Europe

In 1900 Mr. Wallach set up business in Munich, Germany. Now he maintains a shop in Lime Rock, Connecticut. His patterns are carved on pear and juniper wood. Inked, they transfer impressions to napkins and tablecloths. Even velveteen skirts may be block-printed.

Kodachromes by Robert F. Sisson



Here Sheffield's Spartan Churchgoers Shivered Through 50 Heatless Winters

Congregationalists, building the church in 1760, neglected stoves. Members choosing comfort at home to freezing at services risked a fine or confinement in stocks. Elms arch the street; the old horse trough grows flowers.

loup-garou, and had got out of there fast. French-Canadian legends say the loup-garou is a kind of werewolf, a man who has been changed into a wolf or other animal as a punishment for wrongdoing. His skin may be proof against gunshot, knife, or ax unless the weapon has been blessed. Nobody has seen a loup-garou in Vermont since that time Joe did.

Mount Mansfield, Top of Vermont

From the bare granite cone of Mount Mansfield, 4,393 feet above the sea, highest peak in Vermont, the blue-green summits and ridges of the Green Mountains are visible north to Canada and south halfway to the Massachusetts line (page 574).

Only the gleeful "dee-dee-dee" of a lone chickadee and the gentle whisper of the wind broke the silence as I sat on a rock on the summit, munched sweet wild blueberries, and watched black shadows of moving clouds parade up the green slopes of the next ridge.

Almost under my feet gigantic rock precipices plunged down into the deep, narrow gash of Smugglers Notch, as if a giant's ax had made a stupendous cut deep into the mountains (page 572). Through this wild defile, tradition says, smugglers spirited cattle to Canada during the War of 1812.

To the west gleamed the 100-mile-long expanse of Lake Champlain, historic pathway of French explorers and invasion route of British armies and fleets moving south from Canada in the Revolution and War of 1812.

For nearly 100 years a tiny frame hotel has perched on Mansfield's summit ridge, parts of it hardly changed from 1858 when hoop-skirted female guests rode up to it sidesaddle on horseback. Today cars can drive to the top of the mountain over a good toll road.

On the hotel porch I met my old friend Ed Chapin, Smithsonian Institution entomologist, on vacation, but with the happy light of the bug collector in his eyes. He showed me a glass jar full of grasshoppers. "They're a sub-Arctic wingless variety," he said, "found this far south only on the higher mountains where it stays cool even in summer."

"Long Trail" Follows Highest Ridges

Down over the steep 1,000-foot drop of Mansfield's southern spur I climbed and slid on the route of the Long Trail, a spectacular hiking path 261 miles long that traverses the entire length of Vermont, staying in the wilderness of the highest mountain ridges all the way.

Through miniature spruces growing amid tree skeletons left by an old forest fire, the trail led down over bare ledges where cairns, or rock piles, marked the way. A hawk soared silently above the shoulder of the mountain. Below, the trail led among clusters of enormous boulders strewn helter-skelter down the slope, through tunnels formed by piles of rocks, down rustic ladders and past caves.

Puffing up the trail under heavy packs came three high school boys from Dedham, Massachusetts, out to hike the entire length of the Long Trail from Massachusetts to Canada.

"Any excitement so far?" I asked.

"Well, a porcupine climbed in bed with us one night in one of the open shelters, probably looking for salt," they said.

"Another night we had to sleep outdoors because the shelter was full of girls. That was the only night it's rained so far!"

Hundreds hike on the Long Trail every year. A mail carrier once walked it from end to end on his vacation! Built and maintained by the Green Mountain Club, the trail has shelters spaced at intervals of a few miles, near drinking water and equipped with bunks and stoves.

Skiing Down the Nose Dive

Winter now is Mount Mansfield's busiest season. Skiers by the thousands, from as far away as New York City, swarm in for week ends or longer stays at the hotels, lodges, and farmhouses at the base of the mountain. On the highest and longest single-link chair lift in the East they ride in 12 minutes to the top of the mountain, then swoop down the steep Nose Dive Trail or glide more leisurely down the four-mile gentle slope of the auto road.

On a bright, bitter-cold day I watched hundreds of colorfully clad skiers of all ages soar away up the mountain in the chair lift, whiz back down on one of the many trails leading out of the woods, skid to a halt in a cloud of swirling snow, then stop in to warm before the shelter's big open fire or have a cup of coffee.*

Though only two or three of every 1,000 skiers receive injuries requiring medical attention, Mansfield's efficient Ski Patrol carefully supervises the safety of all. Unsafe spots are marked with flags and entire trails are blocked off by the Patrol if they become dangerous.

On the mountain slopes, in summer, you see stout wooden boxes elevated high on stilts to keep them from being buried in the winter snow. In them the Patrol keeps toboggans, first-aid equipment, and telephones. Injured skiers are hauled down the mountain on the toboggans, and a Ski Patrol member is the last man down in the evening on every ski trail.

* See "New England Ski Trails," by Daniel Rochford, NATIONAL GEOGRAPHIC MAGAZINE, November, 1936.

Gang Saw, Shaping Sharpening Stones, Cuts Hard Rock into Breadlike Slices

Norton Pike Company, Littleton, New Hampshire, makes stones to whet Latin America's machetes, the East Indies' rubber-gathering tools, and our own carving sets and industrial blades. Toothless blades cut with the aid of powdered aluminum oxide. They slice this Arkansas stone at half an inch an hour (page 584).

From the top of Mansfield one can see, shining white in the sun, enormous heaps of waste granite around the quarries on distant Millstone Hill. Out of the great pits on this one small elevation have come more than a third of all the private and public granite cemetery memorials in use in the United States today.

Millions of years ago an enormous mass of molten rock welled up from the bowels of the earth under Millstone Hill. Before it reached the surface, it stopped, cooled, and hardened into a mass of granite of unusually fine texture.

Quarry 30 Stories Deep

Steel-helmeted workmen look like ants down in the bottoms of the vast pits, from which comes a special grade of stone called "select Barre granite." The largest of these quarries, the Rock of Ages, a gaping 40-acre hole, is a third of a mile across, and its depth equals the height of a 30-story building (opposite).

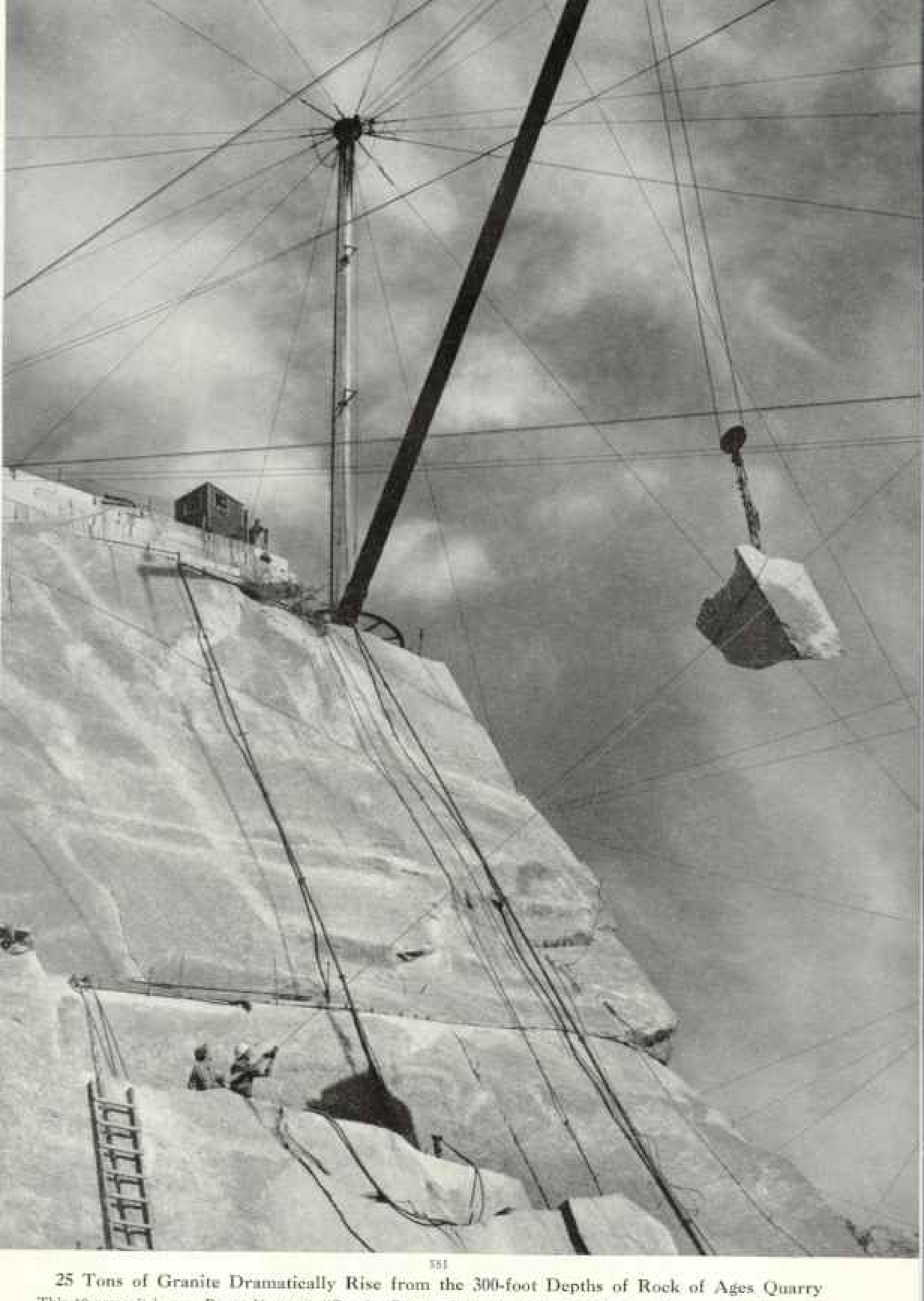
"Hard as granite is, we can do anything with it that one could with wood," Heber England, president of Jones Brothers Company, granite cutters, told me. "It can be sawed, planed, turned on a lathe, sanded, and carved. Granite even has a grain, like wood, so it can be split, too."

Much of the finest carving of granite monuments is done by skilled Italian and Scottish workers whose forebears migrated here more than half a century ago. One man working for Jones Brothers today represents the 16th generation of stone carvers in his family.

Over on the western slopes of the Green Mountains, in and around the little town of Proctor, the Vermont Marble Company quarries a large part of all the marble produced in the United States, ranging through innumerable different colors from almost pure white to a beautiful dark green (page 597).

Countless tiny creatures with shells of lime, living in ancient seas that once covered part of Vermont 400 to 700 million years ago, created today's marble beds. As the creatures died and sank to the bottom, their remains formed layers hundreds of feet thick, which later were hardened and compressed.

Down a high tunnel I walked into the heart of Dorset Mountain, where an 11-acre



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25 Tons of Granite Dramatically Rise from the 300-foot Depths of Rock of Ages Quarry

This 40-acre pit is near Barre, Vermont, "Granite Center of the World." Derricks, beneath an umbrella of cables, are Oregon firs, 115 feet long and 3 feet thick. Pipes carry compressed air to drill crews (opposite page).

582 Laurence Lowry

Ski Runs, Like Comb Lines, Part Cannon Mountain's Shaggy Hair in All Directions

To many persons, Cannon is known as Profile Mountain, owing to the Great Stone Face profiled by Nature on its shoulder (page 584). Here, at the summit, White Mountain ranges roll away toward southern New Hampshire. An aerial tramway lands skiers in the open-mouth shed (page 588). A shorter T-bar lift is indicated by the building and post on right. Cannon Mountain Trail, Ravine Trail, and Richard Taft Race Course all start close to this point (page 595).

cavern 80 feet high has been hollowed out of almost solid marble. Pillars of marble 30 feet thick hold up the roof. Against the reverberating roar of "channeling" machines cutting even farther into the mountain, I could barely hear my guide when he shouted; yet the workmen learn to pitch their voices so that they can talk in ordinary tones.

Marble Has Manifold Uses

Like granite, marble can be sawed, planed, turned, and shaped. Gang saws having as many as 60 steel blades, with sand fed under them, slice big blocks into thin sheets.

Vermont marble is the material of the Amphitheater at the Tomb of the Unknown Soldier in Arlington National Cemetery, and of the Supreme Court Building and Thomas Jefferson Memorial in Washington, D. C. It is widely used in cemetery monuments and mausoleums.

Many varieties and colors go into interior wall wainscoting, floor and wall tiling, mantels and fireplace facings, church altars, fonts, and statues, soda fountains, and garden furniture. Translucent slabs, half an inch thick or even less, lighted from behind, make decorative panels for store fronts and theater lobbies. Ground as fine as flour, marble forms "body" for rouge, toothpaste, paints, rubber, and linoleum.

If you go to a banquet or send some flowers to your wife or best girl anywhere from New York to Chicago or New Orleans, the ferns decorating the table or garnishing the bouquet very likely were picked originally on Vermont mountainsides (page 601).

Mort Ackert showed me the warehouse in Danby where he keeps 20 million ferns in cold storage for shipment to wholesale florists all over the eastern United States.

From August to October, when farm work

permits, his 300 pickers, all local men, women, and children, scour the near-by mountainsides for "Cut Fancy" ferns, known to botanists as *Dryopteris intermedia*.

Crossing the mountains through wild Middlebury Gap, where virgin forests still cloak some slopes, I visited the world-famous Bread Loaf School of English operated each summer by Middlebury College in the quiet and seclusion of this remote hill country.

Old English Ballads Preserved

A specialty at Bread Loaf, director Reginald Cook told me, is the study and preservation of old ballads, some traceable as much as 500 years back in old England, which have been handed down by word of mouth for generations in the mountains of New England. Typical is "Lord Thomas and Fair Eleanor," known in the days of King Charles II.

> Lord Thomas, he was a noble lord,
> The keeper of King's deer.
> Fair Eleanor, she was a lady most bright,
> Lord Thomas, he loved her dear.
>
> "Advise us both, dear mother," he says,
> "Advise us both as one.
> Had I best marry Fair Ellen, my dear,
> Or bring the Brown Girl home?"
>
> "The Brown Girl she has houses and land;
> Fair Eleanor, she has none.
> Therefore I charge you with my best care,
> To bring the Brown Girl home . . ."

Highest and roughest of New England's peaks are the bare and rugged White Mountains, massed in a tight cluster in New Hampshire's northern half. Highest and roughest of them all is mighty Mount Washington, named for America's first President (pages 566-7, 593).*

Wintering on Mount Washington

A gust of wind with the highest velocity ever measured on the earth's surface, 231 miles per hour, whipped across Mount Washington's summit on April 12, 1934. Twenty-five men and women have perished trying to climb the boulder-strewn dome in bad weather, victims of insufficient physical stamina or exposure; yet, when the weather smiles, one can walk up and down it in a day.

Leaning into a 60-mile-an-hour August gale, I visited the summit weather station where a hardy crew of young men stay all the year round. Their reports, broadcast daily from the mountaintop, are used in forecasting weather for all New England and for reporting skiing conditions (page 594).

Bolted to the rocks, the weather station is one of the world's strongest buildings. Its windows are double-paned and covered with fine wire mesh to protect them from flying chunks of ice. An oil burner supplies plentiful heat in winter, but, nevertheless, snow sometimes sifts through the window cracks and stays on the sills for days without melting.

"Coldest winter day we've ever recorded was 46.5 degrees below zero," Harry Temple, chief observer, told me. "It's never been over 44 above in winter or over 71 even in summer. On very cold days we have to wear face masks outside, and when the wind gets up to 100 miles per hour, it's impossible to stand upright.

"Our weather up here is as severe as any in the world, worse than the storms in the Rockies and the blizzards on the Great Plains. In winter we get hurricane-velocity winds on two out of every three days."

On the wall I spotted a membership certificate in the National Geographic Society issued in Temple's name. "A fellow gave me the membership after he got lost on the mountain and I found him," he explained.

Icing Tests for Jet Engines

Bad winter weather on Mount Washington has one good side. It provides a ready-made laboratory for studying that perennial headache of all aviators—formation of ice on planes in flight.

A scientist of the Air Force detachment at the joint U. S. Air Force-Navy research station on the mountain explained the program to me.

"Here on Mount Washington we get natural icing conditions frequently, better than we can produce in a wind tunnel or laboratory. We set up scale models of wings, propellers, and other aircraft parts, watch how ice forms on them, and try out anti-icing devices, such as heating the leading edges of wings.

"Icing affects the performance of jet engines, too, and we're testing various types of jets up here to see how they perform under icing conditions."

When Sylvester Marsh, a New Hampshire boy who had made his fortune in the West, climbed Mount Washington in 1858, he puffed, "This isn't the way we do things in Chicago," and started planning a railroad to the top. People scoffed, and a member of the legislature suggested Marsh's franchise be amended to permit him to build a railroad to the moon!

Marsh designed a narrow-gauge track with a slotted rail in the center, into which meshed the teeth of a cogwheel turned by a steam locomotive. It worked, and one-car trains

* See "New Hampshire, the Granite State," by George Higgins Moses, NATIONAL GEOGRAPHIC MAGAZINE, September, 1931.

pushed by snorting little engines have been carrying passengers up and down the mountain ever since 1869 (page 592).

Repairmen used to inspect the track by coasting down it on a "slideboard," made to fit over the cograil flanges and equipped with hand brakes. One man slid the three miles in 2 minutes and 45 seconds! In 1861 a carriage road was pushed through to the summit and is now a toll road for automobiles.

In winter some 25,000 skiers come to try out the slopes of Tuckerman Ravine and its famous headwall on Mount Washington, where the downhill grade starts on a 50-degree slope. Some amateurs "freeze" with fear when they first look down from its top. Busiest skiing season is from mid-March to mid-May, when the snow is gone or diminishing elsewhere in New England but lingers in the ravine, where the sun hardly penetrates.

Gazing out from the top of the gigantic cliffs on the east side of Profile Mountain (locally, Cannon Mountain; pages 582, 588, 595) with an expression half benign, half stern, is the famous Old Man of the Mountains.

Great fractures in the cliff face began the formation of the Old Man as much as 200 million years ago. Frost action broke off big blocks in such a way that the remaining ledges form the "Great Stone Face" when viewed from the shore of Profile Lake, some 1,200 feet below.

Three Miles of Pulpwood

Driving alongside the Androscoggin River north of Berlin, New Hampshire (page 564), I saw a mass of four-foot pulpwood logs filling the stream from bank to bank for three solid miles. They were stored for future use by the Brown Company, pulp and paper manufacturers, which owns 4,800 square miles of forest land in northern New Hampshire, Maine, and Canada, an area almost as large as Connecticut.

In old times the men who logged these woods lived in rough log houses, sleeping side by side in one long straw-filled bunk. Bathing was rare. Beans, salt pork, molasses, and strong coffee were the staple foods. Coming out of the woods in the spring, lumberjacks spent their accumulated wages in one wild spree.

I visited a modern model camp where the men live in neat portable houses with well-spaced double-deck iron bunks. There were shower baths, flush toilets, set tubs for washing clothes, electric lights, radios, regular mail deliveries, and free newspapers and magazines.

For noonday dinner we had big steaks, potatoes, onions, fresh rolls, and the lightest, flakiest cherry pie I ever tasted anywhere. It's not unusual for one logger to consume an entire pie!

Out of the enormous complicated machines in the company's huge mill in Berlin come pulps and papers from which are made fine stationery, wedding announcement stock, onionskin and carbon paper, cigarette papers, photographic papers, playing cards, parchment, facial tissues, multiwalled bags for cement and chemicals, strong bags for potatoes, coffee, tea, sugar, and flour. They make the base material for paper draperies, gummed sealing tape, insulation paper for electric wiring.

Oldest industry in all the White Mountains, founded in 1823, is the manufacture of millions of sharpening stones for hand use in putting edges on knives and tools. Out from the Norton Pike Company factory at Littleton, New Hampshire, are shipped nearly all the stones used for sharpening machetes in Latin America and for most of the knives used by rubber workers in the East Indies. Some stones are of natural rock; others are molded and fused in electric furnaces from molten silicon carbide and aluminum oxide (page 580).

For 100 years resort hotels have been as much a part of the White Mountains as the peaks of the Presidential Range. Typical of the older resorts is the luxurious Mountain View House at Whitefield, operated for five generations by the Dodge family. Its members have built nine successively larger additions on the original old family farmhouse, which still forms part of the lobby.

The original William F. Dodge got into the hotel business accidentally when a Boston-Montreal stagecoach broke down near by during a storm and some passengers from New Orleans sought shelter in his home. They liked the food and the magnificent view of the Presidential Range, came again and brought their friends. Some families have been spending vacations here for four generations.

Maine Makes Hardwood Gadgets

Where the White Mountains bulge over into western Maine they are less rugged and are interspersed with lakes, forming a popular vacation country in which are located 220 boys' and girls' summer camps.

Here, and in Vermont as well, busy woodworking factories turn the hardwood trees of the mountain slopes into the countless little wooden gadgets that help keep civilization moving.

Leo Melvium, superintendent of the H. G.

United States History Has Special Meaning at Williams, a College Almost as Old as the Nation

Small classes and close teacher-student contacts are the rule in most New England liberal arts colleges (page 568). Here Prof. Luther Mansfield (center) lectures on America's beginnings. Griffin Hall's wall plaque (left) honors Col. Ephraim Williams, whose name the college bears. Killed (1755) in the French and Indian War, he left a fund founding Williams (1793) at Williamstown, Massachusetts. The Palladian window, with its arched centerpiece, was a feature of New England architecture in the early 1800's.

Winter and Sons plant in Kingfield, showed me two machines that turn out 60,000 checkers and 22,000 tiny Venetian blind pulleys in a single day.

"We make costume jewelry of wood, coated to look like pearl and glass," he told me. "Also salt and pepper shakers, lawn-mower rollers, policemen's clubs, croquet balls, wheels, yo-yo tops, gavels, dollhouse-size fruit, folding-bed legs, screw-driver handles, and more other things than I can remember" (591).

Up through parts of these mountains, too, woodsmen have found rusted axheads and cases of lead bullets, relics of a heroic but little-known epic of the American Revolution, Benedict Arnold's tragic march to Quebec.

Disasters Harass Expedition

In the fall of 1775 Arnold, at that time still a loyal and energetic officer in the American Army, led about 1,000 men in bateaux up the Kennebec River to try to penetrate the northern wilderness and capture the British stronghold of Quebec by surprise.

Trouble began early. Water getting into the boats ruined the biscuit, dried peas, and salt fish. Heavy rains flooded campsites, washed away equipment, and made a morass of the ground over which the troops struggled to carry their heavy boats at portages. Many men fell sick, some died, and some units, becoming disheartened, turned back.

With a remnant of only about 500 men, Arnold finally reached Quebec and joined Gen. Richard Montgomery's force of 500 that had come down the St. Lawrence. They attacked, but were driven off and all the privations came to nothing.

Away to the north and east of Moosehead Lake stretch the Big Woods of Maine. Out of this timberland every day comes 1,200 tons of newsprint paper, produced by the Great Northern Paper Company, largest makers of newsprint in the United States (page 591).

So extensive are its forest lands, covering more than a tenth of the State, that the company classifies timber with the aid of aerial photographs, on which experts can identify the various kinds of trees.

Katahdin Rises from Wilderness

Thrusting up out of the center of this wilderness stands the last great eastward bastion of New England's mountains, the solid gray rock mass of Mount Katahdin. Only 12 feet short of a mile in height, Katahdin rises almost alone out of country that is only about 800 feet above sea level, so that it appears more spectacular than any other New England peak (pages 598-9).

Katahdin stands in Baxter State Park, 141,712 acres of woodland given to the State by former Governor Percival Proctor Baxter to ensure preservation of the area in its wild state and for the protection of game, which abounds in this region.

All around in the woods we saw tracks and signs of moose, bear, and deer. Driving back to camp one night, photographer Bob Sisson rounded a curve and almost ran head on into a bull moose standing in the road. Just in time, the moose yielded the right of way.

"Some hikers used to wear out the seats of their pants sliding down on the rougher trails on Katahdin," a Maine guide told me. "They'd stay out in the woods and send in for blankets to wear into camp! Once, for a joke, we sent a fellow a barrel!

"One woman hiker wore so much gear that she got stuck in the Needle's Eye, where the trail goes through a narrow cleft of rock. She couldn't move forward or back, and had to wait all night until some people came along in the morning and pushed her through."

Knife Edge Dangerous in High Wind

Flying me 1,000 feet above Katahdin's top, Bill Turgeon of the Maine Department of Inland Fisheries and Game pointed out the peculiar fishhook shape of the mountain. Point of the hook is the broad, rounded dome of Pamola, named for the deity of the mountain that the Indians feared. Inside the bend of the hook are three great basins, and from their floors stark granite cliffs rise 2,000 feet sheer to the rim above.

Along the top of the bend of the hook we could see the famous Knife Edge, so narrow a man can stand astride of it in many places, and dangerous in a high wind, with precipitous slopes dropping 1,500 feet on either side. This narrow ridge leads up to Baxter Peak, Katahdin's summit. Beyond is the broad four-mile Table Land, a comparatively level area on the top of the mountain.

As far as we could see in every direction, the forest formed a blanket of glorious autumn coloring, dotted with the shining blue of innumerable lakes and ponds, which, as Henry David Thoreau once said, look like the fragments of a gigantic broken mirror scattered far and wide.

Wordsworth wrote: "Two voices are there; one is of the sea, one of the mountains; each a mighty Voice."

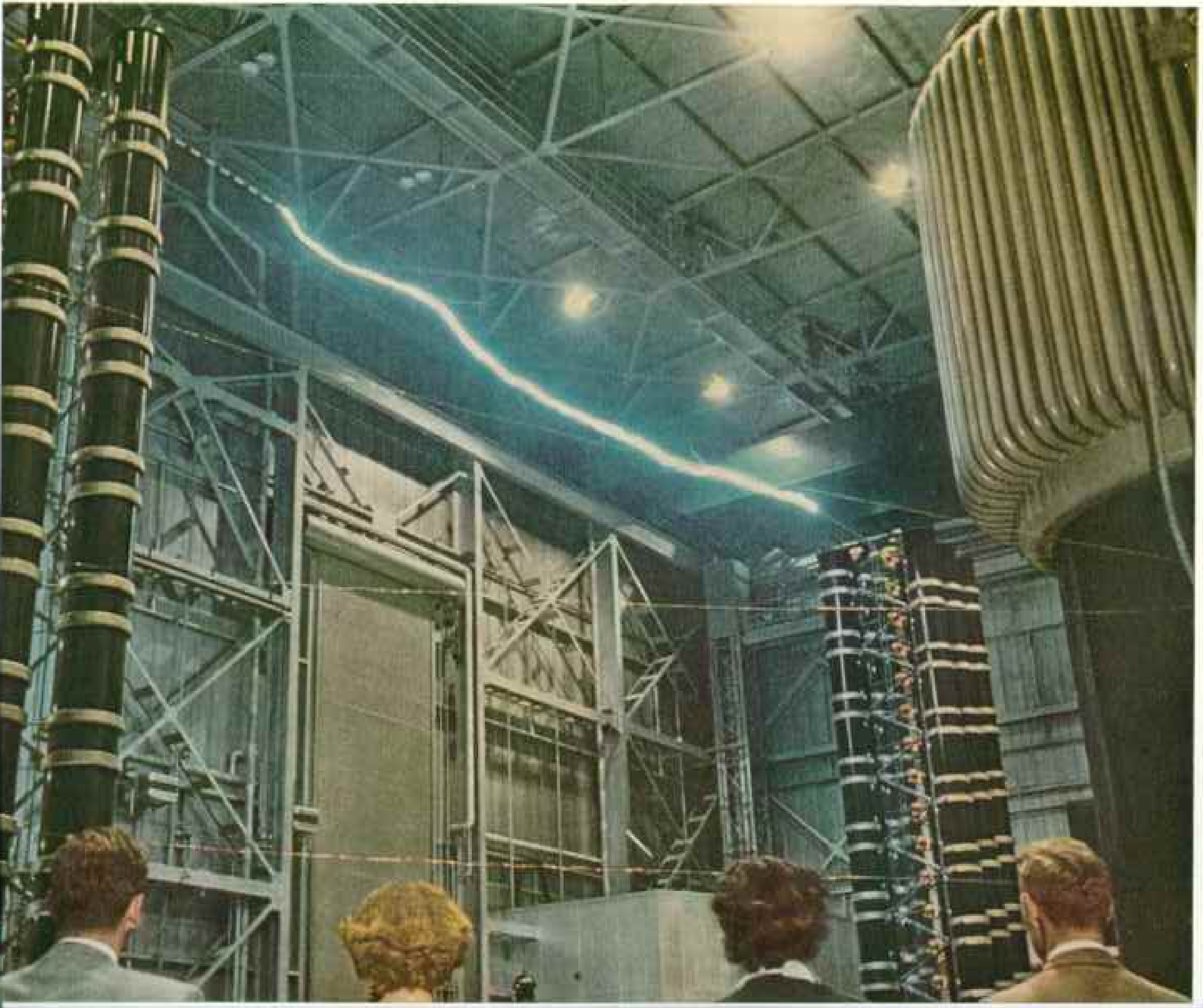
In New England the voice of the mountains is mighty indeed.*

* For additional articles on New England, see "National Geographic Magazine Cumulative Index, 1899–1950."

Kodachrome by Robert F. Sisson

Norwich University Cadets, Practicing Mountain Warfare, Rope Down a Cliff

The Green Mountains' rugged terrain and heavy snows provide ideal conditions for strenuous maneuvers at this military college in Northfield, Vermont. Admiral George Dewey, hero of Manila Bay, was a Norwich student.



^ Cannon Mountain's Cable Car Shoots Up Faster than Skiers Can Slide Down

The aerial tramway in Franconia Notch, New Hampshire, makes the ascent in less than eight minutes. Average skiers take twice that long to return, but experts sometimes achieve 60-mile speeds. These two men, with ski tips turned in as brakes, reduce speed by snowplowing.

< Man-made Lightning's 15-million-volt Spark

The most powerful artificial bolt ever created flashes 50 feet between generators in General Electric Company's High Voltage Laboratory, Pittsfield, Massachusetts. By studying it, scientists learn ways to overcome natural lightning's destructiveness.

Three exposures were made to get this picture on a single frame of film. First, background details were recorded by a time exposure from the overhead lights. Then the spectators were caught by flash bulb. Finally, the camera shutter was left open, the room lights were turned off, and the bolt was photographed by its own brilliant light.

Kodachrome by Robert F. Sisson

Vermont Maples Drain Their Pale, Sweet Fluid into Pails. A Farmer Collects Sap for Boiling Down into Pancake Sirup

Maine's Wooden Toys Are Painted in Tumbling Barrels; Pulp Logs Are Skinned in Barking Drums

Nineteenth-century lumbermen cut down Maine's vast stands of virgin timber. Today pulp from spruce, fir, and hemlock is the State's leading wood product. Every day its forests turn out enough newsprint to make a two-foot-wide strip encircling the world.

Largest domestic producer of newsprint is Great Northern Paper Company. Its daily output averages 1,200 tons; its forests cover more than a tenth of Maine.

Right: Pulp logs float into Great Northern's barking drums at Millinocket. Bark is removed as the logs revolve against one another. Peeled, the sticks go to the mill to be made into pulp.

Below: Hardwood yo-yo tops are painted in tumbling barrels at H. G. Winter and Sons factory, Kingfield, Maine.

New England hardwood goes into such other products as policemen's billies, Venetian-blind pulleys, tool handles, lawn-mower rollers, checker pieces, and costume jewelry.

Kodachromes by Robert F. Sisson

Mount Washington's Cogwheel Train Starts the Season's Last Round Trip

Skeptical New Hampshire men scoffed when Sylvester Marsh in 1869 built a locomotive whose cogged drive wheel meshed into a slotted rail. A legislator remarked that Marsh might as well try to build a railroad to the moon as to Washington's forbidding summit. But the inventor's idea worked, and ever since his railway has carried passengers up the mountain.

The locomotive makes the three-and-one-fourth mile climb in one and three-quarters hours. Seats and boilers are tilted so that they are level on steep grades.

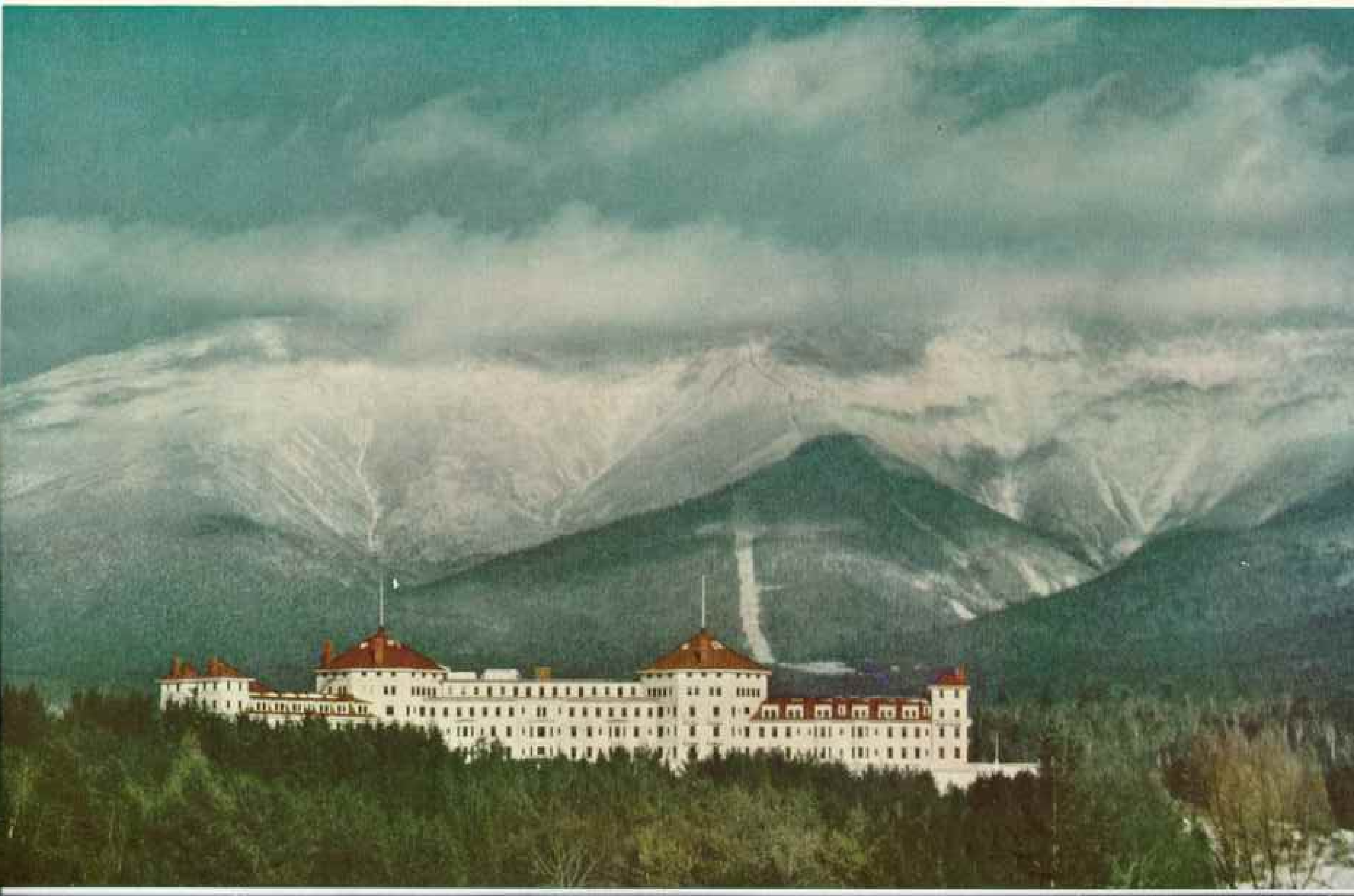
Just before storm and snow began to make conditions hazardous, this one-car train puffed out of the base station near Bretton Woods, New Hampshire, in mid-October.

The right-of-way slashes a wide swath through the forest (opposite page).

Cloud Cap and Snow Glorify the Mountain

Washington's bare, ravined summit, high above timberline, rises 6,288 feet—New England's loftiest peak.

Mount Washington Hotel (foreground) entertained the Bretton Woods Monetary Conference in 1944.



Kodachrome by Robert F. Sisson

Winter in September: Hurricane Winds and Arctic Cold Beset a Lofty Weather Station

In 1934 Washington's mountaintop observatory survived a 231-mile gust, strongest ever recorded. Here feathery frost coats tower and cog-train tracks. Visitors walk in 7-above-zero cold as sunshine floods the valleys below.

New Hampshire Skiers Make Dizzy Turns Cannonballing Down Franconia Notch Trails

Skiing in New England dates back to 1872, when Scandinavian millworkers in Berlin, New Hampshire, founded the Nansen Ski Club. Dartmouth College's Outing Club, organized in 1909, was a pioneer in popularizing the sport. America's first snow train ran to New Hampshire in 1931. New England's courses are convenient to thousands of eastern week-end skiers who never see the Alps.

Above: Hardscrabble Trail drops 2,000 feet in one and three-quarters miles. This run is for experts and intermediates; amateurs take slower trails. Below: Snow is powdered by the Christiania turn.

Old-time Indians Would Have Prized the White Man's Steel-tipped Hunting Arrows

A few New England sportsmen think that hunting has no thrill equal to stalking deer with bow and arrow. For effective shooting, they must advance undetected until their quarry presents an unobstructed shot. The usual range is 20 to 40 yards.

Here Edwin Wallace, in his Whitefield, New Hampshire, shop, fletches hunters' shafts with turkey feathers. He sets the feathers in a slight spiral so that the resulting spin may hold the missiles on a true course. Jigs on his turntable clamp the feathers tight until cement dries.

Mr. Wallace also manufactures target-shooting equipment. He likes to fit the bow to the customer's height, reach, and pulling strength. He uses nylon and linen bowstrings.

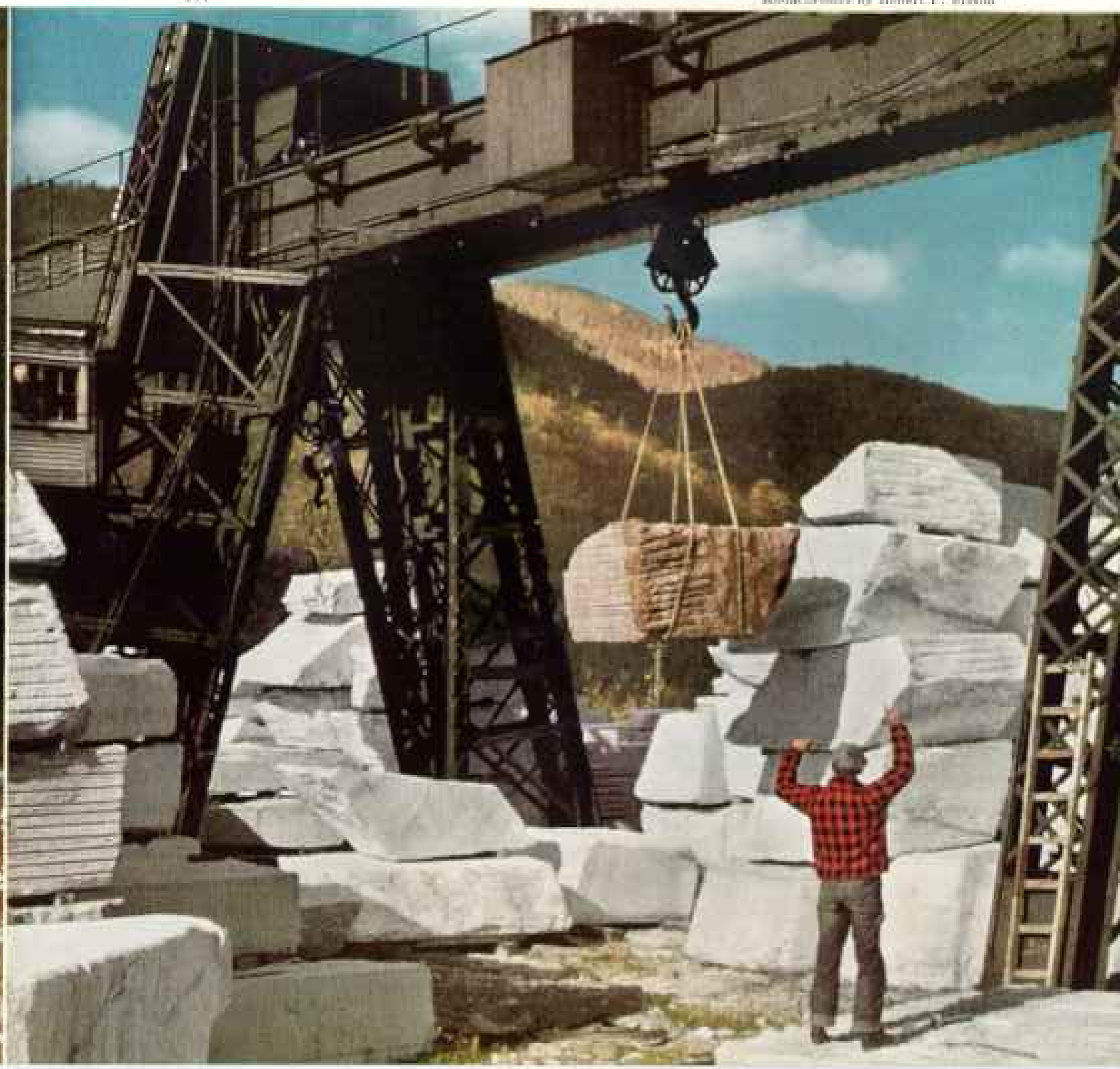
Right: Ski mittens with buckskin palms are shaped on a steam-heated form at Saranac Glove Company, Littleton, New Hampshire. Reinforcing patches resist abrasion from ski-tow ropes.

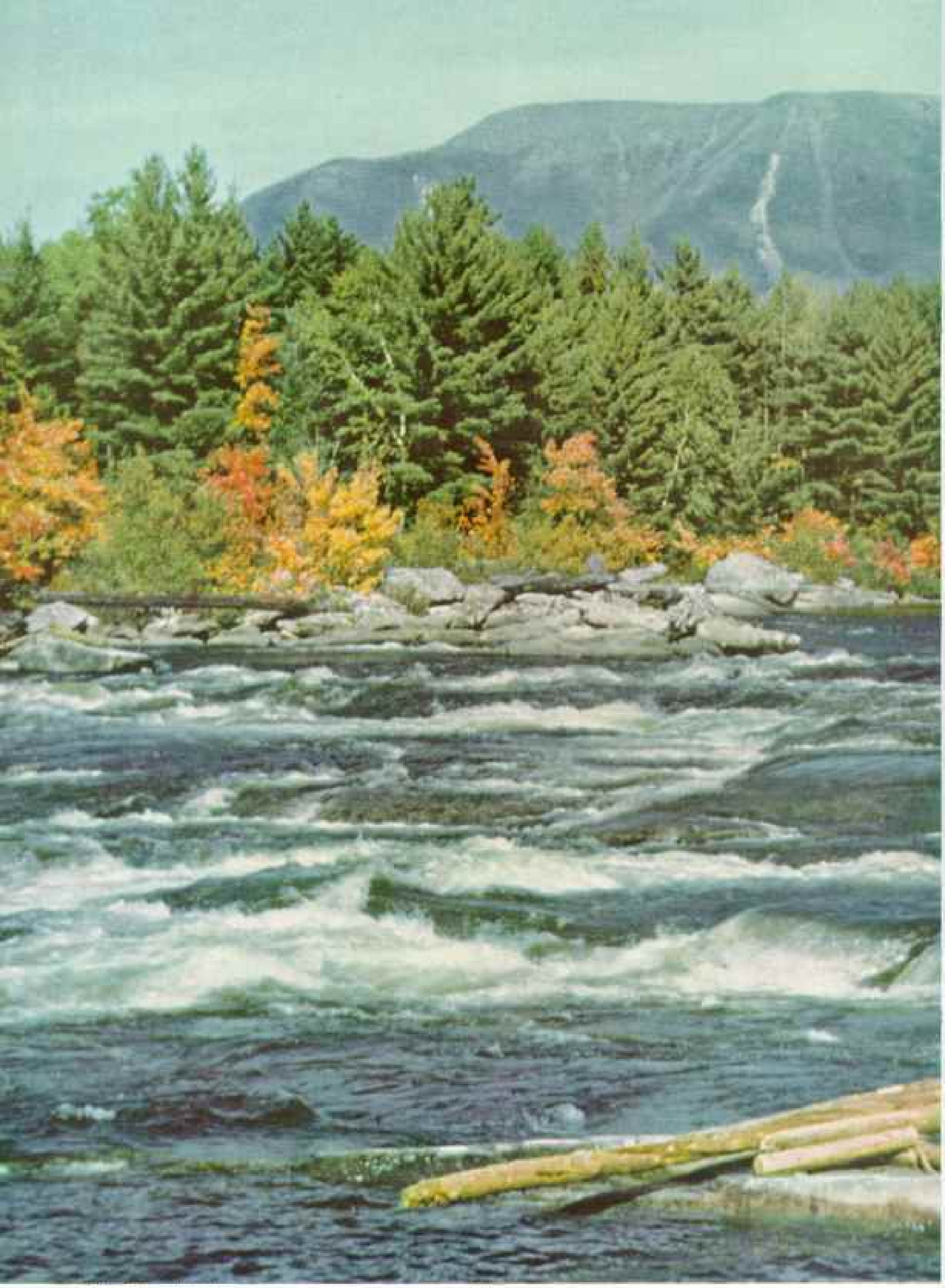
Each year the plant manufactures some 275,000 pairs of deerskin mittens and gloves for workmen, hunters, golfers, and gardeners. Its mittens protected Admiral Byrd's crews on two Antarctic expeditions.

Vermont's Versatile Marble Lends Beauty to Shrines, Makes Enduring Memorials, and Even Adds Body to Toothpaste

Arlington National Cemetery's Amphitheater, Thomas Jefferson Memorial, and the United States Supreme Court Building are Vermont marble. Sawed into thin slabs, the stone brightens theaters and office buildings. Powdered, it goes into rouge, paint, rubber, and linoleum. Here a crane lifts a 15-ton block at Vermont Marble Company's plant in West Rutland. A carver spells out a name with his compressed-air chisel.

Kodachromes by Robert F. Sisson





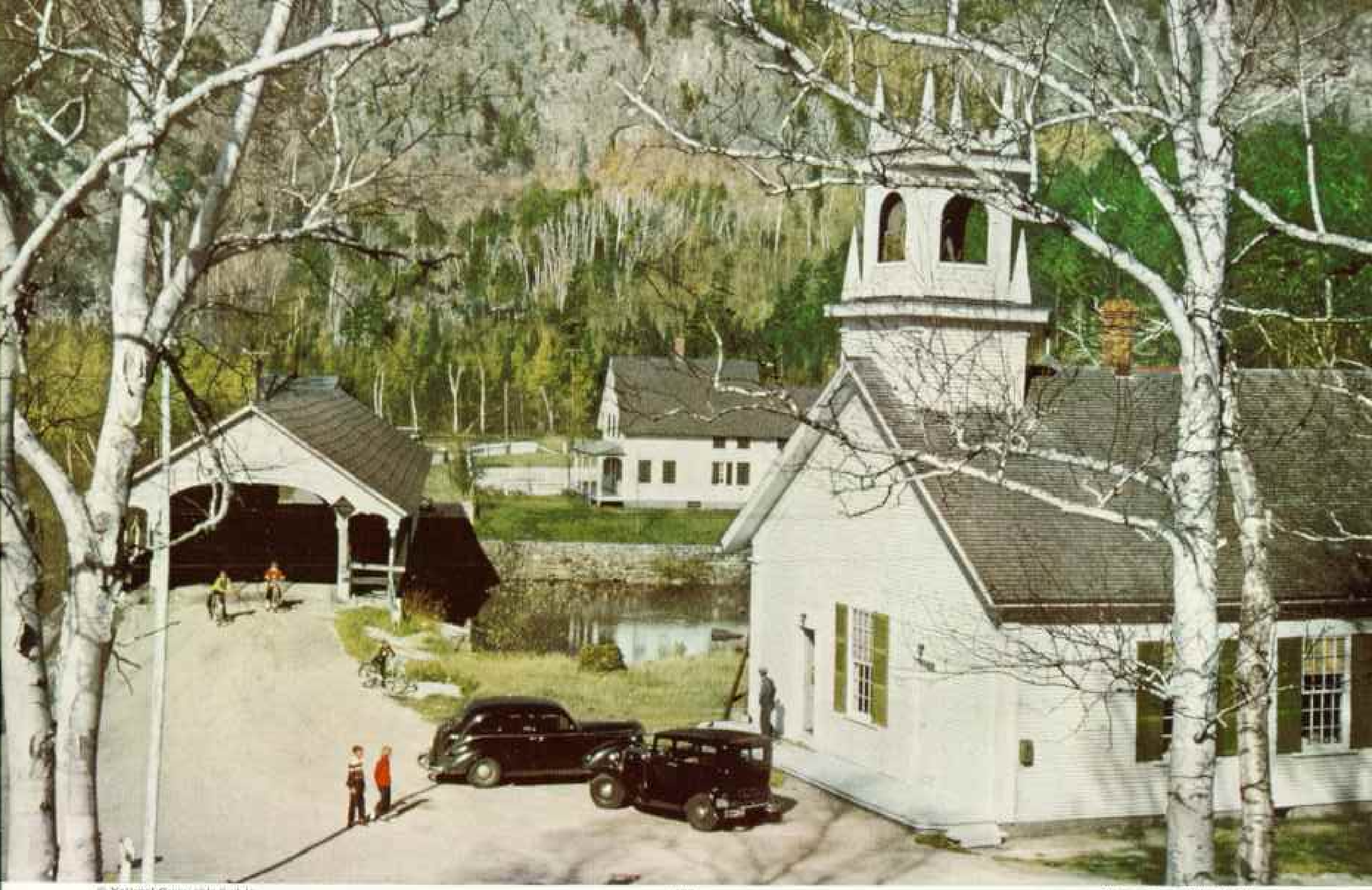
Mile-high Mount Katahdin Rises Bare and Grim Out of the Central Maine Wilderness

Grinding glaciers gave Katahdin the shape of a giant fishhook. Where the hook bends, a hiker may straddle the narrow Knife Edge, provided the wind does not topple him into a 1,500-foot abyss on either side.

Kodachrome by Robert F. Sisson

Indians Never Approached It, Fearing the Wrath of Pamola, God of the Mountain

Penobscot's West Branch floated huge log drives during Maine's lumber boom days. Lumberjacks have lost their lives shooting Abol Falls (left). Moose, deer, and bear, protected by Baxter State Park, abound in the woods.



Reproduced by Robert F. Sisson

← Old Covered Bridge and White Church Say This Is New England

This protected span, crossing Upper Ammonoosuc River at Stark, is one of 57 surviving in New Hampshire. The State Legislature, voting restoration funds, takes pride in preserving it as a useful relic of simpler days.

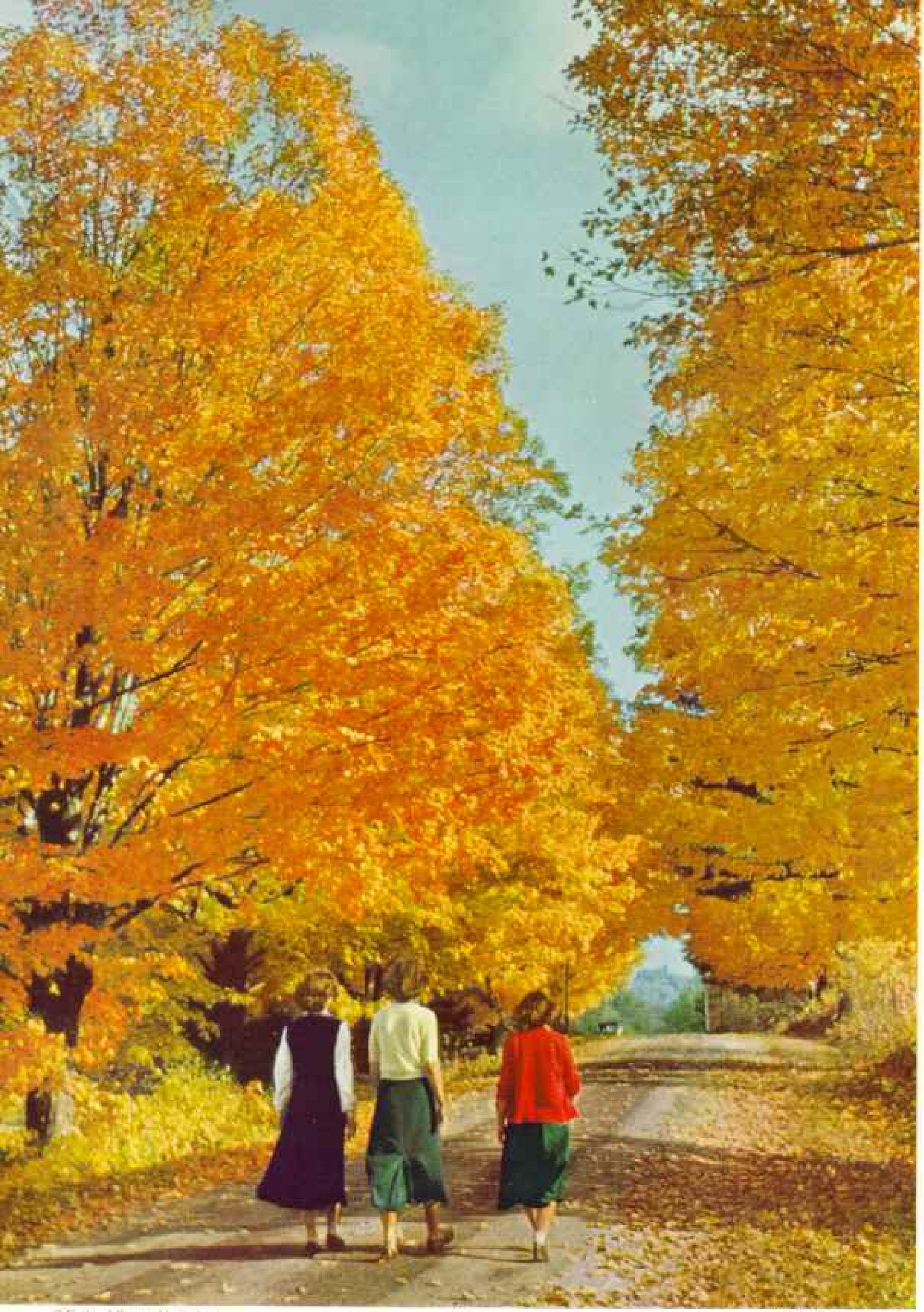
Such wooden bridges were roofed to protect them against weathering and decay and to stiffen them against heavy winds. Some still bear the old-time warning, "Walk your horses or pay two dollars fine."

Vermonters Pick → Ferns by the Millions

Cities as far away as New Orleans and Chicago order Vermont's wild ferns to garnish tables and bouquets. One warehouse keeps 20 million plants in cold storage awaiting orders from wholesale florists. Pickers gather them from August to October, when work on the farms permits.

This party, working near Danby, scours the forest for "Cut Fancy" ferns. They will carry the ferns out on their backs to roadside for collection by truck.

Kodachrome by Robert F. Sisson



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Kodachrome by Robert F. Sisson

Autumn Paints the Maples Yellow and Orange: Farmington, Maine

A Journey to "Little Tibet"

By Enakshi Bhavnani

With Illustrations by National Geographic Photographer Volkmar Wentzel

"WHAT a way to spend your holiday!" our friends exclaimed. I suppose they were right. Our trip would mean a trek of 550 miles on horseback and on foot over ground completely alien to us. It would mean everything from flash blizzards to drought, snowdrifts to desert sand, and temperatures ranging from below zero to 100 degrees above. It would mean strange people, strange customs, a different language and economy. At worst it would be sheer trudgery; at best, rough going. But we wanted to go. We wanted to journey to Ladakh, sometimes called "little Tibet."

Politically, Ladakh is in the eastern part of the now disputed State of Jammu and Kashmir. In every other aspect, Ladakh and the rest of the State are poles apart. The Kashmiris are predominantly Caucasian by race and Moslem by religion, living in lush green valleys.* Ladakhis, largely Mongoloid and Buddhist, inhabit a cold, lofty wasteland.

Doorway to Tibet

Once Ladakh was a part of Tibet. The people still look to the Dalai Lama of Lhasa as their spiritual leader. They are still Tibetan—in religion, in blood, in dress, language, and custom.†

A glance at the map shows that the State of Jammu and Kashmir sits like a crown on the Indian subcontinent. On the east lies Tibet, on the west Pakistan. On the north it touches Sinkiang and Afghanistan, a narrow strip of which separates Jammu and Kashmir from Russia (map, page 607). Claimed by both India and Pakistan, the State is a coveted prize.

Tibet has never welcomed travelers. But remote Ladakh is virtually the doorway to the forbidden land of the lamas. Ladakh was accessible to anyone who wanted to go there—to "the roof of the world." What could be better? To us secluded Ladakh meant romance, mystery, and adventure, something literally out of our world. Nothing could dissuade us. We were going to Ladakh.

Four of us—my movie-producer husband, our young son, a woman friend of mine, and I—set out one bright August evening on horseback from Srinagar, Kashmir's capital. Our itinerary: North to Gandarbal, then east through the Sind Valley to Sonamarg, and on to Leh, capital of Ladakh.

We were to journey for two months over desolate trails, with full field equipment, five servants, 20 ponies, food and luggage, plus feed for the animals. We took canned goods to supplement fresh edibles we hoped to buy along the way. For the most part we lived in tents, camping in the fields beside snow-fed rivers.

Our daily routine called for early rising, a quick breakfast, packing the animals, riding on to the next stage, camping for the night—always moving on. There were 15 stages in all, some long and some short, ranging from 11 to 26 miles each, determined by the difficulty of the route and the situation of the villages.

At the end of our first day on the road after leaving Srinagar, we reached Woyil bridge, where we camped at the edge of the Sind River. A large suspension bridge in the valley 100 feet away arched over the fast-flowing, snowy waters.

Early the next morning we learned that we would travel by the *res*, the system under which a village or group of villages supplies transport for certain stages on certain roads. The rate of payment was small, about half a cent per pony per mile.

Once again we started along the Sind. Snow-capped mountain peaks hemmed the valley. Beautiful flowers filled the meadows; the pale river wound between crags and boulders. The fields were ripe with corn and rice. The mountain walls grew steeper and higher. It seemed to me that there was magic in the atmosphere.

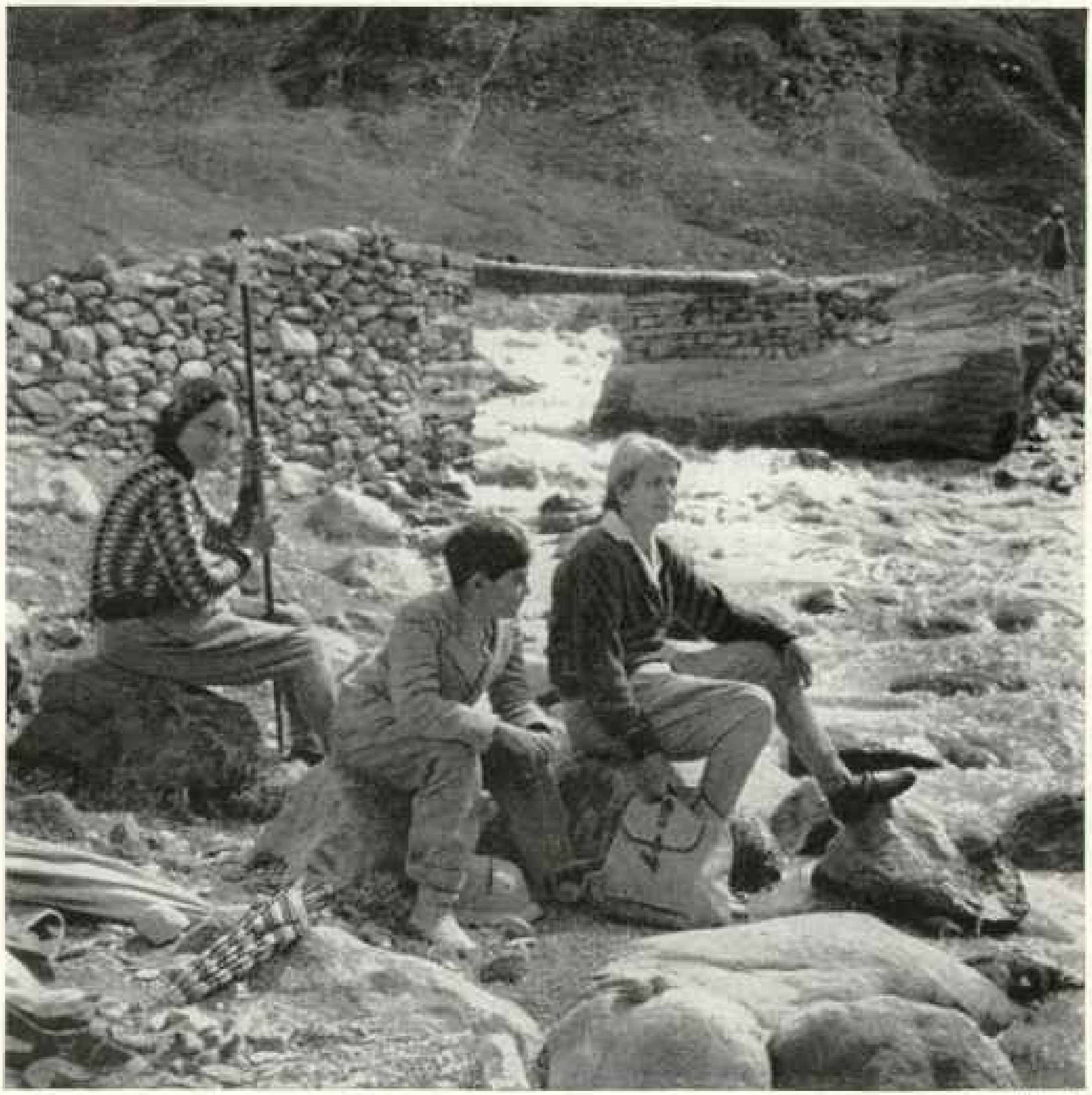
Strauss Waltz on a Carpet of Grass

We reached our next camp, at Kangan, at 5 in the afternoon. Since the pack ponies had gone ahead, camp was ready for us. It was an enchanting spot, with a carpet of grass and the rippling sound of a spring a few feet away. A mountain wall stood grandly in front of us.

Evergreens vied for color with an azure sky. Little calves gamboled over the moss-encrusted rocks as we sipped our tea and listened to the dreamy strains of Strauss

* See, in the National Geographic Magazine: "The Idyllic Vale of Kashmir," by Volkmar Wentzel, April, 1948, and "House-Boat Days in the Vale of Kashmir," by Florence H. Morden, October, 1929.

† See "A Woman Paints the Tibetans," by Lafugie, National Geographic Magazine, May, 1949.



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The Author (Left), Having Crossed the Zoji La, Rests Beside a Torrent near Machhoi

Mrs. Enakshi Bhavnani journeyed to Ladakh with her son (center), friend (right), and husband (who took the picture). They climbed 13,000-foot passes, followed mountain trails looking down into nothingness, and crossed shaky log bridges (background). Ladakh's faces and places seemed as strange to these visitors from India as they did to National Geographic photographer Volkmar Wentzel, who followed their route (pages 612, 625).

waltzes. We hadn't forgotten our phonograph —the one luxury we allowed ourselves.

Along the road the next morning, the scenery increased in beauty. The pine-covered mountains became higher; the valley lay in a mantle of green and gold; walnut trees bent low over our trail. We jogged along on our ponies, munching green walnuts which we bought for two cents a hundred.

Each morning our horsemen fixed all the luggage on the pack ponies, but only after much quarreling and haggling. Each pony was supposed to carry about 180 to 200 pounds. Weighing and distributing the baggage became the source of much argument and shouting. It annoyed and delayed us considerably.

The horsemen, of course, felt we had too much baggage with us. They traveled with only their clothes. Actually, in addition to food, we took only the minimum of necessaries—two small tents, one large suitcase with woolen clothes for the four of us, a canvas bag for laundry, a canvas bath tub, a couple of wash basins, four camp chairs, beds, etc.

We really had to rough it, for cumbersome baggage would have made the journey longer and more difficult. We always made great sport of doing without things, and enjoyed the feeling that we were being tough.

The next day we met a small caravan of 12 yaks and several Ladakhis, the first we had seen. They all smiled in friendly greet-

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Punjabi, Ladakhi, Yarkandi, and Kashmiri Illustrate the Medley of Races in Kargil

Kargil, the emporium of an oasis between Srinagar and Leh, spreads out along the caravan trail like a one-street town along an American highway. Every bazaar fronts this long, rambling avenue. Merchants display grain and dried fruit, saffron and curry powder, cottons and silks, and fly-festooned meat. Many residents are Ladakhis whose ancestors were converted to Islam by the swords of Moslem invaders.

ing as they passed. It was a preview for us of things to come.

It started to rain in the afternoon, an incessant drizzle. After a quick lunch, eaten in the tents of nomads, we pushed hurriedly on in order to reach our next stop before dark. The climb became extremely steep, and we were forced to dismount and walk.

"Golden Meadow" Amid the Glaciers

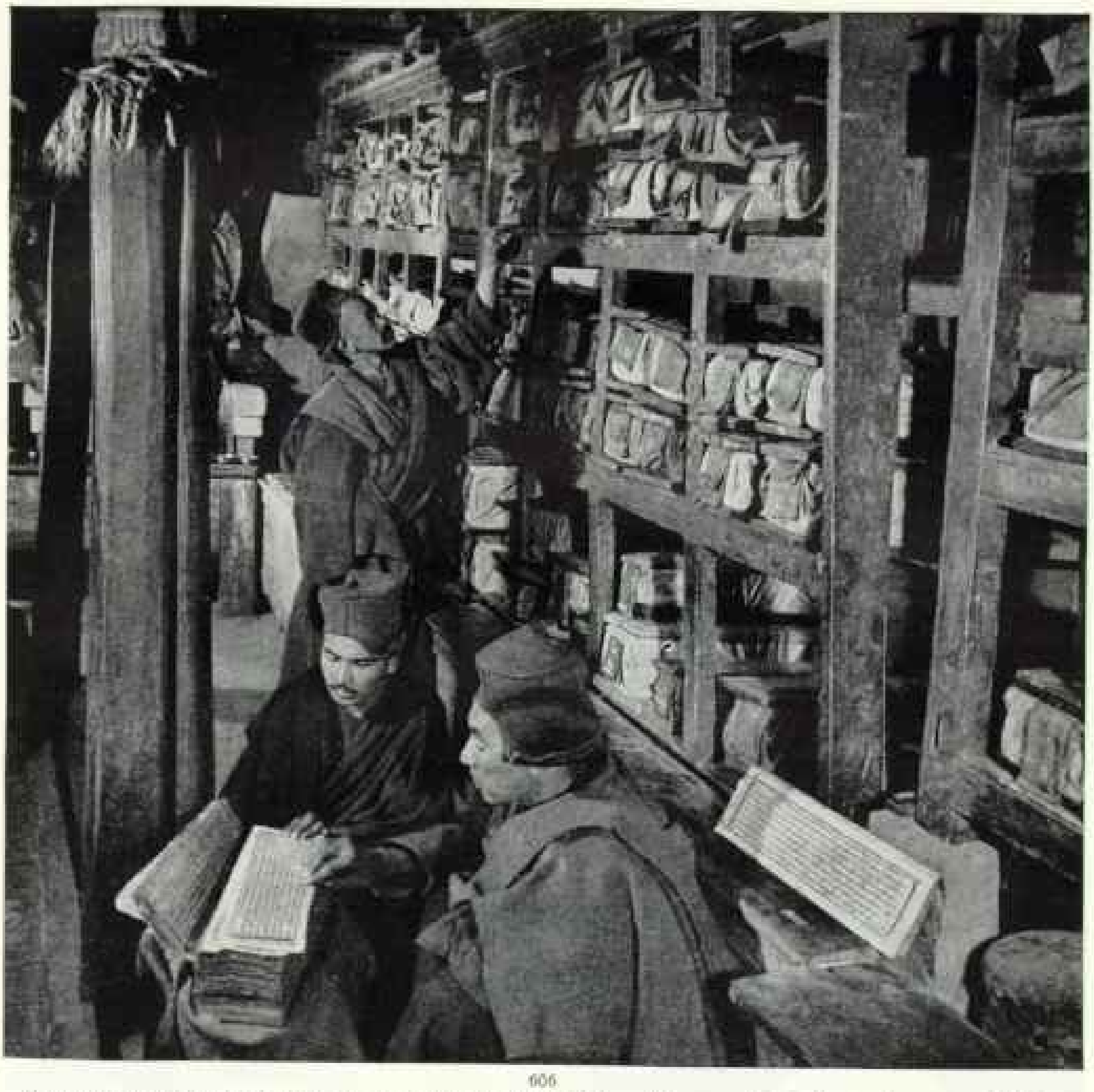
We finally trudged into Sonamarg, "the golden meadow," a lovely village. But everything, including us, was soaking wet. As we settled in our camp, the sun peeped out for a little while.

Forest trees fringed the valley, and an array of glaciers gleamed silently in the evening light. Silvery birch trees and wild flowers dotted the pastures. We slept in a natural bowl 8,650 feet above sea level, remote from civilization.

It was miserably cold, for we had insufficient blankets, most of them wet. An icy wind from the chilling faces of the glaciers swept through the valley. We sat sipping tea in front of a roaring camp fire, trying to dry out our clothes and bedding.

The morning broke with brilliant sunshine; we soon forgot the misery of the cold night behind us. We spent a few hours writing letters to mail at the tiny post office in Sonamarg.

After going on to Baltal, we crossed the



606

Lamayuru Library Stacks Sacred Books Like Shoe Boxes. End Tags Bear the Titles

These volumes were hand printed in Lhasa from wood blocks painstakingly carved by Tibetan monks. Loose pages were wrapped in bright silks and encased between boards. Here the monastery's spiritual leader reads a passage from the *Tanjur*, commentary on the Buddhist scriptures, to a novice. The text is in Tibetan.

famed Zoji La (la means pass), 11,580 feet above sea level. Here begins the ancient road that leads to Tibet.

The pass is strewn with the skeletons of dead horses. They belonged to the Kazaks who fled Communist domination in Sinkiang a few years ago. Many had perished from extreme cold and lack of supplies.

Here the tall pines shot their tops into a blue sky radiant with clouds. On the ground edelweiss and iris grew beside blue poppies and clusters of lemon-tinted daisies. Several snow bridges decorated the scene.

Two Logs Bridge Glacial Crevices

The trail to Machhoi was the coldest, windiest part of the whole trip. The deep vale was enclosed by several high ranges and four glaciers. There were no trees here as there were in the Zoji La. This must be one of the most glacial portions of the world. Snow bridges were numerous. To cross the terrific torrents which rushed out from each glacier, there were only small bridges of two logs, precariously tied together, permitting a slow and dangerous passage (page 604).

Usually, the pack horses and our mounts were led a mile or two around, over a large snow bridge at the foot of a glacier, to avoid crossing the log bridges. We ourselves trembled as we moved cautiously over them, looking down into the dashing, swirling water beneath us.

As we moved on to Matayan, the trail became more difficult. Filled with thousands of pebbles, it criss-crossed several icy streams. Sometimes we almost touched the water's edge; again, we were hundreds of feet above it.

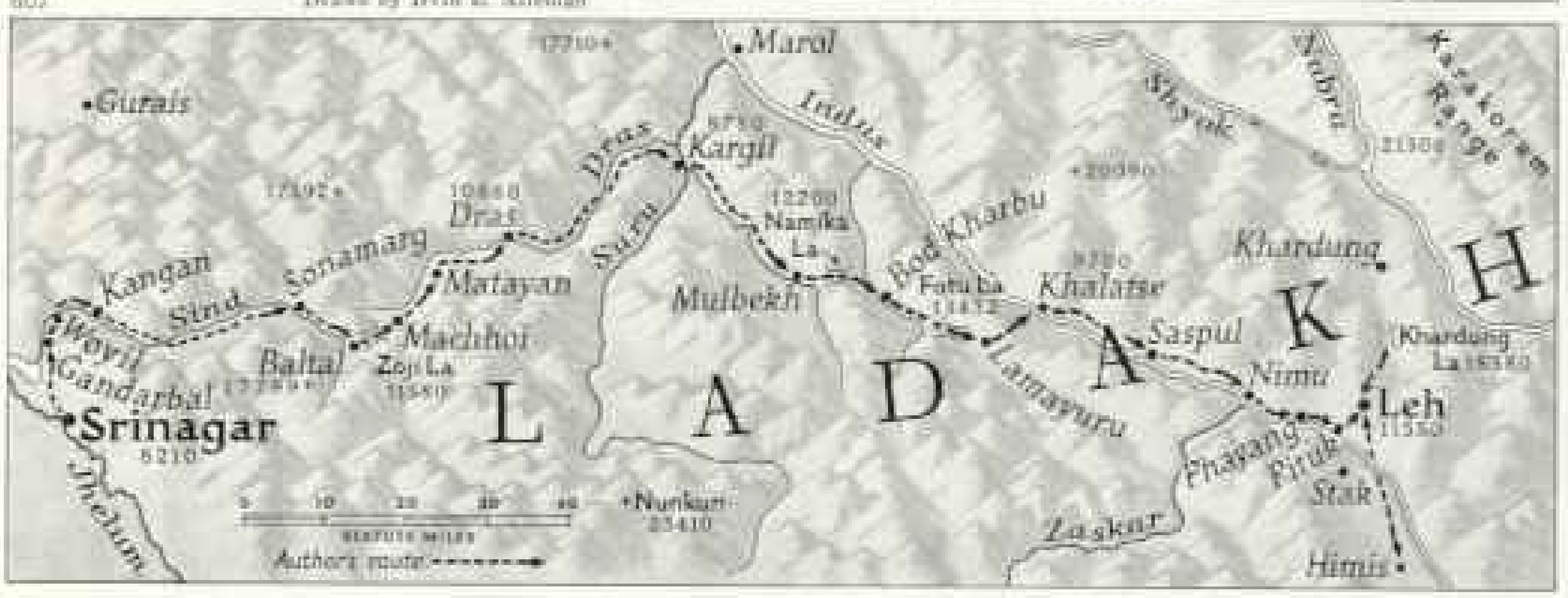
Ladakh: a Stony Desert on Top of the World

Within some 46,000 square miles, Ladakh holds a population of about 195,000 people.

Religion (Buddhism) and race (Mongolian) join the Ladakhis to Tibet, to which their ancestors gave allegiance. Politically, they belong to Jammu and Kashmir, a principality whose Hindu maharaja governs a princely State for whose possession Indian and Pakistani armies have vied. Lately the United Nations has debated the question of a plebiscite to determine Kashmir's disposition.

Ladakh has one main highway, the so-called Treaty Road, actually a pony trail, which connects Srinagar and Leh. This route was taken by the author on her 550-mile caravan trip, Srinagar to Himis and return.

Leaving Kashmir's green vale, Mrs. Bhavnani climbed the 11,580-foot Zoji La (pass) and entered a strange, lofty plateau where nothing grew save in those spots where irrigators could trap water. Ice fields 20,000 feet high overhung her route. Seen across enormous distances, they appeared close at hand, so rare and clear was the air. Mountains she could "almost touch" took a day or more to reach.



Drawn by Irvin E. Alleman

We met a post runner carrying mail from Leh. Each runner had to do three miles a day, handing his post to a relief at the end of his stint. At each relay point stood a small mud-and-stone hut where the runner handed his mail over to the next fellow. From Baltal on, people did not actually understand miles. They measured by *daks*, or post distances, of three or four miles each.

We spent a bitterly cold night at Matayan, with freezing wind tearing at our tents. The next morning it was still cold. But the scenery was unique—straight and fine like a Chinese etching. There was not a tree anywhere, scarcely any grass, and no flower dotted the wide plateaus.

Later in the day the sun came out and shone over the resplendent mountains. The scene was like a painting, with brilliant hues over the mountains, turquoise merging into sapphire skies, and a purple horizon. It was almost unreal.

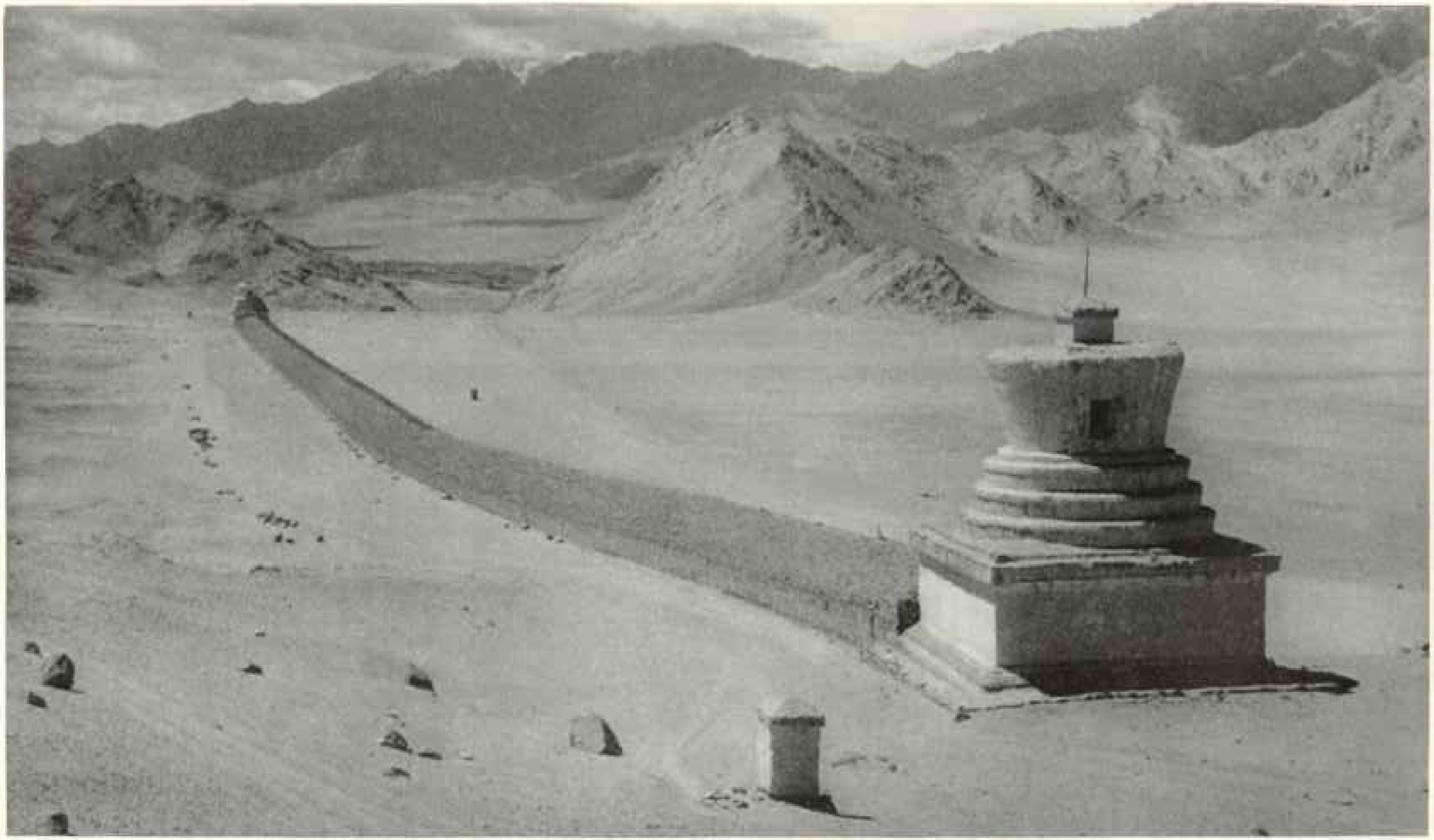
Dras, the next stage, is the land of the Balti and Dard people.* The men wore long cream-colored, hand-woven woolen coats and felt boots. Riding fast ponies with wooden saddles, they resembled Cossacks.

Their women, garbed in black hats with veils, and tunics over full trousers, were tending the bright yellow fields. They looked much like the Turkis of Russia.

Snow Traps Inhabitants for Six Months

Except for grain fields, the landscape was devoid of vegetation and studded with multi-

* See "First Over the Roof of the World by Motor," by Maynard Owen Williams, National Geographic Magazine, March, 1932.



608

John Abel, Camera Clix

What Purpose Can Idle Wall Serve in Empty Desert near Leh? It Prays for Passers-by, Ladakhis Believe

Treeless, grassless, lifeless, the landscape seems unreal. Man has made it more fantastic still with a massive *mani* wall. Eerie *chortens*, resembling book ends, enclose the half-mile structure, which guards nothing, shuts out nothing. Centuries ago, pious lamas, honoring a Tibetan king, carved each outer mani stone with the words, *Om mani padme hum*, perhaps the world's most widely repeated prayer (page 622). To keep the sacred wall on their right, travelers proceed to the left. Obliging two-way traffic, the wall divides the trail just as a grassy island splits a superhighway.

John Abel, Camera Clix

Himis Sets Hundreds of Prayer Wheels in Monastery Walls. Pilgrims, Twirling Them, Grind Out Mechanical Pleas to Heaven

Carved stones, fluttering flags, and water-turned wheels say prayers automatically, but the recessed cylinders require a flick of the hand. These women in shaggy sheepskin cloaks and turquoise headdresses came to see Himis's devil dances (pages 626, 632, and 633). If very devout, they crawled up to the shrine on hands and knees. If impatient to get the best seats, they walked. One (right) fingers her Buddhist prayer beads.

colored stones. Little villages nestled deep into the mountain slopes, their roofs barely visible. The hard-working, tough inhabitants are marooned by snow for six months of the year. In summer they cultivate wheat and barley and rent their ponies to travelers.

Again the night was windy and cold. The next morning we were greeted with depressing gray rain. We met a party of Americans who were returning from Leh on the same route. It was pleasant just to listen to them talk after hearing the Balti language, which resembles a strange mixture of Russian and Chinese.

We moved on to Kargil, the halfway point. Even in good weather this particular stage of the journey is cold and rough.

The rain only made matters worse, causing a number of landslides and cutting deep rifts into the trail, making the going slow and treacherous.

Our hands grew so cold that we could not hold the reins, and had to dismount and walk from about 2 in the afternoon until 9. Our boots were caked with mud, our gloves sodden, coats cold and clammy.

But we had to take off our wet hats to the servants. They worked wonderfully and never complained, pitching our tents, unpacking and serving our meals.

Most praiseworthy was our personal houseboy, a South Indian who had lived all his life on the scorching plains. He was always the first up in the morning, notwithstanding the terrible cold and the fact that he stuck to his strict vegetarian diet throughout the whole trip.

Washday in Ladakh

When we finally reached Kargil, the rain stopped. Houses were packed in rows within groves of apricot trees, with a long bazaar wedged in between (page 605). People greeted us from their housetops and windows as we passed. We decided a day of rest was in order.

My woman friend and I welcomed the change. At last we could wash our clothes. In the heart of the Himalayas washday is unknown. And I must admit our camp looked somewhat comic with a line of wash flapping in the breeze.

The greatest excitement in Kargil came when we called at the midget post office and picked up several letters, newspapers, and telegrams.

That afternoon my friend and I changed from breeches and shirts into saris and sandals and entertained two English-speaking local officials at tea. For the first time since we had left Gandarbal our faces were free from the generous coating of cold cream we used to avoid sunburn.

We picked up our trail again. The trip to Mulbekh was uneventful. But beyond Mulbekh a whole new world opened up to us, for here began the pure Tibetan country (pages 630-631).

We spotted our first lamasery, built high on a hill overlooking a panorama of river and field, with ranges of the Himalayas all around. The Tibetans in their flowing woolen coats and embroidered boots fascinated us.

The World of *Lost Horizon*

Villages appeared from time to time between long barren stretches. We passed splendid whitewashed houses whose architecture reminded us of *Lost Horizon*. We were introduced to the peculiar Tibetan food of powdered barley mixed with hot tea, rancid butter, and salt.

The route to Leh is nothing more than a pony track. Under British control it was turned into Treaty Road and became a notable trade route. It continues on from Leh southeast to Demchok, Tibet (map, page 607), and then on to Lhasa. The Kashmir Government kept only a small garrison at the frontier.

Ladakh has an area of some 46,000 square miles, about the size of Pennsylvania. It holds a scattered population of about 195,000.

It has been said of Baluchistan (now a part of Pakistan) that, after the world had been made, that country was then constructed from the debris. The same might well be said of Ladakh.

The entire province is studded with gigantic barren mountain ranges and riven with deep narrow gorges. The whole region lies very high. The average height of surrounding ranges is 19,000 feet. There are infrequent blotches of irrigated land; these are the habitable oases.

But it is a fascinating country, inhabited by a most charming people who, despite their barren land, laugh their way through life.

The farther we advanced, the more unreal the scene became. Days passed without sight of grass. We climbed to 12,200-foot Namika La, overlooking range after range of mountains and a vast space of indistinguishable landscape.

Cold wind pushed through the valley. The temperature at the height of summer dropped to 22°, when just a few hundred miles away the plains of India sweltered in 122° heat.

We came to know the typical Tibetan horseman who traveled with us (page 621). He carried as his only luggage a *chakmak* (flint

Never to Kill, but Occasionally in Sport, a Jolly Yellow Hat Lama Draws His Bow

Though Hindu India and Moslem Pakistan both claim this bearded monk, he is a thorough Tibetan—Mongolian and Buddhist. Sky-high Ladakh, his section of Kashmir, is a little Tibet. It is a fantastic land where men pray with machinery (prayer wheels) and women take multiple husbands (polyandry). Once a year this man is released from his religious duties for Lama Day festival at Pituk Monastery (page 638).

Kodachrome by Volkmar Wentzel

On Treaty Road, a Central Asian Trade Route, the National Geographic Caravan Crosses the Dras, a Tributary of the Indus

Kodachromes by Volkmar Wentzel

Himis Monastery Perches Between Desolate Crag and Tree-shaded Oasis. Apples Grow at 10,000 Feet in Saspul

Three neighbors, Russia, China, and India, keep watch over Ladakh and its strategic trade routes. Church affairs, however, prove more absorbing than power politics to the unworldly Ladakhis. Once a year many of them gather at Himis to see the Red Sect lamas, robed as saints and sinners, perform their mystery plays (pages 632, 633). Right: Wherever water can be tapped, miles-high valleys grow green with life. The author tasted not only apples but apricots, tomatoes, carrots, and sweet corn.

Men from All Corners of Asia Swarm the Bazaar of Leh, Where India Trades with China

Terminus of caravans, Leh sees yaks, ponies, and camels drop their packs and start home with fresh cargoes. Tatars, Pathans, and Hindus rub shoulders; the streets are a babel.

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Kodachrome by Volkmar Wentzel

Empty Palace (Center) of Deposed Rajas and Monastery (Right) Stand Watch over Town

Approached only by mountain trails, Leh has a civilization without wheels. Polo used to be played in the poplar-lined main square, all shops closing for the game. Hay dries on roofs (left).

↑ **Central Asia's Surprise: Window Boxes in Leh**

Moslem father (right), who could take four wives, and Lamaist mother (left), who is entitled to several husbands, have compromised on monogamy. Because Leh people are tolerant, intermarriage is common.

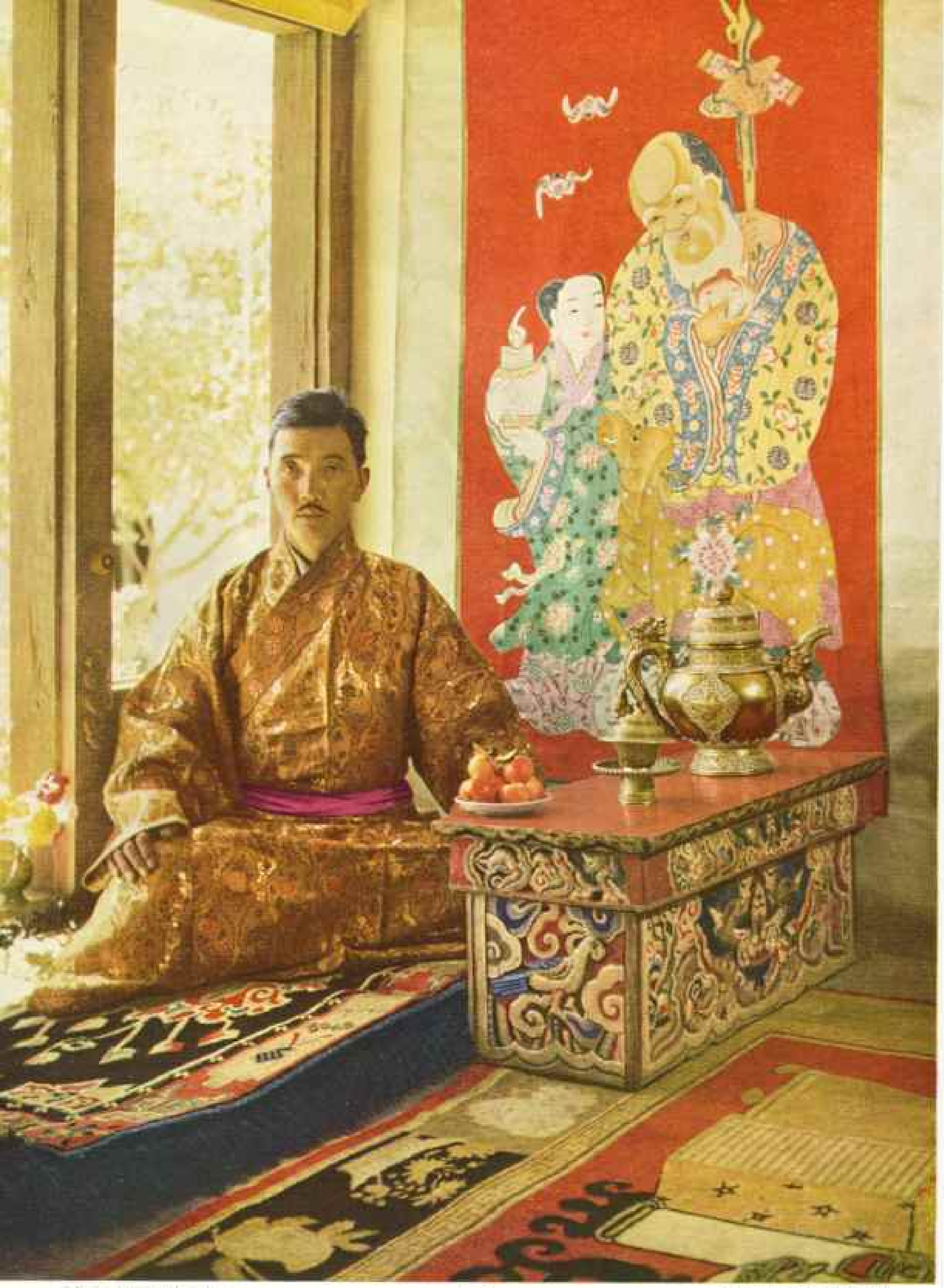
↑ **A Farm Girl Wears Her Fortune on Her Head**

This cobralike headdress, peculiar to Ladakhis, is known as the *peyrak*. It consists of a long broad strap studded with turquoises (page 627). Since a girl's dowry may be invested in these jewels, a fortune-hunting suitor may estimate her worth at a glance. Black lambskin ear muffs stick up like wings. The apparent comb is a wooden grain fork.

← **No Baby Carriages in the Himalayas.** Seen in Kashmir, the daughter of a vacationing Sikh couple rides a servant's back.

A Leh Family Enjoys a Million-dollar View; Prayer Flags Flutter Like Laundry on the Roof

Flanked by his brothers and children, a merchant sits in awninged ease on a folding chair and contemplates his apple crop (left). Warm in winter, cool in summer, his walls are mud brick (page 618).



In His Home, Furnished with Tibetan Art Objects, Sits a Leading Citizen of Leh

Every two years this wealthy merchant journeys hundreds of miles with one of his caravans to Lhasa. There he bought robe and tapestry, both of Chinese silk, and the teapot. Apples come from his yard (page 617).

and metal matchbox), a small dagger, a brass alloy spoon for eating, a wooden bowl, a little leather purse with thread and needle, and charms against evil. I was reminded that "Man wants but little here below."

These people had so little, yet were content, happy, and free from envy and conceit. I can't remember ever seeing a Tibetan out of temper or rude or complaining on our journey. When we stopped for lunch on the road, they squatted happily beside us, grinning in comradely fashion and eating their roasted barley powder.

They began teaching us the Tibetan names of various objects. It was not long before we learned to say *"Jooley"* (good day). Constantly they begged us for cigarettes, which they smoked with the greatest pleasure. We had brought about 5,000 extra cigarettes just for such a purpose. These proved to be appreciated much more than tips of money.

The men wore flowers in their hats and were pleased when we put flowers they gave us in our hair. These horsemen were the happiest and jolliest we had come across.

They were singing, dancing, or laughing all the time, especially one old man who had a gleam in his eye and considered himself quite a Don Juan. He was a wonderful type, a real Robin Hood, wearing his hat at a jaunty angle. Their singing was reminiscent of something Arabic and something Chinese; their dancing was Arabian, with fast turns and waving arms.

Skyscraper in the Sky-high Himalayas

We now came to the third great pass, Fotu La, 13,432 feet high. Beyond it Lamayuru stood supreme in her gorgeous virgin beauty. The lamasery reared its head from a steep hill shaped like a Gothic cathedral. In the foreground green and yellow corn spread a carpet. In the background the blue mountains shone majestically (page 634).

The lamasery was perched atop a steep cliff rising more than 100 feet straight up from the floor of the valley. It looked like a penthouse on a windowless skyscraper. Above it prayer flags fluttered in the breeze.

We were invited to visit the lamasery, as are most visitors who come to this remote region. On our ponies we climbed the narrow steep path that leads to the top of the pinnacle and the lamasery. Once in the courtyard at the top, we were ushered into the central prayer chamber.

Beautiful old frescoes and paintings of the life of Buddha lined the ancient walls. His statue and that of the first *skushok* (head lama, or abbot) were placed on an altar of brocade, with ever-burning lamps and water bowls before them.

A skushok is believed to be a reincarnation of a very holy and virtuous man and is chosen by establishing the fact that he was born at the moment his predecessor died, or by the aid of an oracle.

An air of mysticism filled the monastery when one of the lamas took up an old parchment and chanted for us. Covered with beautifully written religious verses, the manuscript was made of fine old parchment and bound with silk (page 606).

Christian Mission in "Little Tibet"

The whole country filled us with a strange wonderment. For the first time since leaving civilization, we felt that, in the midst of the grandeur of the mighty Himalayas, these simple people, and the mystery of the atmosphere, nothing that one counts important in city life mattered. Life took on a different meaning. We unconsciously moved nearer to the spirit of perfect solitude.

Moving on to a place called Khalatse, we stopped for lunch in the garden of a Moravian missionary whose wife is a well-known doctor. They were in Leh at the time, but their assistant, a young Tibetan convert to Christianity, welcomed us and gave us apples and apricots from the adjoining orchard.

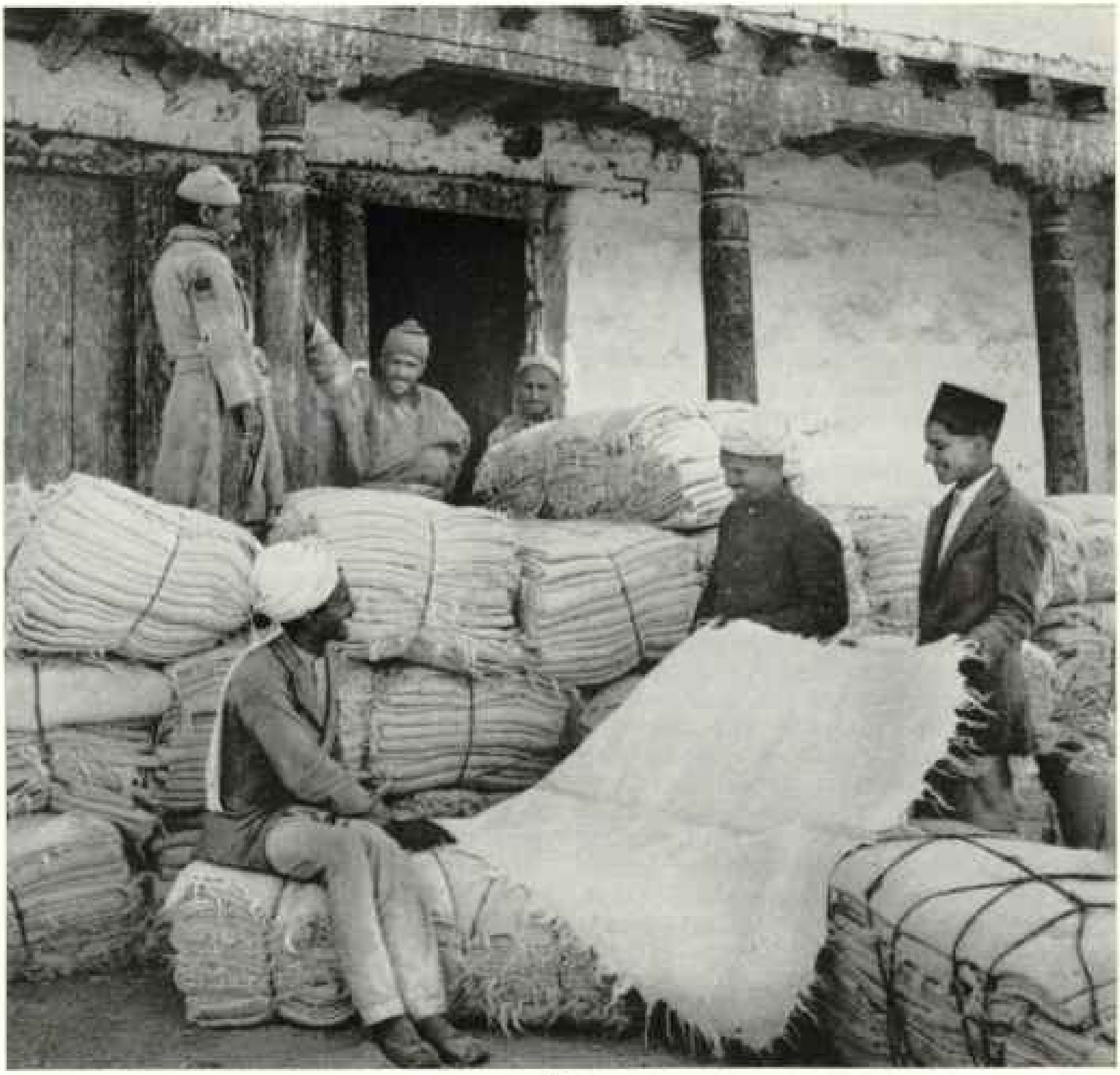
After lunch he arranged dancing for us. It was the first time we had seen Tibetan women dancing. Being a dancer myself, I was much interested. A group of young girls and women arrived wearing the usual black or reddish-brown gowns, tied at the waist with a small shieldlike ornament, and with tassels hanging from one side.

They were all very jolly and danced in little circles, singing and laughing, and opening and closing their fingers like the opening of a bud. There was not much variety or beauty in the dance. But the strange environment, the laughing Mongolian faces, and the weird accompaniment of Tibetan flute, drums, and cymbals made it fascinating.

But I was disappointed. These were unlike our colorful peasant dances in Hindu festivals, where women dance with much grace and exquisite hand movements.

Success Story: Golden American Corn

When we were leaving, the young Tibetan presented us with several vegetables—carrots, pumpkins, cabbages, and tomatoes. The big surprise, however, came next morning, when the cook served us delicious corn. Later we learned from missionaries we met at Leh that it was Golden Bantam, which had been im-



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Baled Felt Rugs Spread on the Streets of Leh Embody the Romance of Asian Commerce

Wool was sheared in remote Sinkiang and pressed into rough namdas. Tough little ponies hauled the bales to Leh across 18,000-foot Karakoram passes bleached with the bones of animals that didn't make it. Next, the felts are packed to Srinagar, where needlemen in dark lofts strain eyes embroidering them. Finished namdas go all over the world, many to American homes. Turbaned Srinagar buyers here spread samples. Capped Yarkandi caravaneers, their goods sold, will speed home before autumn's snow closes the passes.

ported from America and now was grown in Ladakh.

On the next lap of our journey, we had poor horses and uncomfortable saddles. Two of us fell off while we were riding.

My son had a trick of lagging far behind, then suddenly galloping up the narrow steep pathway and catching up to us just for the thrill of it. It was terrifying because one false step would mean a fall of thousands of feet.

We refrained from checking him because we did not want to frighten him or make him nervous during dangerous ascents and descents. On this particular morning, he galloped up as usual. His pony suddenly tripped and fell just at the edge of the steep cliff.

We silently looked down the precipice to the Indus River roaring far below. He learned a lasting lesson—he never lagged behind again.

Farther along the trail another ornate lamasery, hidden by an unexpected sweep of trees, sprang into sight. It appeared like some mystic abode, through a narrow, deep ravine. Its skushok was a handsome boy of 13.

When we arrived, boy lamas presented us with small red apples and apricots and conducted us up to the monastery, where the skushok put on his brocade ceremonial robes and posed for us.

Later, on the road, we met the baby skushok of Phayang lamasery. He was riding, dressed in his golden robes and hat, and accompanied by his chief minister and a retinue

621

Belled Pony Trudges a Weary Trail; Pampered Pup Rides Tattered Master's Back

This valuable, intelligent little animal is a Tibetan terrier, one of a centuries-old breed. Born in Nimu, he is going to Srinagar for sale. Tibetans esteem him as a mascot, hunter, retriever, watchdog, and a child's loyal guardian. The United States has seen very few dogs of his kind. One American, who has journeyed to Tibet, exchanges glassware with a lama for fresh breeding stock. The caravan horse, chafed by sharp straps, carries big loads but gets little to eat. If he wanders off in search of grass, the bell sounds news of his whereabouts.

of lamas. One of them held a golden umbrella over his head. The procession presented a strange picture.

One More Mile? No, Tricked Vision

The mountains became a rainbow of color. We were amazed to see green, red, brown, blue, and gray mountains. Their outlines were equally striking, having been weathered into the shapes of forts, pyramids, castles, and domes.

Because of the long stretches of dry land, the thin, dry air, the type of country, and refraction of the sun's rays, we could often see the next village, almost lifesize, from a distance of nearly eight miles. This gave us the impression that it was only a mile away. But, as we rode on and on, the size did not change. Though an extraordinary phenomenon, it was a source of great exasperation, especially when we were tired and thought that we had reached camp, only to find that we were still miles away.

People walking toward us with their horses presented the same phenomenon. They looked even bigger than actual size when they were far off. It was only when we were abreast of them that we realized how far away they had been and how the proportion had changed too.

At our next stage, just before Leh, we had a most unhappy experience. We had reached Nimu, 18 miles from the capital, at 5 in the evening. A party of more than 100 people camped next to us. They were traveling from Demchok.

They invited us to see a performance of dancing given by two Ladakhi girls. We accepted their invitation and took along our camera to take some pictures. We returned to our tents in time for dinner and thought no more about the dancing.

But the next morning, as we prepared to start, our valuable camera with special lenses and filters was missing. The Demchok party had left at 6 in the morning. We questioned the watchman; he assured us that Tibetans were too honest to have stolen it. We searched the entire area and searched it again. But our camera was gone.

We set out for Leh along a fantastic road framed in barren mountains, often without vegetation. We passed only occasional villages. The ancient monastery of Pituk, commanding a splendid view from its distant height, was an interesting landmark along the way (opposite, and page 628).

Farther along, the road was suddenly glorified by the panorama of magnificent snow ranges that stood before us, glistening white and pure. It was the famous Karakoram Range.

Suddenly we sighted Leh, an oasis amid rings of snowy mountains. Barley and wheat waved in the near-by fields. We could see the old palace of the kings of Ladakh, and the lamasery of Sankar (pages 614 and 615).

Flags Wave Prayers Heavenward

Outside the town we saw long *manis* (prayer walls). They consisted of exquisitely carved rough stones bearing the inscription, *Om mani padme hum*, meaning, "Oh, thou jewel in the lotus, amen" (page 608).

The stones are set by pious monks who believe they possess a magic power which is supposed to bring peace to the soul after death. Near by there is usually a line of prayer flags waving in the breeze. These carry the prayers to heaven.

Leh, with its population of 3,000 people, is on "the roof of the world." The entire country lies at an average height of between 11,000 and 14,000 feet above sea level—probably the highest area where that many people live permanently.*

Traveling to Leh we had crossed three high passes. Now, just before us, stood the historic Khardung La, 18,380 feet high, the open door to Yarkand.†

We journeyed up to the pass one afternoon, finding the trip extremely strenuous because of the rarified atmosphere. We stood looking about us. Far below lay the village of Khardung, and all around the snow peaks of the Himalayas gleamed like sentinels, chaste and noble in their garments of white.

A pony track ran north to the Karakoram Pass, about 150 miles away, and on to the actual boundary between Sinkiang and Kashmir.

Our yaks browsed in the cold and were undaunted when we were suddenly caught in a heavy snowstorm on our return. Returning to Leh, we came across the *zho* and *zhomo* (male and female crosses between a cow and a yak). They are stronger than the average cow or bull, and are used for heavy transport, long travel, and for providing milk.

People from the strange and exciting world beyond met in Leh's bazaar (page 620). The Yarkandis, some in smart top boots, black uniforms, and small skull caps; people of Russian and Chinese Turkistan; merchants from Lhasa; Kashmiris and Indians, all swarmed the streets.

Little whitewashed houses stood huddled together in dozens of short, sloping lanes. Their rooftops were covered with hay drying to feed sheep and goats in the winter. Goatskins filled with butter lay buried under shops for storage, and hundreds of furs, piled one upon the other, barred low doorways.

We camped in a beautiful garden facing a range of the Himalayas. A stream tinkled beside our tents, and apples and apricots hung from the trees above.

Passing through the long line of the bazaar in Leh we were followed by a crowd of Tibetans, chattering and laughing heartily. Wide-eyed women pointed at us. Later we learned that they were highly amused to see women dressed like men in breeches, shirts, and coats, and were trying to figure out whether we were grown-up boys or freaks.

A Bit of Europe in Central Asia

We met the Rev. and Mrs. Walter Asboe, who ran the Moravian Mission in Leh. The mission has performed a humane work for many years. Its doors are open to everyone, regardless of creed. The mission also maintains a hospital and a special industrial school which promotes Ladakh's woolen industry.

The Asboes, who are English, lived in a little clay cottage, built, they said, for $200. Their garden was full of fragrant roses and sweet peas, cannas, snapdragon, daisies, larkspur, gladiola, and forget-me-nots. It was a little bit of Europe in Central Asia.

The house boasted curtained windows,

* See "Map of Asia and Adjacent Areas," supplement to the National Geographic Magazine, March, 1951.

† See "On the World's Highest Plateaus," by Hellmut de Terra, National Geographic Magazine, March, 1931.

623

Pituk's Head Lama Serves Buttered Tea and Apples in His Canopied, Carpeted Tent

Here the photographer saw devout laymen crawling on hands and knees to make contributions to the *skushok* (center). Later the fun-loving monks staged a skit burlesquing the manners of western travelers. Tea was drawn from the brass samovar. The occasion was Lama Day, an annual holiday (page 611).

Tibetan-made woolen rugs, colored clay bowls filled with sweet peas, unpolished wooden furniture made by the local carpenters under the guidance of Dr. Asboe, and a radio. The radio was operated by a 12-volt battery, charged by a homemade device consisting of a huge wooden wheel which was revolved by hand and connected to a dynamo.

We had tea in the dining room and were surprised to find hot cakes, scones, biscuits, homemade bread, apricot jam, and candy. Mrs. Asboe had made them all.

We might have been in any small home in Europe, except for the landscape seen through the windows—the towering Himalayas, Ladakhi children playing hopscotch in the meadow, and a strange Tibetan hound in the yard.

Dr. and Mrs. Asboe spoke excellent Tibetan. He published a typewritten newspaper in Tibetan for people in Leh, getting the latest news from his radio. He also put one out in English, though there were scarcely more than four English-speaking people in the area.

Later we met a young missionary from Khalatse who loaned us his camera for our stay in Leh.

Yellow Hats vs. Red Monks

We also met Father Gergen, an elderly, cultured Tibetan gentleman who had become a Christian and was the chief minister at the Moravian Mission. His lovely daughter is married to a young Tibetan, the nephew of the Rajah of Stak, a descendant of the original rulers of Ladakh.

Father Gergen showed us an ancient manuscript written in fine Tibetan print. It was an edict issued by one of the kings of Ladakh nearly 600 years ago. The king had been to Lhasa and had come in contact with Tsong Khapa, the founder of the order of the Yellow Hat monks. This edict designated the order as the one which the Ladakhi king wished his subjects to follow. Tsong Khapa lived between the years 1357 and 1419.

There is little difference between "Red" and "Yellow" monks. Red lamas—called that not because they are Communists but

because they wear dark red cloaks—trace their origin to an old Tibetan sect which began in Tibet in the 8th century.

Yellow lamas also wear red cloaks, but with a yellow hat (page 611). The Yellow Hats are the more austere, but actually there is little difference in doctrine. Yellow lamas predominate in Tibet proper, while the Reds, with headquarters at the Himis lamasery, are stronger in Ladakh. One out of every six Ladakhis is a lama or a nun.

When we were in Srinagar, we were told of a book written by a European who advanced a strange theory. The author claimed to have found documentary evidence in Himis that Jesus Christ had been to Ladakh in His lifetime. After the crucifixion, so the tale goes, Christ was not buried in the Holy Land, but was brought secretly to little Tibet, brought to life by Himalayan herbs, and later ascended to heaven from the Himalayas.

We were also told that this author mentioned going to Himis and seeing the document with Father Gergen. But the venerable old gentleman assured us he knew of no such evidence. Though he remembered the author, he had never been to Himis with him.

After reading the book, several European church dignitaries wrote to Father Gergen asking for corroboration and details of this matter.

When we visited Himis, we asked about the document, but the lamas didn't know what we were talking about. It was Greek to them!

Our first Tibetan lunch was at the house of a landlord. We sat around the room on rich silk carpets at little lacquered tables and were served Tibetan tea in delicate jade bowls. It was real punishment sipping the highly salted, buttered tea.

The meal consisted of spaghetti and tomato sauce, chicken and beans, salt meat, potatoes, curried gravy, rice, and baked apricots. Our host then offered homemade *chang* (beer), and *arak*, a kind of vodka made from barley. We tasted a few drops of each from sheer politeness. According to law, Tibetans can make these drinks at home but cannot sell them to anyone.

We found the Ladakhis charming, hospitable, and colorful. A man wears a loose-fitting, knee-length coat, called a *gonche*. It is coarsely woven of heavy homespun wool and dyed a reddish-purple color. Around his waist he ties a sash (*skirax*). Felt socks (*namda*) cover his legs to the knees. For added warmth, his shoes (*pabboes*) are made of heavy knitted yarn but have leather soles. A fur- or wool-lined cap tops his costume. The cap has flaps that can be pulled down over his ears in winter months (page 629).

A woman dresses in much the same fashion, except that she wears a heavy skirt with her gonche (page 609). Over her shoulders and back she wears a goatskin, fur side in. This cape is worn as much for style as warmth.

Her Dowry Goes to Her Head

Her fancy headdress (*peyrak*) consists of a strip of cloth extending from her forehead, over the head, and down her back. The peyrak is studded with chunks of turquoise (page 627). She also attaches patches of black lambskin to her hair; they stand out from the sides of her head like giant, protruding earmuffs (page 616).

Actually, the peyrak is a woman's dowry. The collection of stones starts from the time she is born. It is her whole fortune. One glance will tell a prospective suitor how rich she is.

Even the naturally rosy-cheeked Tibetan woman is not without her cosmetics. She applies the juice of a tiny berry, similar to the gooseberry, to her face and decorates it with a design using the minute seeds. The result is attractive and practical. The juice serves as an anti-sunburn cream. The seeds stick to the face and the skin becomes taut. Wrinkles vanish.

I used the berry juice and seeds myself, instead of cold cream, for three days. They are much better. But they took too long to apply, so I lost patience and went back to modern face cream.

Chief occupations of the Ladakhis are care of their herds and the cultivation of wheat and barley on their sky-high plateau (page 628). They spend their spare time weaving and spinning wool and felt for boots and rugs. As they worked, their chubby, carefree children romped merrily with pashmina goats and sheep and tumbled around in the fields, their grimy faces lit with mischief and laughter.

The most striking thing about these people is their honesty and the fact that they never bargain for anything. We locked up nothing all the time we were in Leh, though Ladakhis walked through our campsite constantly.

Occasionally they came to our tents to sell us souvenirs. We bought antique rings, necklaces, bracelets, and charms for ridiculously low prices.

For instance, I bought a lovely old silver and coral necklace for about $2. When a silversmith in Srinagar saw it, he offered me many times what I paid, but I wouldn't part with it.

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Photographer Wentzel Tests His U. S. Army Rations on the High Lamas of Himis

Mr. Wentzel, having tasted the abbots' fare, repaid hospitality with a dinner in his quarters. Mohammed, his Kashmiri servant, served rice, cheese, chocolate, and water, but no meat. "The lamas were too polite to say so," relates the photographer, "but it was evident they preferred their native food. When they offered me salted yak-butter tea, I smiled with pretended relish and forced it down."

In Ladakh the men outnumber the women many times. Probably such a situation exists in no other country in the world today. Some Eastern countries practice polygamy (more than one wife), but in Ladakh polyandry (more than one husband) is commonplace.

So it is quite conventional for a Ladakhi wife to have three husbands. This puts her in a commanding position. She is the undisputed head of the household, a unique situation in the Oriental world.

No Wedding Ring for Ladakhi Bride

We were lucky enough to witness part of a marriage ceremony in Leh. The bridegroom sat on a large swastika symbol drawn on the floor. Then, as other members of the wedding party chanted softly, the young bride (this was her first marriage) was ushered in and seated on a lotus flower, also drawn on the floor.

A silk scarf was tied around the bridegroom's head as his marriage token. In India, and throughout the Western world, it is usually the bride who wears the marriage token—a ring, or a bracelet or necklace, as in India. The Ladakhi bride is given no sign of marriage, however.

After the simple ceremony, the bride, groom, and nearest relatives danced in a group to the music of pipes and drums. The dance was slow, and for the most part consisted of walking in a circle and executing little three-step pirouettes. The men carried scarves which they gracefully raised and lowered in rhythm with their body movements. The women used their hands, opening and closing them like the opening of buds.

Ladakhi folk art is influenced by the Chinese. With song, dance, and sweeping gestures, the people enact a romantic drama of a princess saved from drowning by a prince. Similarly, they act out other themes, the most amusing being a pantomime of a polo match. The participants play-act the game with little wooden horses like hobby horses. Alive and quick, the play sparkles with comedy.

Their actual polo is especially exciting and fast moving. They slash hard with their wooden mallets, driving their small galloping ponies at high speed. The horses are wonderfully strong, wiry animals, considered by some the best in the world for mountain climbing.

Tibetan culture goes far deeper than simple plays and sport. It is shown in ex-

quisite paintings and artistic curios. Their superb frescoes and paintings deal with religious themes inspired by their ancient theology. Their delicate bronze sculptures are perfectly molded and smooth. Tibetan jewelry, too, shows an original touch.

We took a trip to Himis, 25 miles south of Leh, to visit the famed lamasery. The road stretches across a dreary and monotonous landscape. All that we could see for miles was stones and boulders and more stones and boulders.

"Hidden Valley" of Himis

But the Valley of Himis itself is the closest thing to Shangri-La we could hope to see. Tucked away in the high Himalayas, it is called the "hidden valley." Its secluded location has undoubtedly saved the valley and its famed lamasery from destruction by Asiatic conquerors sweeping across the land. The lamasery, headquarters of the Red Sect in Ladakh, is the richest in the land.

Once we arrived in the valley, we had a long climb up to the lamasery, perched high on a rugged mountain crag (page 613). We stayed at the summer palace of the skushok, in a garden filled with wild flowers blooming at a height of 12,500 feet. Near by, the lamasery lifted its sacred head almost into the clouds that lingered over the peaks.

We were fortunate to be in Himis for the celebrated two-day Devil Dance Festival. The first day we took a commanding position overlooking the courtyard, and waited for the sun to come out so that we could film the ceremony. But we waited in vain.

At 6 in the evening, one of the lamas offered to say special prayers for bright sunshine the next day. We accepted his offer graciously, and he began a droning prayer chant that seemed to have no end. We were glad when he finished and solemnly assured us there would be sunshine for us the next morning.

Sure enough, it was a lovely day, and we filmed the festivities, which were practically a repeat performance of the previous day. Similar to other religious dances we had seen, this was done by lamas in elaborate brocade costumes. Some wore masks of animals and skeletons, and others great hats crowned with images (pages 632 and 633).*

The dancing depicted Buddha's fight with evil forces, the driving out of wicked spirits, and the ultimate triumph of good over evil. Buddha was portrayed with the mask of the lion, whose strength, nobility, and greatness of heart destroy anything harmful to mankind.

Accompanied by an orchestra of drums, cymbals, and giant 10-foot trumpets, the dance continued. Lamas paraded through the courtyard, whirling and circling, moving faster and faster as the dance reached its climax. Other monks chanted hymns and sprinkled holy water.

The dance did not stop until sunset, when the lamasery gongs called the monks to vespers. The sun cast a strange shadow over this land of mystery.

As we walked back to our quarters, I felt how true were the words, "More things are wrought by prayer than this world dreams of . . ."

We returned to Leh for a few days, then decided we must start our trek back. It was already early autumn and the flowers were gone. Winter was on the way. Snow now covered most of the high passes and all the peaks.

Just before we left, we received the good news that our missing camera had turned up in a shop in Srinagar. I realized how foolish some thieves can be. The man who stole our camera was one of the servants of the party that camped with us at Nimu. He told the shop owner that he had bought the camera, complete with special lenses and filters, a few months ago for 15 rupees (just over $3). Could anyone doubt that he was a novice in the game?

Lofty Himalayas Haunt Every Traveler

It had been difficult to get the necessary travel permits to visit Ladakh, the remote province so little visited by people from the outside world. And the trip was long and hard. But our rewards were satisfying—real adventure and many wonderful memories that would never die.

Although we were back in Srinagar, our thoughts were elsewhere. The Himalayas have a way of getting into your blood. The fascinating people and places we had seen haunted our dreams and wove a magic spell through our waking moments.

We spoke constantly and fondly of our trip. But we thought of only one thing for the future—when could we go to Lhasa and Tibet itself?

Any traveler who has seen the indescribable loftiness of the Himalayas, felt the peace and contentment of their immeasurable space, the strange atmosphere of their magic, is irrevocably called back there again and again.

* See, in the National Geographic Magazine: "With the Devil Dancers of China and Tibet," 43 ills. in color, July, 1931, and "Life Among the Lamas of Choni," November, 1928, both by Joseph F. Rock.

Queen of Ladakh Wears 300 Turquoises in Her "Cobra" Headdress (Close-up, Right)

Wife of a raja whose dynasty was overthrown a century ago, she sits in her mud-brick palace at Stak. Her daughter, holding a Lhasa dog, dresses plainly, as she is a nun. Center: A prayer wheel, with spinner.

Enthroned Between His Teachers, the High Lama of Himis Is a Frightened Boy

To Ladakhis, the young *skushok* is his predecessor's reincarnation, identified as such in babyhood because he indicated recollection of a previous life. Picture taking brought tears, soothed by the gift of a toy monkey.

At the Foot of Pituk, a Sanctuary for Men, Women in Goatskin Cloaks Winnow Barley

Pituk Monastery, an oasis in the Indus Valley, is Ladakh headquarters of the Yellow Hat, or reformed, lamas. At its base the mausoleumlike chortens, or stupas, of bygone lamas form a city of the dead (opposite).

Ansco Color by Volkmar Wentzel

Ladakhis Enshrine the Ashes of Lamas in Pagodalike Chortens

Chortens of all sizes are found beside roads, in fields, and on mountainsides. This sepulchral monument, work of a former king, stands near Leh. Each cavity contains the remains of a holy man. With clay added, the ashes were molded and stamped with a seal. Once a traveler called such relics "potted lamas," and the name stuck. Here a flag drooping from a pole bears a stereotyped supplication. As no breeze blows, no prayer ascends.

Schoolboy Flutists Practice at Leh

They form a section of a 15-instrument band. Frocks are of homespun. Ear flaps turn up like wings.

Kodachromes by Volkmar Wentzel

Red-robed Monk Hauls Golden Barley

He is one of the worker monks, who cultivate the soil, beg alms, and collect their order's rents.

Walled by Naked Rock, the Village of Bod Kharbu Harvests Barley at 11,000 Feet

Dry, barren Ladakh is a lofty desert. Willow patches such as these are sure signs of flowing water. Miles-long irrigation ditches tapping mountain streams convert granite dust to fertility.

63] Kodachrome by Volkmar Wentzel

October's Faint White Patches Fleck the Himalayas, the Sanskrit's "Abode of Snow"

Snow leopard and ibex populate the forbidding heights; man seldom ventures out of the valleys. Not far away, 20,000-foot ridges squeeze glaciers feeding headwaters of the Indus.

Himis Devil Dancers Wear Death's-head Hats and Shields

Buddhist Ladakh is almost as theocratic as its mother country, Tibet, home of the Dalai Lama, whom Ladakhis acknowledge. One Ladakhi in every six dwells in a monastery or nunnery. Such celibacy serves a useful purpose by relieving the birth rate's pressure against a scanty soil.

As in Tibet, monks are divided into two orders. Red lamas, of whom these dancers are examples, practice rituals inherited from an ancient Nature worship. Yellow lamas, a reformed brotherhood, are stricter (page 611).

Another classification divides monks into workers and spiritual groups.

Each summer the Himis lamas, disguised in grotesque masks and Chinese silks, dance as devils, saints, and buffoons. Their audience includes rival Yellow lamas, scornful Moslems, and unbelieving Hindus. During intermissions visitors barter dried apricots, brick tea, saffron, herbs, and turquoises.

For the benefit of the National Geographic Society photographer, who arrived out of season for the Himis festival, these hospitable lamas enacted their mystery play. As presents they received a shaving mirror, two flashlights, and two gallons of kerosene, the last-named a scarce and valuable item in remote Ladakh.

Kodachrome by Volkmar Wentzel

With Fiendish Howls, Masqueraders Chase Souls in Purgatory

Many devil dances have lost their meaning, but in general they depict wandering souls waylaid by malignant forces which only holy spirits may overcome.

Acting out a ballet of Oriental horrors, lamas dress as three-eyed monsters, painted skeletons, and dragon-faced fiends. They caper to the barbaric music of shawms, gongs, cymbals, and human-bone rattles. To the sweet refrains of a holy choir, benign spirits exorcise the demons. Blasphemous clowns caricature the mysteries, slashing out with slapsticks and laughing insanely. Other lamas, armed with scourges, beat spectators back into line. Hapless dogs and horses, cast as scapegoats to absorb the people's sins, are drenched with red paint, representing blood.

These demons were played by Himis novices, mere boys, who joyfully postured for the camera. One (right) stuck a tongue through the mouth of the mask, his peephole.

Kodachrome by Volkmar Wentzel

Perpendicular Marvels Such as Lamayuru Appear in Fairy Books, Dreams, and Ladakh

Man and Nature join in making Lamayuru rambling and eccentric. Built like a Crusader's castle set for siege, the monastery crowns a crag. Masonry springs out of solid stone. Hundreds of chortens line the labyrinthine approach (foreground). Main street's touching roofs, filtering out sunlight, arch flights of rock stairs.

Flamingos' Last Stand on Andros Island

By Paul A. Zahl

With Illustrations from Photographs by the Author

ABOUT ten years ago a visitor crossing one of the numerous shallow lakes that dot Andros Island in the Bahamas might have seen a breath-taking sight. First he would spy a long thin line of pink at the water's edge. As he came closer he would hear a strange squawking, like the constant gabbling of wild geese.

Then, as if on signal, the noises would abruptly give way to an apprehensive silence. When the visitor came within 100 yards of the shore line, the rasping clamor and chatter would begin again, growing louder and louder. Suddenly countless flaming "jets" would streak over the water like a quivering sheet of fire—thousands of gleaming red flamingos boiling into the sky and quickly disappearing into a mirage-like horizon (pages 648-649).

Today man could comb Andros in vain for flamingos. He might see eight or ten stray ones shoot overhead in a V-formation and sweep out of sight behind the trees. But no red multitudes. The grotesquely beautiful flamingo of Andros faces the same fate that made the ungainly dodo extinct about 250 years ago.

Outpost of the Bahamas

Detoured for centuries, desolate Andros, 110 miles long and about 30 miles wide, lies baking in the white sun. Occasionally it is tilted back on its heels by a hurricane roaring out of the Caribbean storm womb. In the years before the war the world had left Andros, largest of the Bahamas, to a few thousand natives who dwelled in wind-resistant limestone huts in the small towns and communities along the east coast. They eked out a living raising corn and coconuts and fishing for sponges, conches, and spiny lobsters. Here also a few white men found refuge from a maddening world.

The interior and west coast of the island are uninhabited. For the most part, these areas have remained little known since the beginning of time. Like all of Andros, they are a conglomeration of hundreds of irregular land patches interlaced by shallow waterways, some narrow, some expansive. Scrubby mangrove brush covers the land. Dangerous sharks and leg-ripping barracuda cruise the shallows. Moray eels, sting rays, fish, and other marine life abound.

Such wasteland and solitude was a haven for the flamingo (derived from the Latin *flama*, meaning flame). For years flocks of them fed on the mollusks found in the sand bottoms of the salt lakes, mated and nested on the low, flat shores. The flamingo, which brought color to an otherwise drab scene, claimed Andros as its cherished and undefiled home.

And, strangely enough, for the shy, nervous flamingo Andros was one of its last stands—the world's end. Forty years ago the island, lying north of Cuba and off the southeast tip of Florida (map, page 639), had a population of many thousand flamingos. Feeling the pinch of encroaching civilization nearly everywhere else in this area, they prospered on the by-passed and seemingly forgotten island.

But Andros was rediscovered during the last war by man and his technology. The big flamingo city found on Andros by the late Dr. Frank M. Chapman of the American Museum of Natural History, New York City, in 1904, was as surely a war casualty as Leningrad, Warsaw, and Berlin.

In the early 1940's, military planes roared through sun-drenched Bahama skies on practice maneuvers. Pilots were at first perplexed by the sight of immense vermilion patches which mottled the land below. More than once a young airman, bored with routine pattern flying, would bank out of formation, descend on a great mass of this red-pink color, and give gleeful chase to the terrified birds.

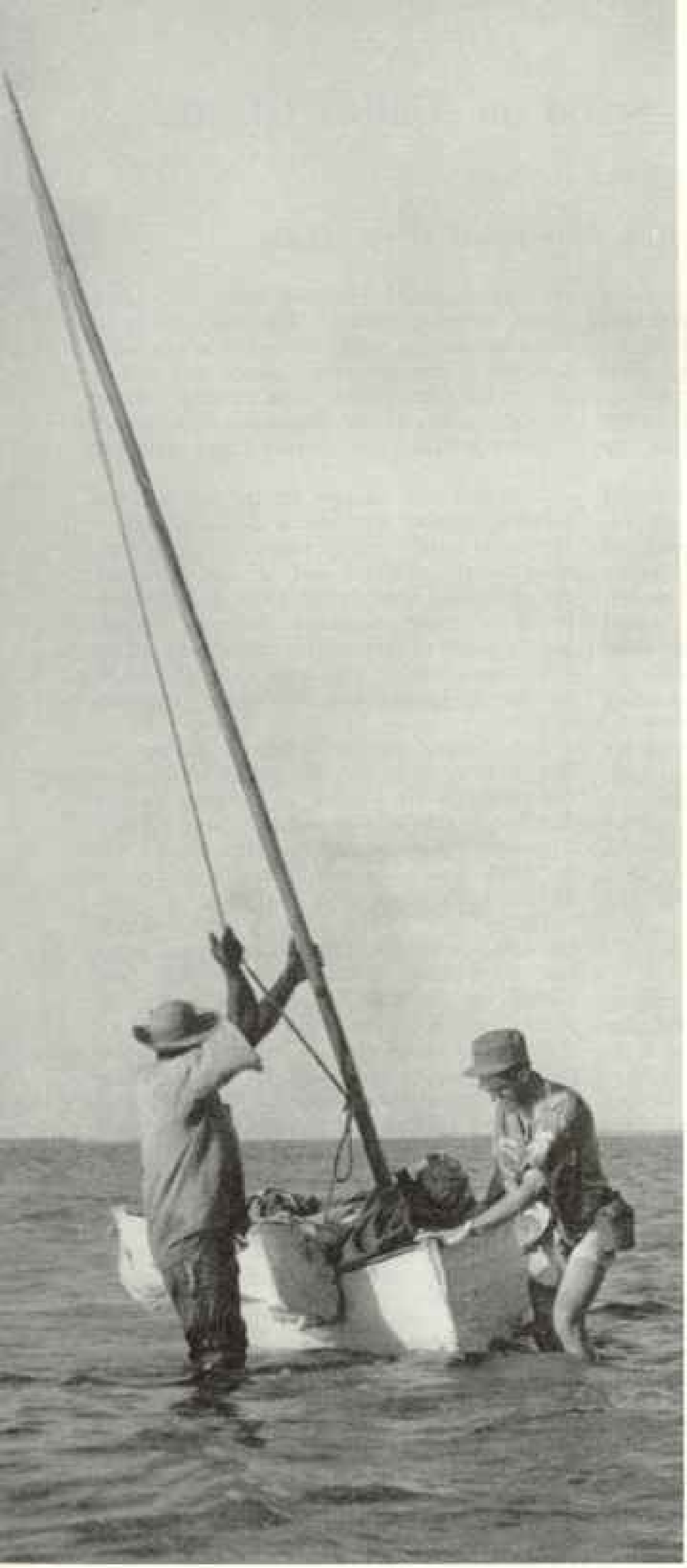
When perhaps a half-mile away, the pilot could make out some movement among the birds. Those nesting would rise uneasily. Thousands of ungainly black-beaked heads would periscope and freeze in the direction of the approaching intruder.

No Protection—Only Hysteria

Rising from their nests, the birds would reveal a myriad of mud mounds, bowls extending above the shallow water level (page 652), the center of each punctuated with a single chalk-white egg, rarely two. The air would well with honks of raspy terror.

The wild flamingo, *Phoenicopterus ruber*,*

* See "Large Wading Birds (Herons, Ibises, and Flamingos)," by T. Gilbert Pearson, with paintings by Maj. Allan Brooks, National Geographic Magazine, October, 1932.



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Author and Helper, Invading Andros, Pull Their Dinghy over a Bar

Dr. Zahl (right) remained long enough to discover a tragedy: flamingos which once brightened a wasteland had disappeared.

screamed its indignation over this aerial violation of its traditional homeland. One of the most fragile and neurotic of birds, the flamingo has techniques for protecting itself and its nest from hawks, crabs, lizards, sharks, and floods. But to the roaring menace of a low-flying plane it has no response other than hysteria.

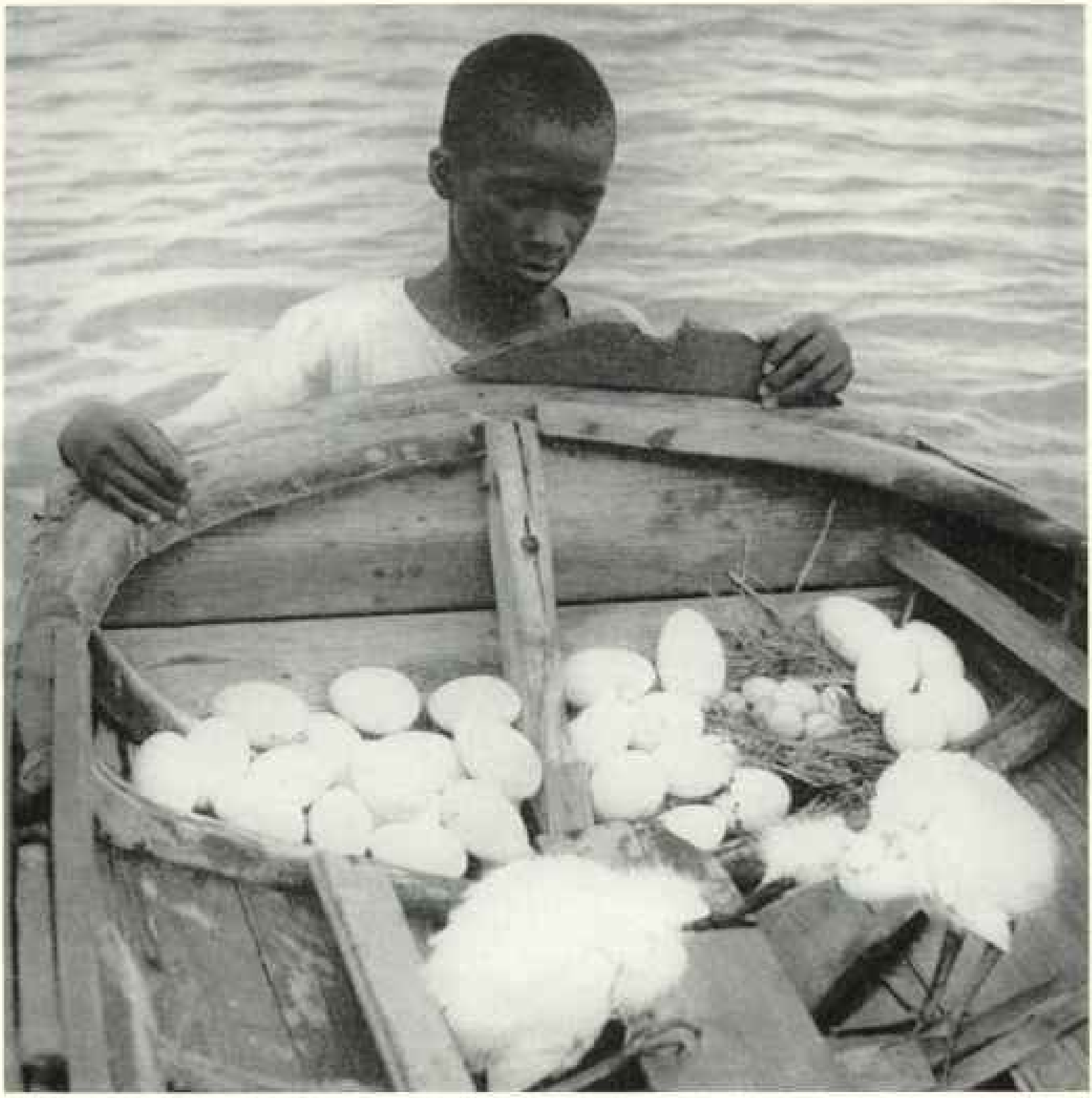
Such springtime groups of flamingos as were seen on Andros by these early airmen were recent arrivals from remote swamps—perhaps in Cuba, perhaps in isolated sections of the Bahamas—where they had undergone their winter molt. There they lived in relative nongregariousness, possibly because they preferred not to be seen by their fellows during this feather-shedding process.

But when the regrowth of richly colored plumage had given each spindly body an elegant new dress, the mating call began to stir within each bird. They knew, too, that at Andros a fresh crop of small mollusks, believed to be the flamingo's sole diet, lay on the sands.

In small groups the birds emerged from their winter reticence in distant swamps to make the ocean flight to Andros. Flying in gooselike formation, they entered Androsean skies, peering down in search of other earlier arrivals of their species. Group after group returned to the old nesting grounds off Grassy Creek, each alighting with great fanfare among those already there. In the old days the congregation was said to exceed 25,000, with perhaps half that many nests speckling the shallow lakes.

Here each year during April and May vast bird cities would come to life. With great wing flutter and excitement the previously quiet shoals would resound with the bedlam of a thousand courtship dances, the quivering flurry of treading, the heaping of mud by webbed feet and its masonry by crooked beaks into cylindrical mounds. And soon acres of mud nests would be glorified by innumerable white eggs (page 645).

The small mollusks, living by the billion on the floor of the lakes, were cleaned out in the areas immediately around the nests. When a setting female needed food, she rose from her nest, stretched her stilty legs, and took off for some more distant bight.



A Raider Counts His Catch: Flamingo Eggs, Heron Chicks, and Heron Clutch (Right)

This Andros Island boy thoughtlessly helped decimate one of Nature's most spectacular sights, a colony of flaming flamingos. He was hungry; beauty did not arouse his compassion. In better days Andros's egg catch might have filled his boat to the rim. The author, tasting heron flesh, found it fishy and unpalatable.

The male promptly ascended the mound and, with great dignity, settled himself on the egg for his turn at brooding. When the female returned, he would leave for his own foraging. At each of these shifts, the parents seemed to sniff tenderly at the egg, rolling it a bit to insure uniform incubation. Each pair of birds cherished its egg.

Take-off—Pale Pink to Bright Red

One or more flamingo communities were perhaps in this stage of development when the first warplanes started coming over and curious pilots were lured by the shimmering pink. When the approaching planes were a half-mile or so away, speeding in fast and low, something within the nervous system of every flamingo inhabitant suddenly and simultaneously snapped. The impulse to flight and self-survival overcame that of nest and egg protection.

Then all the birds would take off, each one running at breakneck speed, legs slashing through the shallow water, over the nests and across the lake. Wings would beat wildly, quadrupling the apparent intensity of the color mass.

Soon the momentum of running would be taken over by wing action, and a cloud of birds would rise into the air, sometimes

An Andros Youngster in 1946 Gathered Flamingo Eggs by the Hatful

The sight of Indians eating flamingo shocked Spanish explorers. These pious men looked upon the bird, with wings, legs, and neck outstretched, as a flying cross.

causing the pilots to bank sharply to prevent disastrous collision. The birds, which to the pilots had seemed a pale pink when on their nests, would now appear gleaming red, with black wing-tip feathers flicking in the sunlight. Head and neck straight out in front, long legs pencilling aft—the flying flamingo is an aeronautical color poem (page 644).

For a few minutes the birds would continue to circle the nests. Then they would wheel abruptly and sweep away en masse. The pilots, watching the flock disappear into the horizon and undoubtedly thinking how beautiful Nature is, would then bring their planes back on course.

Had the pilots been able to come back after such a rout and walk among the nests, they would have seen, as I have, the devastation of broken eggs spilling their embryonic contents down the walls of the mounds, a devastation wrought by the stampeding take-off (page 643).

Lizards would soon put in an appearance, and a dozen vultures would show up from nowhere. Often after raids of this sort the flamingos would not return to their nests. Perhaps they realized the damage caused by their violent departure, or knew that unattended eggs would immediately fall to carrion predators or quickly rot in the sun.

During the war years more and more planes came into Androsean skies. A large military base on near-by New Providence Island kept the air in this part of the Bahamas a-roar with the sound that the delicate flamingo

found so disturbing. Bombers and swift pursuit planes—like the flamingos, seeking privacy for the practice of their secret maneuvers—would spend many hours over the swashes and cays.

Until after the war there wasn't much flamingo activity on Andros, only scattered attempts to nest by a few homesick birds.

Black Gold a New Villain

But the flamingos did not wholly forget Andros. At the end of 1945 military plane traffic began to fall off, and Bahama skies seemed relatively quiet again. Large groups of the birds started coming back. Perhaps the refugees could re-establish themselves in full number. The memory of their previous frights was becoming dim, and the impulse to nest and lay was beginning to reassert itself.

By the spring of 1946 I found a colony of almost 3,000 birds attempting a return to the homeland. By June of that year, numerous new mounds poked their muddy heads up through the water of one of the old rookeries. Impatient females began to set. White eggs appeared. All seemed well.

Drawn by Harry S. Oliver and Victor J. Keller

Andros: a Flamingo Colony's Pillaged Paradise

Largest of the British Bahamas is Andros. Called an island, it is in reality several, channels slicing it into three main sections. Its lonely swamps, forbidding to man, made ideal nesting grounds for helpless flamingos until low-flying warplanes and marauding egg hunters drove the birds away.

But the flamingos didn't know that the security of their mangrove lakes and swashes was again being profaned. They didn't know that all of Andros was under postwar suspicion of bearing oil; that elaborate surveying parties, drilling crews, and camps of laborers were being stationed at strategic points.

They didn't know that civilized man, who for so long had rejected Andros as a worthless waste, was now taking seismic readings, cutting away the mangrove snarl, and burning out the palmettos, calling in engineering crews from London and New York.

The presumptive black gold down 14,000 feet was the thing. Flamingos belonged in Hialeah Park, near Miami, Florida, where a transplanted colony of flamingos thrives in semicaptivity—not on oil lands. But the captive birds at Hialeah have their wings clipped and cannot fly. In confinement they lose much of their rare beauty and vitality.*

One day across the bight came two Andros Islanders in a little dinghy with a white butterfly sail. They had been searching for

* See "Flame-Feathered Flamingos of Florida," by W. A. Watts, National Geographic Magazine, January, 1941.

Flamingoes. Natural Antelope hunting

Wading Birds Cock Serpentine Necks and Eye the Camera

Finicky in their eating habits, wild flamingos apparently accept no other food than *Cerithium*, a small mollusk (page 651).

Aside from man, the gentle, defenseless bird has few enemies. At times the turkey buzzard steals eggs and young; his presence results in raucous protests.

The late Dr. Frank M. Chapman described a flamingo colony's agitation when he and a guide approached. "At a distance of about 300 yards," he wrote, "we first heard their honking notes of alarm, which increased to a wave of deep sound. Soon the birds began to rise, standing on their nests, facing the wind, and waving their . . . wings. As we came a little nearer . . . the birds began to move . . . like a great body of troops, they stepped slowly forward, pinions waving and trumpets sounding, and then, when we were still 150 yards away, the leaders sprang into the air. File after file of the winged host followed. The very earth seemed to erupt birds." (From *Camps and Cruises of an Ornithologist*, copyright Appleton-Century-Crofts, Inc.)

Women Haul In Crops; Idle Man Tastes Berries

These Andros people in prosperous times seldom molested flamingos, but a failure of the sponge-fishing industry turned some of them to nest raiding.

J. Linton Riggs

nesting grounds. Having found them, they were now bent on mischief. These men undoubtedly knew that on the Bahamian books there was a law forbidding the molestation of flamingos.

But they also knew that the law had seldom been enforced and that the watcher who for some prewar years had been assigned to guard the birds during the breeding season had long since been withdrawn. Besides, to them flamingo meat is more savory than chicken, and flamingo eggs a delicacy. The men understood nothing of conservation and didn't care.

As the intruders approached, the sentinel birds began squawking loudly, and a wave of noisy apprehension swept through the flock. About 1,000 feet from the nest area the boat crunched to a standstill. The men leaped overboard and with baskets in hand proceeded through the shallow water on foot. An old fear surged over the flamingos; the birds streamed into the sky. Angrily but ineffectually protesting, they watched the nest robbers fill the little boat with eggs (pages 637 and 638).

Overlooked Eggs Carry On Species

As the dinghy sailed away, the birds hurriedly returned to their nests. Not all the eggs had been taken. Those remaining were nudged affectionately by the beaks of their parents, who quickly resumed brooding. Those parents who found their nests eggless seemed perplexed and frustrated. But within a few days they were replastering their mounds, and a week or two later there were new eggs.

Several times in succeeding weeks, as the location of the new rookery became noised about among the camps and coastal settlements, other men, lured by the treasure of fresh flamingo eggs, came to raid the nests. Always, however, a number of eggs were overlooked. In these the race was being carried on.

By mid-August there were gentle shell tappings. The brooding parents listened excitedly and waited. In a day or two fluffy white creatures with straight small beaks and short legs appeared on some of the mounds.

One wonders how these little puffs of down grow up to be grotesque flame-colored creatures with necks and legs each a yard long, and with great black hooked beaks. It looked more as if someone had slipped some fertile goose eggs under the brooding mothers.

Before long, the young ones climbed down off the mounds and swam about in the water surrounding the nests. Fond parents gathered and regurgitated food for their offspring. As the weeks passed, legs started growing longer and heads and necks began to resemble those of adults.

By this time many additional eggs had hatched, and the water between the mounds was spotted with several hundred young birds who aped their elders by stilting about on their growing legs wherever the water was shallow enough (pages 646 and 647).

Although the rookery had started out earlier in the summer with an adult population of about 3,000, many of these had somehow dropped by the wayside, perhaps worried into flight by the egg robbers.

The remaining group had produced perhaps 300 young, although eggs kept appearing on various mounds to replace broken or stolen ones, or those carried off by an occasional high tide. If the colony had not been molested, there could have been approximately 1,500 young. But even with only 300 new flamingos, there was as yet no serious survival threat to the colony.

New and more deadly troubles, however, were soon to begin. The egg robbers had been watching their calendars to calculate the probable hatching time. Just before the young were beginning their first flight exercises, the dinghy with the white butterfly sail again appeared from across the lake. This time there were three men.

As they approached, the birds began their raucous alarm calls. Many of the young descended in panic from their nests and began swimming toward one of the corners of the lake.

For a time the adults held their ground with the nestlings. But as the invaders came closer, all the adults took off. They circled overhead and watched the predators go after their helpless young.

Last Roundup for the Flightless

Nature again had failed to provide either parent or offspring with an answer to this dangerous dilemma. Each from a different angle, the men splashed barefoot toward the cowering group of youngsters and succeeded in driving them into a small estuary. Older fledglings were furiously flapping their wings in a vain effort to get into the air.

The men began the assault by throwing stones into the group. It was hard to miss. When an effective missile landed in the group, there was a wild scatter, leaving one dead in the area evacuated. But this was not efficient enough; other methods must be employed.

By now the men had succeeded in driving

Kodachromes by Paul A. Zahl

Author and Helper Seek Flamingos in a Bahamas Wasteland

On swampy Andros Island the delicate pink flamingo found safety from ordinary predators, but not from man. First noisy airplanes, then wanton hunters terrorized the flock. Poachers cruelly stole the eggs, trapped the surviving young with ropes, and shot older birds. Of 3,000 flamingos counted on Andros in 1946, the author found none in 1949.

A Frantic Parent Broke Her Egg; a Crab Sits Up and Seems to Beg

Land crab, so pale pink it appeared broiled, was one of a horde that overran Dr. Zahl's camp, scavenging loose food and rifling provender boxes. Belying their fierce appearance, friendly crabs became pets, finally pests. The egg, cracked by a flamingo in hysterical take-off, was opened to reveal its contents to the camera. A foot-high mound of mud made up the nest.

Kodachrome by Paul A. Zahl

Pink Flamingos, Their Outstretched Necks and Legs in Perfect Balance, Sail Through an Azure Sky

Once abundant in Florida, the bird appears now only as a storm-tossed straggler or as a pet in Hialeah Park.

The Author Finds Andros Island the Perfect Spot for an Egg Hunt with Camera

Nest-building flamingos scoop mud with bills and feet. Most mounds contain a single egg. Parents take turns on the nest.

Kodachrome by Paul A. Zahl

Adolescent Flamingos, as Yet Lightly Colored, Feed in the Shallows of an Andros Island Pool

Inch-long, spiral-shelled mollusks, found by the millions in the salt marshes, are assumed to be the birds' only food.

Fragile Heads Snap Up Like Jack-in-the-Boxes. Flightless Youngsters Herd Together at Sign of Peril

Pale-pink five-month-olds, roaming a lake on Great Inagua Island, lack maturity's bright coloration. A moment after this picture was taken, the entire pack of 1,000 stampeded, knocking the author-photographer into the water and almost ruining his camera.

Kodachrome by Paul A. Zahl

Kodachromes by Paul A. Zahl

A Nest-laden Shore Makes a Busy Air Terminal. Andros's Flaming "Jets" Constantly Land and Take Off

< Eight Panicky Birds Tangle in a Knot

Left: When the Great Inagua Island flock stampeded (page 647), the author's assistant instinctively seized these youngsters by their necks. Dr. Zahl ordered them released; the birds fled to freedom at breakneck speed. Bahama's game laws forbid flamingo hunting, but raiders, ignorant of the consequences of their act, still decimate colonies for the sake of eggs and meat. Like the ungainly dodo, the beautiful flamingo faces extinction.

Right: The photographer, believing the young flamingo injured, approached cautiously, but, just as he snapped the picture, the bird jumped up and galloped off through thigh-deep water.

In Flight or on Land, Flamingos Display the Poise and Grace of Ballerinas

In taking off, the birds run through the shallows at ever-increasing speeds, their wings flapping furiously (lower panel). An instant before ascent they appear to be racing across the surface, their feet kicking up geysers of water. Young birds learning the difficult art of landing take many a clownish flop.

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Kodachromes by Paul A. Zahl

His Lonely Tent Was the Author's Link with Civilization

In southern Andros Dr. Zahl and his associate lived in forbidding mangrove swamps. Rain water caught in a tarpaulin quenched their thirst. Lizards, herons, flamingos, and vultures were the only signs of life.

An Overturned Rubber Boat Served as Blind and Shelter

Dr. Zahl concealed himself from birds, but ants had no difficulty finding him. He learned that wartime student flyers, by buzzing the Andros flamingos, had gravely disturbed the rookery's well-being.

the young out of the water and onto a sandy beach. Here the birds were doing better for themselves, being able to outrun the invaders. But then the final craftiness of the spoilers asserted itself.

One of them got on the far side of the group, to prevent the birds from fleeing farther onto the land. The other two, standing shin deep in water, untwined a ball of fish line. Each man carried one end and was separated from the other by about 50 feet. The frantic adults still wheeled above, flashing red and screaming wildly.

Helpless Young Trapped

Suddenly the two men with the taut line held low between them began to run, faster, faster, splashing through the water, drawing the fish line about the group of quivering young.

Some jumped over, some darted under, some ran before it into the brush. But others, especially the larger birds with legs beginning to grow long and awkward, were caught at about knee level. Both legs broken, these pitiful victims fell.

When the men had finished their assault, perhaps 20 or 30 disabled birds lay on the sand or floated on the water. The men leisurely picked up the young flamingos by their fractured legs and carried them back to the dinghy. Nor did they mercifully kill their wounded victims; they merely threw the fluttering creatures into the bottom of the boat. Left alive, they'd stay fresh longer. It was a long trip, back to the coast and camp, before the birds could be killed and cooked or cut up and dried in the sun for later use.

When the dinghy left, the adults landed again and the surviving young crept back to them. Adults to whom no young returned paced anxiously. In a few days these lonely mourners left the rookery. Time had run out for them. There was no use trying to lay a new batch of eggs. The hurricane season was imminent.

Coming In for a Crash Landing

The remaining family groups, apparently soon forgetting the slaughter, continued with the business of completing Nature's mission. Within several weeks, some of the young succeeded in getting into the air. That was easy. Merely run as fast as you can and flap your wings with everything you've got, and the principles of aerodynamics will do the rest.

But landing is quite another matter. The young noticed an adult glide smoothly in for a landing, its spread wings tilting gently back and forth (page 649). Then the landing gear is slowly lowered, legs extending down and a little forward. When the webbed feet hit the water, the bird starts running rapidly, splashing through the shallow water before coming to a stop.

When the offspring tried it, there were complications. The delicate balance between wing and leg movement was something to be learned only after long practice. The young would often lower their legs too soon or too late. Inevitably there would be a crash landing and a flip-flop in the water.

But it wasn't long before the youngsters were flying off with adults to distant bights to feed. They learned to take a position in V- or angle-line formations, to sweep low with the group and skim the water with their wing tips. They learned how to find beds of *Cerithium* (inch-long, spiral-shaped mollusks).

Feeding Birds Use Beaks as Sieves

The flamingo feeds both by day and by night (page 640). The bird plunges its head into the shallows so that the beak is inverted and pointed backward. Then it gulps a mouthful of sand, the while shaking and rinsing its head. Water and sand are strained out through a grill arrangement of the beak's inner edges. Mollusks too large to pass through this grill are retained and swallowed.

Feeding in one spot at a time, the flamingo slowly pivots until a complete circle has been made, during which all mollusks within reach have been cleared out. Then it moves on to another spot and repeats the process.

Each former feeding station is recognizable as a shallow mound and moat left in the sand. The author, wading through shallows, has seen hundreds of such feeding scars.

Normal living, however, was not for this generation of Androsean flamingos. It was early one morning in September that final disaster came. The pink rays of the rising sun were shoving the clouds up off the eastern horizon. The lake was blue and quiet in the morning air save for the intonation of an occasional flamingo voice.

The birds had not seen the dinghy approaching, for it had come in under cover of darkness. Suddenly a blasphemous explosion shattered the peaceful quiet. Instantly the birds screamed into the sky. Several, their delicate bodies pierced by gunshot, did not rise.

Then came another shot, and another, and yet another. Each time one or two flamingos plummeted down out of the flock like clay

Louis L. Mowbray, Jr.

Flamingos 31 Years Ago Erected a City of Mud Tees as Their Nursery

"Multiply these mounds by a thousand," says the author, "and you will have some idea of the colony in its heyday." Here the nests stood rain pitted and seemingly abandoned. Mating birds, flying back the following spring, did a replastering job. The late Dr. Louis Agassiz Fuertes (right), naturalist and artist, took part in a National Geographic expedition to Andros in 1930.

pigeons. There was one more shot, and with this the circling formation abruptly wheeled and swiftly flew due south. In a few seconds the red cloud had disappeared over the horizon.

All was quiet again. Red and black feathers were gently falling in the area as the hunters came in to gather up their quarry. The few birds not old enough to fly fled into the mangrove, where they undoubtedly starved or were picked up by hawks. This was the final outrage. The flock never came back.

Survival in Great Inagua and Yucatán

This happened in 1946. A year later I returned to Andros and spent five weeks searching the entire area in an unsuccessful attempt to relocate the flamingos. Sometime before my arrival, a flock had returned to the Grassy Creek rookery, only to be routed again by the pilot of a private plane who had spotted the birds, and, like the military airmen of the war years, had flown in close to get a more intimate view. As in previous years, the terrorized birds abandoned their nests and swept into the sky.

Again, in 1949, I returned to Andros, this time in a reconnaissance plane supplied by the Bahamas Government. I flew the width and breadth of the great island, searching for pink patches on the blue and emerald lakes—but in vain. The birds had not returned.

A number of the displaced birds went to Great Inagua, some 300 miles to the southeast, a desert island not quite as large as Andros but otherwise similar. Reports in August, 1950, indicated there were as many as 3,000 flamingos on Great Inagua, 2,000 in Cuba, and 600 on Hispaniola. It was also learned that there was a colony of 3,500 birds nesting on the coast of Yucatán, in southeastern Mexico.

Such a bird as the flamingo—like the dodo and the Florida spoonbill—has become so specialized anatomically and psychologically that adaptation to abruptly changing conditions is impossible.

With the protection of man, the Caribbean flamingo can perhaps survive in such out-of-the-way places as Great Inagua and the Yucatán coast, places where security may be found from molestation, terror, and the threat of sudden death.

I Walked Some Irish Miles

By Dorothea Sheats

With Illustrations from Photographs by the Author

IN COUNTY CORK, where I came ashore, the accent is soft and the wind is strong, though it rides in on the main branch of the temperate Gulf Stream. Listen and you hear cattle lowing. This is the sound of Ireland's countryside.

Time? Nobody seems to care.

"Clocks stop ticking here. Nobody hurries. Any Irishman will stop for a chat or a pint," said a little fat man in a Glengariff doorway. "Sure, we're easygoin', praise be to God!"

I had just eight weeks for "going back" to an Ireland I knew only in song and story; my grandparents sailed from there to America before I was born.

Alas, no weeks in my life passed so fast. I walked 250 miles, rode in carts, cars, buses, and trains; slept over "pubs" and under cottage roofs, ate in Irish kitchens, stayed on a farm, worked in a store, danced, talked, and went to church with these friendly and generous people. I explored a fairy fort in County Kerry, stubbed my toe on an Ogham stone, and climbed into damp, ivy-covered castle ruins in County Cork.

Often I met the old and the new, like the humble thatched cottage near Galway where daughter Peggy—shooing her chickens out of the door—was soon to enter University College at Dublin (Baile Atha Cliath).

Friendliness greeted me everywhere, and curiosity too. "Where are you from, kind lady? What brings you to Ireland?"

About the size of the State of Maine, the island has 32,000 square miles. Six of its 32 Counties make up Northern Ireland, part of the United Kingdom. The "Border," subject of dispute in and out of politics, separates Northern Ireland from the remaining 26 Counties—the new Republic of Ireland (map, page 656). Ulster cannot be used as a synonym for Northern Ireland, for the name covers both Northern Ireland and three Counties of the Republic.

Most of my eight precious weeks were spent in three Counties of the Irish-speaking West—Cork, Kerry and Galway.*

Irish Mile—"a Mile and a Bit"

In the southwest I started, in an off-the-beaten-track peninsula, locally known as "Bere," in County Cork. You leave resort-town Glengariff behind and suddenly you are alone in craggy, wild country, with the bleak Caha Mountains to the right and Bantry Bay, gray and misty, to the left.

The ten miles to Adrigole, where I hoped to get "bed and breakfast," seemed endless. I knew no one, had no reservations. Cameras and pack with supplies for a week dragged at my shoulders. Each time I inquired for Adrigole, it was still "a mile or two."

"Don't you know an Irish mile is a mile and a bit—and the bit is as long as the mile?" asked a tall, grinning Irishman I met when at last I reached the elusive town.

"You mean they're longer than other miles?"

"By about 500 yards!"

Adrigole is just what its name implies, "A Place Between Two Forks," with a small harbor. Looming darkly near by is 2,251-foot Hungry Hill. For three days I lingered here, at a big friendly stone guesthouse. Floors were cement, walls white.

Seat of O'Sullivan Clan

As evening fell, a waitress spread a blue-and-white cloth on the table and brought "tea"—ham, tomatoes, loaves of dark and white bread shaped like small cartwheels, and a knife to cut all I wanted; creamy butter, black currant jam, tea.

The girl came back with an armful of turf—peat, we call it—traditional Irish fuel. She upended the brownish-black oblongs on the hearth. Soon I sniffed the sweet, almost buttery fragrance of my first turf fire.

"How quickly it lights," I said.

"Black is best." She spoke so fast in musical Cork cadence I could hardly understand, but I did learn that her mother once emigrated to America, only to return to marry a childhood friend. Her name was Margaret O'Sullivan. (Here, if you forget the name of the man you met yesterday, you can guess it's O'Sullivan and you'll probably be right! Bere peninsula is an ancient seat of that clan.)

I picked up a bit of turf. It was neither soft coal nor hard soil, but like a solid mixture of both, with grass clinging to it. That morning I had passed it stacked in desolate bogs (pages 668, 674, 677).

A young Government clerk from Dublin,

* See, in the National Geographic Magazine: "Ireland: The Rock Whence I Was Hewn," by Donn Byrne, March, 1927; and "Old Ireland, Mother of New Eire," by Harrison Howell Walker, May, 1940.

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The Hiking Author Switches from Walking Stick to O'Callaghan's Trap

In Macroom, a County Cork farm center (page 664), Mrs. Sheats struck up a friendship with John O'Callaghan (right) and his wife, who insisted she board their two-wheeler for her photograph, snapped by Mrs. O'Callaghan. Horse carts are giving way to cars and trucks even in rural Ireland.

on holiday, threw off his dripping raincoat, sat down across from me, and ordered dinner. He told me many things.

"Saucer-shaped, Ireland has flat midlands and high coasts. Big rocks were left by glaciers, like that one back of this house. It's balanced on another so lightly you can move it with your hand!

"Women loom large in Ireland's history," he continued. "One was Grace O'Malley, who commanded a fleet of galleys. Then there was Queen Maeve; whether legend or history, she was ruler of north Ireland and, some say, is buried in County Sligo."

"But today," I said, "so many women are leaving Ireland. Why's that? Hasn't the Government set up a program to make them want to stay home and work here?"

"No," he said. "Things don't move as fast here as in America. Ours is still a young nation. We've been on our own only about thirty years." He wrote some Gaelic in my notebook. "This is an Irish saying. It means 'Little by little, castles are built.'"

Gaelic Revival in Schools

We talked of the Government's efforts to revive Gaelic, or Irish, as Ireland's national language, in a program to keep alive traditions of Irish culture and civilization. Today in the "Gaeltacht"—Irish-speaking districts, mostly in western Counties—at least 200 schools perpetuate the ancient tongue.

"Gaelic used to be the language of the home. When you talked of cooking, or knitting, talk was in Gaelic," the earnest Dubliner

655 Irish Tourist Association

Glowing Peat Makes a Country Kitchen as "Warm as a Thrush's Nest"

Sweater, kerchief, and heavy boots show this woman is on the go between barnyard and hearth. Here, baking bread, she transfers burning turf to the lid of her pot to ensure even browning. His chores done, the man rolls up his sleeves, smokes his metal-capped pipe, and pets his sheep dog.

went on. "Then about a hundred years ago people began to think that English was the language of gentlemen, that a poor man might be satisfied with Irish."

All around me was the soft, sometimes throaty sound of Gaelic, often mixed with English.

"'Allo, 'allo, 'allo," a husky voice called, and a black-eyed O'Sullivan, home from Cork City, stood in the doorway and sang for "the American girl" while rain lashed the window.

That first night in Adrigole I slept in an iron bedstead in my third-floor room. A heavy china pitcher of cold water stood in a bowl on a stand. There was no key to the door; I could hear steps on the stair and movement behind other walls. Pictures hung near the bed, but I was too tired to take my candle and investigate. Next morning I saw they were all sacred.

An Adrigole family took me to Mass on Sunday, bounding along in a small, right-hand-drive Hillman car, which, like Prefects (Fords) and Austins, seems to suit the narrow, winding roads. Women's black shawls and coats of the men were sodden from rain. Pews were straight-backed. Large religious pictures hung on the white walls.

"Do you have a penny?" asked my companion. I couldn't find one, so she put a large coin with a hen and chickens on one side into my hand for the collection.

Later at Adrigole's Civic Guard barracks, really the police station, I followed a blue-clad guard down the corridor past shiny handcuffs on the wall. He turned the huge key in

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Drawn by Harry S. Oliver, Robert Northrop, and Victor J. Keller

Dear to Many Irish Americans Are Ancestral Galway, Clare, Limerick, Kerry, and Cork Counties

652 Alfred Eisenstaedt, Black Star

Dublin's O'Connell Street, Jaywalkers' Delight, Is Cherished by Irishmen the World Over

Just as O'Connell bridges the River Liffey (not shown), it splits into Westmoreland Street (right) and D'Olier. Distant O'Connell Monument honors Daniel O'Connell, 19th-century political leader known as the Liberator. Dublin's General Post Office (lower right) was headquarters of the Irish Republican Army during the 1916 insurrection. The picture was taken from Nelson's Pillar (page 676).

the lock and opened the door into a very empty, whitewashed room—the jail!

"Nobody's been locked up here since last June. 'Twas an Irish laddie made a check for one pound into ten! We held him overnight, but he was no criminal, just a laddie who did it for a lark!" He smiled understandingly, and offered to let me try on the handcuffs. I said no thank you.

One late evening the little chambermaid pointed out the Plow in the sky—the Big Dipper—and asked if California was larger than Adrigole.

I ventured a look into the inn's "pub," or barroom. It was better than a newspaper. Everyone brought fresh gossip, tidings of comings and goings throughout the parish.

So many O'Sullivans were in the crowd that I asked the schoolmaster, "How do you keep them all straight?"

"Well," he said, "I'm called Mike Jer O'Sullivan. The distinction is in the Christian names." Mike Jer (for Jeremiah) was one of twelve children—four became teachers.

Mail, Not Industry, Eases Hard Life

I wondered how these people here live. The land is rocky and poor; there is no industry.

Mike Jer told me that three-fourths of the population couldn't exist without help from

relatives in America or England—gifts of clothes, like smart American hats I saw on colleens in church, or American dollars. One post-office clerk said many a sizable check is cashed at Christmas time.

Farming is limited; rocky land makes only patches cultivable. The mobile creamery, where cream is sold, and the motor road are two marks of progress on this peninsula.

"Life *is* hard. That's why so many young people leave for America or England," he finished.

I asked him how they learn about America.

"The wireless—radio, you call it. Even back in the glens you'll find wireless. One in a family goes; then he writes home, sends money, and returns in a few years to take a brother or sister out with him."

Before I left Adrigole I hiked four miles up to 1,084-foot Healy Pass, where County Cork meets Kerry. I walked past turf carts, fields of turnips and cabbages, through a lonely valley. I got to the pass in a violent thunderstorm and huddled under a rocky ledge to wait for the rainbow.

For ten hilly miles to Castletown Bere I faced a stiff southwest wind. There were no billboards, only a rare crossroads marker. By noon I had tied on my hat with my raincoat belt, and farmers, pushing their bikes in the full force of the wind, shouted "'Tis wild!" Even the sheep and donkeys hugged bushes to escape the blasts.

Hospitality on the Road

Dreaming of a cup of hot tea, I knocked on a farmhouse door.

Donald O'Neill, owner and poultry farmer, paused in his work on a new barn to bid me welcome. The kindly woman of the house set out fine china and served me tea.

Soon I was out walking west again beside a pretty Irish girl.

"You're an American," she said. "I can tell by the clothes. I get packages from America—this suit came from my aunt in New York."

"Would you like to go to America?" I asked.

"'Tis my one wish. My mother used to tell of emigrants leaving for the ships with big feather ticks and dishes. They were so kind they could not even leave the dogs behind."

She shrugged at a Government bulletin warning farmers to spray against potato blight. "'Tis thunder and lightning makes it—turns 'em blue and they won't boil."

The coastal town of Castletown Bere was full of Spanish sailors. Into its fine harbor twenty-eight ships in a fleet of Spanish trawlers had been forced by bad weather. I turned into O'Shea's General Supply Store, on the square, to hear the fluent Spanish.

There, darkened and stained, on the wall was a 1937 National Geographic map of the British Isles—friendliest sight imaginable.

Fishermen talked lustily. Kegs of Guinness stout stood on the floor. Shelves held Kellogg's Corn Flakes (packaged in Ireland); cans of "stewed steak" (Irish product); cooked corned beef; big tins of Jacob's biscuits.

Across the street at a lending library, for fourpence, I could borrow Christopher Morley's *Human Being*, or Nancy Wilson Ross's *The Left Hand Is the Dreamer*. At another shop such American pulps as *Western Story* and *Texas Rangers* were for sale, besides English patterns for suits and coats.

"Irishmen are good workers. They go to America with only a national school education and then go to night school to become chiefs of police, mayors . . ." a woman in a candy shop told me proudly.

"A Hundred Thousand Welcomes!"

She let me have a worn copy of *Old Moore's Almanac*. In it fairs, about 150 of them, were listed for the second week in August. One was for Killorglin in County Kerry, and I knew I had to hurry to see that Puck Fair.

From Castletown Bere, through tunnels and over mountain road, I went by bus to Killarney in County Kerry. Then, by train, I covered 25 miles to Killorglin and Puck Fair. Surely no fair was ever like this!

"You'll be after viewin' the only reignin' monarch in Erin!" the railroad station agent whispered when I bought my ticket.

He was right! There was King Puck, a well-fed billy goat perched above the crowded square on a scaffold. I stared up at it and then down, just in time to let a horse prance by as his owner paraded him for sale.

First comes Gathering Day, when Puck is mounted on his throne with much merrymaking, to remain there hobbled and tethered through Dispersing Day and the last, Scattering Day. The Gaelic greeting, "A hundred thousand welcomes," fluttered below him.

The origin of this famous fair stems from legend and history. One tale is that goats warned the Irish patriot, Patrick Sarsfield, lying in ambush near Tipperary, of the approach of William III's men. But often the celebration is linked to the dim pre-Christian past.

Scouts, hikers, Irish families, cyclists, drovers in heavy coats and boots, English tourists, all milled about, spilling out of shops into the streets to buy or sell horses, cattle,

Border Leicester Ewes, More Anxious than Sheepish, Await the Auctioneer in Mallow

So flavorsome are Irish mutton chops that natives prefer them to lamb. Herders say that small "mountainy" sheep make the best eating; they rank black-faced Suffolks next (page 662).

pigs, or sheep, or to take a ticket on a game of chance. Long caravans of gaily decorated wagons, belonging to tinkers from all over Ireland, led out of town (pages 670, 671).

Who were the tinkers? They looked like Gypsies.

"Thievin' wanderers, they've not a ha'penny to hear 'em beg!" someone told me. "Descendants of the O'Driscolls, kings of Old Ireland! Mind you don't cross them!" whispered another.

"This Wish Will Come True . . ."

I put half-a-crown on the palm of a bejeweled young tinker. But a pretty colleen from the train had taken me under her wing. She spoke up. "No, no, a sixpence is enough!" Bridget Sullivan, home on holiday from London where she worked, caught a frown from the tawny tinker, who said she would give me change later (page 678).

"You've had a long journey," the little soothsayer began in a soft singsong. "You'll take another. There's a letter with a photo in it . . . I see a gentleman . . . Now if you will make a wish—"

When Bridget mentioned the change firmly, the tinker told me, "For the extra I'll give you another wish—only this one will come true!"

I took this once-in-a-lifetime offer. But in a moment, Bridget cried disappointedly, "You should have wished for the change!"

Ireland has its own currency system, but it also uses British pounds, shillings, and pence.

Boarding the train at Killorglin for the trip back to Killarney was like braving a New York subway rush. Sixteen people crowded a first-class compartment. Among them were three weary children, a widow in black, and an Irish-American woman back after 21 years in the States. Two girls from Cork City, with tender, tired feet, said they'd "danced all night" but were "happy as Larry," as the saying goes. In our party also were Bridget, who saw the fair with me, and a tinker and his tired wife.

Between pulls on a bottle of "Woodpecker Cider" the tinker sang Irish ballads, solemnly

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Kerry Cows, a Small, Sturdy Black Breed, Graze Dingle Peninsula's Rocky, Tide-gnawed Pastures

Medieval Spaniards traded with this western corner of Ireland, and shipwrecked sailors from the Armada found haven here. Travelers believe they can still see Spanish influence in Dingle folks' dark eyes and olive complexions. Rugged Sybil Head towers in the distance (page 675).

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Nickering Horses, Shouting Sellers, and Disputatious Buyers Announce the Opening of Galway's September Fair

Every fall the stock show takes over quiet Eyre Square. On this rainy day, Big Aran Islands horses, tough Connemara ponies, and pigs go on sale. Sheep and cattle come later. "Luck money," a percentage returned to the purchaser, seals the average deal (page 675).

sweeping off his cap and shaking hands all around after each verse! His wife plucked tirelessly at the three remaining strings on her banjo. When the ballads were sad, their eyes grew misty. She smiled apologetically as her voice cracked. "I've been singin' all night," she said hoarsely.

So anxious to see Puck Fair had I been that Killarney and its famed lakes in the kingdom of Kerry only now seemed real. Joining English and Irish tourists, I took the day-long trip through the Gap of Dunloe in all its varying beauty of mountain, lake, and wooded glens. On the first lap I clung to the side of a jaunting car (symbolic horsecart of Ireland), negotiated the next lap on horseback with cameras flying, and covered the last in a longboat, manned by strong men and true who spun endless yarns of Tir na n-Og, "The Land of the Ever Young."

I Follow a Funeral

The sun beat down on the narrow streets my last day in Killarney. A freckle-faced girl stopped me. "Do you know where I can get a passport picture made?" To be mistaken for a native was pleasant, but I had to admit I was "from over."

She was 17, going to England for an interview about a position in a bank. But it was Saturday noon; shops were closed.

As we talked, a funeral procession silently came around the corner. Shoulder-to-shoulder, many walked beside bicycles, following the hearse; cars came last.

They'd stop at the top of the town, my little friend said; so I went along. The pace was fast.

I had checked out of my room and expected to take the train for Tralee. But the cortege left Killarney behind. Four miles away, at Aghadoe's ancient burying ground, they laid this Irishman to rest, the Lough Leane of Killarney blue in the distance. I missed my train.

The remains of a round tower, an early defense lookout, and a church perhaps of the seventh or eighth century, were close by. As I walked around, fussing little wagtails tilted back and forth on sagging headstones.

Aghadoe means the "Field of the Two Yews." The yew tree was held sacred by ancient Druids, and to early Christians it symbolized eternity.

The next train went east to Mallow; I took it. (Somehow, *where* I was going didn't matter; it was still Ireland.) The way a Corkonian can pronounce Mallow is lovely indeed.

I found there a prosperous farm town of 5,000, a railroad junction, and a sugar-beet factory. Leaning on the bridge over the River Blackwater, which flows through the town, I watched red and white cows, knee-deep in cool water, gaze leisurely at small boys shying sticks from the banks.

All around, rich pastures rolled over upland and valley.

Tea in a Monastery

Next morning sheep were running down Mallow streets for the fair (page 659). I watched them from the green lawn of Patrician Monastery grounds. Just then a tall, white-haired Brother of that order greeted me in English and invited me in. "Sure, it's not right to keep you standing out here."

Inside the gray stone building this teacher of Gaelic let me read his thick scrapbook. Clippings went back 15 years. Their theme was farm life, even its humorous side.

Change was not easy, one clipping said, and told of Katie who tried cooking a small bag of bread crumbs with cabbage to absorb odors. But when her new husband found the bag among his cabbage leaves, he thought it was a chicken's craw, stalked out the door and never came back!

"This scrapbook is a hobby of mine," the Brother said. I asked about the children he taught.

A smile broke over his ruddy face. "Children don't want to work, now, do they? Any children, isn't that so? But Ireland is a spiritual country, not materialistic, as is so much of the world. Isn't that what you've found?"

He gave me an apple and his blessing and bade me goodbye at the gate.

Fermoy, in salmon-fishing and hunting country on the beautiful Blackwater, was just 18 miles away.

There a ballad singer, dark head thrown back, filled the air with his song. Finished, he hurried in and out of shops holding his cap for contributions.

A Mound in a Field

In Paddy O'Shea's radio shop I listened to the story of the Fermoy Field Club, an amateur archeological group. "'Tis a kind of madness," said Mr. O'Shea, in his rich brogue.

One day he and a friend had sat down to eat their lunch by a mound in a field. He had poked around with his trench tool, made a small opening, and saw just enough to bring them back. With help from University of Cork's Prof. Michael J. O'Kelly, they unearthed an ancient urn burial and food vessel. (I have had news of Paddy's death; some say it's not considered lucky to guide a "dig" in burial mounds.)

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Young Adventurers in a Rowboat Explore the Maritime World in Cork Harbor

Cork's name derives from *corcaigh*, Gaelic for "marsh." Thousands of emigrants pass through the city on their way to America-bound liners at near-by Cobh. Here *Irish Cedar*, part of the Republic's expanding merchant marine, discharges cargo beside a grain elevator. *Innisfallen* plies between Ireland and England.

Late Stone Age pottery, saddle querns, stone hammers, and flints of the Bronze Age were discovered in this district.

Most interesting find was a pair of small bronze tweezers excavated in 1945. Were plucked eyebrows modern 1,300 years ago?

Ireland offers archeologists a field day, from its Ogham stones, those early grave markers with their strange inscriptions, to bogs yielding perfectly preserved skeletons and implements. Other groups like the Fermoy Field Club can be found on the island.

Out of the treasures in his shop, Paddy O'Shea picked me a hazel thumb-stick to walk with. Once, he said, saints used them; now they're carried by the drovers—those cattle and sheep men I saw at fairs or herding their stock up and down the roads of Ireland. Some of the Irish still believe that hazel, like thorn, carries a charmlike power, though to a less extent.

Here in the rich grasslands, large dairy herds have grown up. Creameries and cheese factories are "wearin' the beef men away" because dairy products are more profitable.

Unlike the less-than-10-acre farms on Bere peninsula, almost one-third of the farms in these Cork valleys and uplands cover more than 100 acres each. Many employ laborers outside the family.

Land Changes Men's Lives

In Ireland good land and poor land often lie side by side. Paddy O'Shea told me of the 15-mile area in County Cork near Macroom, in the Sullane River Valley, where I could find the old and new in farming, the difficult and the easy.

"'Tis the land decides it," he said. "To the east of Macroom, land is good; farmers live well and work hard. But to the west, in the brownstone country, rocky and poor, cows, chickens, and sheep are the crops. There's plenty of time to chat. Nobody's in a hurry. Go down to Macroom and see the land that changes men's lives!"

I went by way of Mallow and Cork City.

Often I took taxis just to meet those irrepressible Irish drivers. At Mallow I had met one who refused payment. He would be waiting, he said, when I came through again. I tried to tell him as the train pulled away I would probably never be back. But again in that same station I saw him, sweeping his hat off like an old friend, offering me a ham sandwich and a glass of orange crush!

As I changed from train to bus at Cork, a long, lean taxi driver helped me with my suitcase. I told him I wanted to stay on a farm. Visibly that disturbed him. "If it's a farm, now, where you're goin', don't be expectin' facilities!"

He told me of three elderly ladies who returned to a near-by farm after 27 years, but stayed only a week. "Lack of facilities," he concluded darkly.

Macroom, important marketing center, straddles the River Sullane. It lies on the fringe of Cork's creamery district to the east. On the west is the Irish-speaking Gaeltacht (page 654), where old red sandstone ridges, "brownstone," pile into wild mountainous landscape, almost unyielding to any plow but host to cattle and black-faced sheep.

"Saving the Corn"

The whine of a tractor rose and fell in west Cork as I reached Macroom. "Saving the corn" means harvesting in Ireland, implying the struggle in wresting the grain from the weather.

Lateness of the crop makes oats the most difficult grain to "save." But now, gift of the fine 1949 summer, the golden oats stood in "stooks." About eight sheaves, with one at each end tied together with "sugan," or rope of twisted straw, made up a stook. If weather was good and the grain hardened properly, it was "drawn in" to the haggard (open area between house and barns) without stacking.

Two men fed sheaves into a thresher on the Michael E. Murphy farm near Macroom. Straw was forked into a tall golden stack. Corn crakes—birds like our long-legged rails—called raspingly from the field.

Men paused frequently to tap a keg of porter or stout—traditional convivial phase of "saving the corn." Often a harvest dance follows.

"By the time they pay for the porter, pay the thresher, and feed the helpers, the profit is not so great," someone said. There was an air of industry about the scene; work would continue by lantern light until it was finished.

Thirty men, trailing chaff at every step over the flowered carpet, ate at Murphy's. Everywhere was the sharp, clean smell of fresh oats.

Irish Kitchen—Warm as a Thrush's Nest

Later I sat down at the long table with the other women. We had "bastible cake," named for the three-legged iron pot in which it was baked over a turf fire. Bits of burning turf on the heavy lid made an oven of the black kettle (page 655).

A movable iron crane suspended the pot over the whitewashed hearth. A bellowslike "fire machine" fed air into the flames at the turn of a handle.

On the wall a clock ticked busily; a dog curled up on the wooden bench beside the hearth.

"I'd like to be here in winter," I told Mrs. Murphy, imagining how snug that kitchen would be on a dark night.

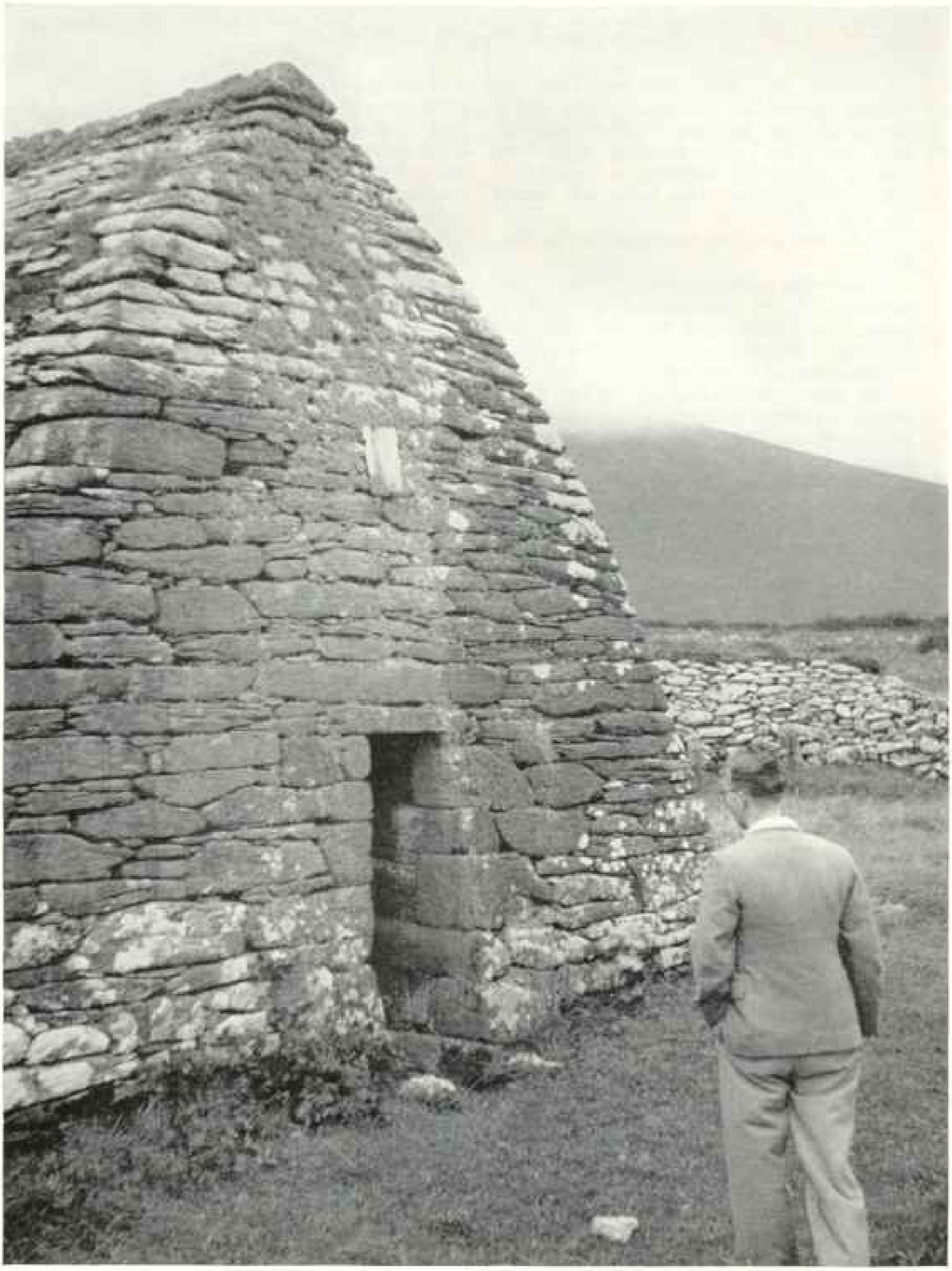
"It's warm as a thrush's nest," she smiled.

Ivy-wrapped ruins of an old castle dominate Macroom's market place. Admiral Sir William Penn, father of the founder of Pennsylvania, once lived here, but today arches lead to a movie house and garage.

On market day in the wide square I watched a woman in hooded cloak sell the last of her apples and turn into a chemist shop. She bought tonic for the pigs, salts and face cream, then turned into the draper's to purchase five yards of tartan plaid for shirts.

"Ah, yes," agreed the girl behind the counter. "When men sell animals on market day, they put a roll of bills in their pocket, but that pays big debts. Women spend their money on the farm or themselves, and that helps us."

Beyond the bridge I met a housewife who remembered when she came as a bride to Macroom. Then, as she swept or baked, she would sometimes be startled when a face appeared at the only window to the room, blocking the light. Angrily she collared one "peeping Tom," to have him admit that there were only three clocks in Macroom: one in a pub—costly to see; one at a distance—too far to go; and one on her wall facing the main street. He was "only after seein' the time"!



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Gallarus Oratory Has Endured Almost Since St. Patrick's Time, 15 Centuries Ago

Early Christians, using prehistory's beehive stone but as their model, built the church at Gallarus without mortar or the true arch. They did the job so well that the interior remains dry to this day. The author, finding no direction signs, lost her way hunting this relic; she finally discovered it in a pasture (page 675). Knowing how Americans might ballyhoo a similar treasure, she was surprised at Irishmen's failure to advertise.

I stopped with Mary and John Healy on a small farm near Macroom. Cows and a few rolling acres occupied what time was left each day after John collected eggs from near-by farmers for shipment to England or sale in Cork City. The house was nearly 200 years old.

What does an Irish household do on Sunday?

It tunes the wireless to hear the big football match—Cork vs. Cavan! The broadcast came from Dublin and was sprinkled with O'Reillys, Murphys, O'Keeffes, McGraths, O'Donahues, and Cronins!

One warm summer evening, eight of us sat around the Healy kitchen, enjoying a gathering for storytelling. Neighbors dropped in one by one, taking places on the settle, the kitchen chairs, the settee.

Mickey, a brother, turned the pages of an album of yellowing photographs and told of his days near Delhi with the British Army.

"I'll Ne'er Forget Old Ireland—"

Ella in a high, clear voice began the song, "The Irish Emigrant"—

> I'm sitting on the stile, Mary, where we sat
> side by side,
> On a bright May morning, long ago, when
> first you were my bride—

We listened in the lamplight, hushed, as she finished—

> They say there's bread and work for all, and
> the sun shines always there,
> But I'll ne'er forget old Ireland, were it fifty
> times as fair . . .

About it there was that haunting quality that runs through so many Irish songs.

Mary Healy excitedly told me the house had been "measured" for electricity. Ireland's Shannon Scheme in 1925 first harnessed the 100-foot fall of the River Shannon between Lough Derg and Limerick. By 1928 there were 50,000 users of its electric power. Not long ago the expanded plant's output reached 310,639 users. Some generating stations use turf as fuel.

"What will you buy first after the lights are turned on?" I asked Mary as she waited for water to boil.

"An electric teakettle—from Cork!"

But 75 percent of the community must agree to buy electricity. Here only 40 percent had accepted, the remainder declining because of high rates, or because they had always managed without it. But not John.

"It's for the future," he said. "We might have an electric milking machine some day—God is good! And if we win the Sweep—an electric pump!"

Walking west of Macroom, I put my pack down on a big rock near the River Lee. A dark bird with white waistcoat and a bit of a tail skimmed the water. It was a dipper, or water ousel, and bounced up and down on "rubber" knees.

Next village was Ballingeary. This was "brownstone country" where, as Paddy O'Shea had said, farms shrank and "saving the corn" was only a three- or four-man job, and where cows, chickens, and pigs ranked high as farm produce.

Back to School—in Gaelic

Greeting here was in Gaelic. "May God and Mary bless you," said one traveler. The other returned, "May God and Mary and Patrick bless you!"

In 1904 the first Irish-speaking college was established at Ballingeary. I attended a summer class there for young and old in a modern school building. At one point some 50 boys and girls broke out in unison, reading aloud from the blackboard in Gaelic.

The schoolmaster told me later it was a well-known poem, *The Yellow Bittern*, eulogizing a lonely bird which had died of thirst. The poet, who was overfond of drink, points out that thirst shall never cause his death!

The *ceili*, or folk dance gathering, held almost nightly in the big Ballingeary college hall was part of the Irish sessions. Small boys in knee pants and striped jerseys and little girls with braids mingled with oldsters, scuffed and swung, skipped and stepped, as a melodeon whipped off one tune after another. One was "Yankee-Doodle"!

I said no when a tall lad asked me to dance. But a determined eight-year-old came up, told me to follow him, and off we went into the haymaker's jig. (Lucky I was: it was like the Virginia reel.)

I stayed in a big house near Ballingeary with a dozen or more Irish students from all over Ireland. We explored the craggy ridges, followed the Lee near its mountain source above Gougane Barra lake, hiked by moonlight to Irish dances, and had "singsongs." Once we went to a Gaelic football match.

A big red truck collected the team. "Michael, come on! Sean, to the match!" they called.

One by one, players clambered in until 15 men, the Ballingeary football team, bumped along with six girls—all sitting on chicken crates—bound for a match with the village of Inchigeelagh.

Before the 10-mile ride through mountain and glen ended, cleated shoes and blue-and-gold jerseys came out of a battered suitcase.

Kodachrome by Harry Dugan

Atlantic's Grinding Tides Undermine the Limestone Shore of Ireland's Aran Islands

Three stony Aran Islands have contributed many sons and daughters to America. About 1,800 remain. This shelf is about as close to the Irish mainland as some ever get. Here on clear days they can see Connemara, to the north.

Kodachrome by Dorothea Sheets

The Author, Walking Stick in Hand, Trudges Between County Galway's Stone Fences. Dark Peat and Bright Oats Stand in Stacks

Sparse, rock-hewn farms support a handful of people and cattle. Artists love the land, with its red-skirted, barefoot girls; but residents, preferring prosperity to the picturesque, complain that life is hard. The Marshall Plan has eased their plight, having advanced $144,000,000 to the Irish Republic by last year-end.

Hardy Aran Islanders, Out on a Choppy Sea, Trust Their Lives to Bladeless Oars and Frail Canvas Curraghs

Islanders row out twice a week to meet the Galway steamer, which cannot enter their wild waters. Here they ferry back provisions and a fair passenger; ofttimes they transport squealing pigs and baaing sheep. Should a man fall overboard, he may drown, for few Aran men learn to swim, so rough is the Atlantic.

Kodachrome by Dorothea Sheets

Kodachrome by Dorothea Eliasta

Ireland's Gypsylike Tinkers Never Settle Down for Long. In Gaily Painted Caravans They Roam from Fair to Fair

Most tinkers are descendants of Irish landowners dispossessed centuries ago. They speak, not Romany, but English and Gaelic. Their carefree life on the road they leave only to cajole sober folk into a game of chance or a reading of palms. They fill the air with songs sung to banjo or violin music. As cattle and horse traders, "They're not to be trusted," some Irishmen say. Others will tell you, "Sure, they're related to the kings of Old Ireland." These tinkers' wagons, just a few in a mile-long line-up, park in Killorglin for August's Puck Fair. Three pedestrians appear to be drovers.

Opposite page: Kathleen McCarthy (left), entertaining friends, lives in her comfortable stove-heated caravan. Poorer tinkers travel in open carts and sleep in tents. A few prosperous families wander in trucks.

Kodachrome by Dorothea Lange

Noon Tea Calls County Cork's Hungry Field Hands Home for Mutton, Beef, Cabbage, and Potatoes. Any Meal Is "Tea"

Nature's Own Dyes: Green Comes from Moss, Red and Purple from Wild Fuchsia, Brown from Onion Peel, and Blue from Mulberry

In his Clifden shop, weaver J. Kearns (left) exhibits handmade tweeds, rugs, and carpets tinted with rich, primitive colors. He boils his "vegetables" 20 minutes, soaks the wool overnight in the dye, and wrings it dry the next morning. Colors he sets with salt and vinegar.

Right: Purple fuchsia is squeezed into raw wool to show the liquid color. Yellow is derived from furze. Black comes from undyed wool of black sheep.

Kodachromes by Dorothea Sharp

Kodachrome by Dorothea Sheats

To a Kerry Turf Bog Goes a Pony Cart for a Staggering Load of Peat

About a fifth of Ireland is bog, yielding a primitive coal. Housewives call it dirty; they yearn for cleaner, costlier English coal. The driver will load his cart to nearly twice its height, but not a spadeful will he lose, though he drives down a mountain.

Dunquin's Stone-fenced Farms Drop Down to the Sea

Some residents scratch a meager living from the soil; others catch lobsters; a few get help from abroad. But many, leaving empty cottages, emigrate from this "next parish to America." Gaelic students love Dunquin as the heart of the Irish-speaking West.

We arrived in full strength, if sixty minutes late. Ballingeary practiced two hours, but finally fans left the field. We went home too, because the team from Inchigeelagh never showed up.

But nobody cared. Homeward-bound, Michael started singing "On the Banks of My Own Lovely Lee" and the singsong started. We stopped for orangeades and Cadbury chocolate.

I left Cork suddenly for County Kerry, realizing I must hurry, hurry, hurry; time (Ireland's priceless commodity) was running out for me.

Dingle peninsula is called Kerry's index finger; it stretches its mountainous, heather-scented length from Tralee to Dunquin on the Atlantic (pages 660, 674).

I walked west from the town of Dingle, where Spanish influences are believed to mingle with Gaelic tradition and fishing is the town's livelihood.

Down on the "strand" of Ventry Harbour I noticed some industrious women. I asked an old man what they were picking up.

"Seaweed," he said, "to put under potatoes as fertilizer."

I told him I was going to Dunquin.

"Is it Kruger's you're stayin'?" he asked, and I nodded. "Ah, you'll be lazy to leave Kruger!"

Kruger's real name is Maurice Kavanagh, and his tales are tall and many. Back after some fifteen years in the States, he dwells in a red-roofed cottage on the Slea Head road in this "next parish to America."

Gallarus Oratory on Dingle peninsula, an early Irish church, was visited in 1838 by Lady Chatterton with much pomp and ceremony, when she wrote *Rambles in the South of Ireland*. Now, climbing over rocky fences in the rain, I could see it. I touched the time-smoothed stones. The old walls, inclining inward to form a beehive-type roof, were musty (page 665).

By bus I went to Galway, through Tralee and Limerick, winding through Old World towns, often the River Shannon in sight.

Women's Flight from the Land

But I passed no forests, for Ireland's original wealth of timber was misused. Today a national program of reforestation hopes to build a new supply. Natural resources are limited. To live, Ireland's imports must be many, but her exports, mainly agricultural, are fewer. Chief export lately is not meat or eggs or milk, but, as one Irishman sadly put it, "'Tis a pity, but we export our own people!"

Last year, 2,000 people bought one-way tickets to the United States between May and August. More than half were girls.

From 1942 to 1946 about 69,000 girls left the Republic to work abroad, over two-thirds of them under 25 years of age. They leave by ocean liner and plane. Ireland's total population is about 3,000,000.

A young girl in cotton frock waved to her parents and brothers and started for a plane one fine evening at Shannon Airport, near Limerick. While the wind whipped her bandanna, her family called her back and could not hide their tears, nor did they care. They caught at her dress and hands, and tried to hold her, but she finally ran, now crying herself, to the plane which would take her thousands of miles to a new life in Canada.

It is not easy to fill qualifications required by United States authorities for visas and sponsors. Each immigrant must have someone in America to be responsible for him.

"Why do so many girls emigrate?" I asked a woman who was making a fair living in Dublin.

"They're looking for adventure. They could find work here if they wanted to look," was her crisp answer.

I asked an old man. "They're too proud over here to work at some things, but they'll dig ditches on the other side!"

But the girls say that on the land they might as well be slaves. Even the lowliest job in Dublin earns *some* money, but work in the lonely cottages yields only drudgery. Water must be carried from a field. Cooking must be done over a low turf fire. Only the dim glow of a candle or oil lamp furnishes light. So women are in flight from the land.

Selling Behind the Counter

Galway, "City of the Tribes" and traditional city of the West, mixes modern manners with ancient streets and Spanish arches.

I worked here in a small department store. Saturday morning I stood in the center of the four-sided counter with a row of belts hanging above my head. The shop resembled an American variety store, with books, saucers, and cigarette cases on display. Prices ranged from pennies for pins to guineas for fine china. Smiling colleens who sold behind the counter showed me the stock.

Women in black shawls from the west and carrying woven shopping bags, girls in English sweaters and tweeds, men in homemade suits, in Connemara weaves, stopped and looked and bought.

"Will this dye a frock scarlet?"

"How much for pins? Sixpence! That's much," and the shopper put them down.

A tall, spare man, bronzed by wind and sea, bent over the pins and needles, soap and bobby pins ("clips") and hesitantly asked me if I had seen his wife.

English tourists bought Rinso and Lux (packaged in Ireland). Soap and toothpaste sold here were made in Ireland. Much raw material and spare parts for motorcars are imported, but many items are assembled or packaged on the island, from Ford cars down to corn flakes and aluminum teapots.

A crowd collected at the china counter. Someone handed me a dish to wrap. It was Pyrex, as familiar to me as my own kitchen.

That same week came the Galway Fair. Its first day featured pigs. There they were, hind legs hobbled, on straw, squealing right up to the hotel steps on Eyre Square! Beyond stood horses, large and noble-looking, and sturdy Connemara ponies (page 661).

All around were buyers, coattails flying, ash sticks waving, "handlashing" for the bargain, looking like enemies but agreeing good-naturedly on "luck money," the part that's given back.

"I'm doin' you a good turn and you don't have the sense to see it. Mind you, 'tis a fair price!" stormed a tall Irishman, while a peaceable little man listened patiently with his hand on his horse.

Casual observers suddenly whispered to the buyer and pulled him back as he started off in great disgust. Then arm in arm the two sealed their bargain.

"They'll argue for ten bob and drink up a pound!" said a man at my elbow.

Cattle and sheep sold on the second day, starting before dawn; by noon only calves remained. It *was* the sound of Ireland—cattle lowing, calves bawling, and an occasional baa-aa, with a fine mist wrapping it up.

Aran—30 Miles and 8 Hours Away

Rain and wind whipped Galway Bay. Fat sea gulls cried mournfully. Beyond the locks, whitecaps edged the choppy sea. Cattle and horses, churning about with people on the quay, were restless to be loaded for the Aran Islands (page 667),* but the captain of the *Dun Aengus* was undecided.

"The wind is wrong," he said. "The cattle would be all right, but the horses—I'd never land them. 'Tis an awkward day." He squinted at the sky. "The forecast is fine. I know 'twill change. 'Tis an awkward day."

Next morning we sailed. I wore two woolen skirts, three blouses, jacket, raincoat, wool socks, and two hats. Still my teeth chattered!

Shipmates were a telephone repairman; a young Irishman studying water-supply improvement for Kilronan, main village of the three islands, some 30 miles from Galway; an American couple; young people from Belfast; English tourists; and islanders—women and men of Aran returning to their homes with pigs, cattle, horses, or sheep they had not sold at the fair, and with flour, pails, soap, face powder, and rope.

Islanders' homespuns were richly beautiful. Some were clad in blue-and-white tweed. One old man wore a handsome black-and-gold mixture which his wife had woven and fashioned into a suit.

We were eight hours reaching Kilronan on Inishmore, the largest island and the last stop.

First, passengers and stock for two smaller islands had to be transferred to curraghs, fragile tarred canvas craft that bobbed about on the waves (page 669).

Soon a sad-eyed cow dangled in a sling from a crane and dropped into the blue-green sea with a mighty splash. The quick islander holding the lead rope grasped its head, and the animal began to swim to shore behind the strongly rowed curragh. Horses, too, legs wildly flailing the water until the sling dropped off, swam behind the curraghs. Pigs and sheep rode home in the bottom of the canvas craft with flour and pails.

As we got under steam again, someone discovered a lone curragh following us with shouting, gesticulating riders. One man's cow was still on board! Back we went, and bossy was lowered to the briny, amid cheers!

Galway is the gateway to Connemara, lovely land of mist, moor, and mountain; through it, too, you can follow the coast road to Spiddal and Carraroe, another Gaeltacht district (page 668).

Walking near Carraroe, I saw thatched cottages tinted heavenly blue—as if rain that color might have fallen—and banked with geraniums as red as the cherry wool skirts the women wore. Here greeting was often just a shake of the head sideways, as if to say, "Now, can it be you, Tom?"

Dublin—Genial, Crowded Capital

My last stop was Dublin. As my train pulled in, I remembered a proud saying from County Cork: "Belfast was, Dublin is, Cork will be—."

Dublin *is*—bustling, friendly, cosmopolitan, against a background of stately buildings and age-old charm. The development of power on the Shannon, the Liffey, and other rivers has brought industry to the Republic's political

*See "Timeless Arans," by Robert Cushman Murphy, NATIONAL GEOGRAPHIC MAGAZINE, June, 1931.

677 Irish Tourist Association

Two Farmhouses in Every Three Depend on Peat's Dark Bricks for Their Heat

Ireland, lacking forests and coal mines, takes its fuel from 3,000,000 boggy acres. Decaying grass, rush, and moss have laid down deep, rich beds. This digger, using his spadelike slane, cuts some 8,000 pounds of soggy turf a day. Dried, his water-soaked harvest shrinks to 300 pounds.

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Bridget Sullivan, Home from Her London Job, Sets Out to See Killorglin's Puck Fair

As this 18-year-old colleen headed for the merrymaking, she was slowed by two younger sisters. Everything piqued the children's curiosity. Here they stand fascinated by donkey and colt, an everyday sight in Killorglin (pages 670, 671). Bridget tugs impatiently, but her charges refuse to budge (page 659).

and social capital. Today, with more than 500,000 people, Dublin, the city, is overflowing into Dublin, the County. One Government plan proposes a string of satellite towns built around the city at strategic points to relieve the concentration of people and factories.

But in the heart of Dublin is quiet grandeur.

Along College Green, past dignified Trinity College's cobbled courtyard, I discovered tree-shaded College Park, scarcely out of sight of O'Connell Street and its swarm of bicycles, taxis, buses, cars, and sprinting Irishmen (page 657). In Trinity Library was the rare Book of Kells (Ceanannus Mor).

At the National Museum I saw the sprawling antlers of the extinct Irish giant deer, or Irish elk, retrieved from a bog; and in a case in Trinity College Museum, mounted and unbelievable, stood the great auk, bird of times past.

To Abbey Theater and Bird Market

That night from the crowded pit of famed Abbey Theater I heard a gong mark the acts of a comedy of the West, *Katie Roche*, and the Irish laughed at themselves.

A penny paid my way one Sunday morning into the bird market in a lane near St. Patrick's Cathedral, where I mingled with men, boys, and little girls in their fathers' arms. Here bird fanciers, for 18 or 20 shillings, bought a linnet or a lark and carried it home in a paper bag.

"There's the best of the lot! Won't do any harm to look at that one!" the seller cried, pointing to a green finch in one of the many cages on the brick wall.

A Last O'Sullivan

My trip was ending. I sat in the shadow of the Cathedral, still talking and listening.

An old man on a near bench reminisced. "When I was a boy, a strange thing used to happen. Water under St. Patrick's would burst through the floor. People came from all over Dublin bringing jugs and bottles, buckets and pans, to get it."

"Would they drink it?"

"They would—and add to it and keep the strain. 'Twas good luck!"

My last chat was with an O'Sullivan of the Irish Folklore Commission. He gave me a kind of benediction. When he asked where my people came from in Ireland, I told him I didn't know.

"No matter," he said. "'Twill be written in God's Book."

And so it will.

Saving Earth's Oldest Living Things

By Andrew H. Brown

With Illustrations from Photographs by Raymond Moulin and the Author

THE CLOSER we drew, the more enormous the living column loomed. It was the mightiest of a thousand Big Trees *(Sequoia gigantea)* in California's unspoiled South Calaveras Grove. As we reached out to feel the patriarch's rough bark, one of our party, bursting with information, tried to speak.

"It's as high as a skyscra—" she began.

But a U. S. forest ranger with us lifted his hand; he and the lady were old friends.

"Hold the statistics a moment, please. Let's just stop, look, and listen first."

Other immense cinnamon-red trunks towered far above adjacent pines and firs that were giants of their own kind. A brook gurgled near by. A squirrel twitched, then "froze" on a branch. Birds chirped aloft.

We slumped to needle-padded ground. Leg and back muscles reminded us we'd paid a price to reach the cathedral hush and majesty of that out-of-the-way spot. Eight punishing miles of rutted, muddy fire roads had forced the use of shovels and tow cables, even though our jeeps and trucks had four-wheel drives (page 684).

The fact-packed lady could contain herself no longer.

"This is the Louis Agassiz Tree, named after the famous zoologist and geologist. It's high as a 20-story building, wide at the base as a city street, heavy as a destroyer, and probably as old as the Christian Era."

"Besides which," the ranger said quietly, "it's big."

Louis Agassiz, one of the greatest of all sequoias, was certainly impressive. Its heroic girth shrunk men and girls of our party to puppet size. Far above, the tree's branches and swelling top were dwarfed by distance.

Limbs Larger than Many Trees' Trunks

"An old stag-headed sequoia's branches start 100 feet or more up the trunk," the ranger said. "You need binoculars or a helicopter to appreciate their size.

"A single limb on the General Sherman Tree in Sequoia National Park is nearly 7 feet in diameter and 150 feet long! It's larger than record specimens of many more familiar trees" (page 680).

The National Geographic Society had sent the writer and the San Francisco photographer Raymond Moulin to record the splendor of the South Calaveras Grove. Last major stand of Big Trees in private ownership, it grows on Sierra Nevada slopes 70 miles southeast of Sacramento.

Your Society has been an important contributor to the purchase of irreplaceable Big Trees.* The Society and individual members in 1921 completed a donation of $100,000 to help preserve the finest of the sequoias in the Giant Forest of Sequoia National Park. It now supports efforts to set aside the South Calaveras Grove as a California State park for the future pleasure of all citizens.

Just a century ago next year, hunters and gold seekers roaming the forests of Calaveras County, California, discovered nearly unbelievable trees. They were so huge the finders knew reports of them would be greeted in the world at large with jeers.

Big Tree Stump Made Dance Floor

To dramatize their find, men cut down the biggest tree they could locate (a 22-day job for five fallers), smoothed off its stump, capped it with a pavilion, and staged cotillions and quadrilles on it, with as many as sixteen couples twirling and bowing (page 684).

The dancers' feet beat on wood that was growing nearly 200 years before Charlemagne founded the Holy Roman Empire. On the trunk of the same fallen tree enthusiasts laid out a bowling alley.

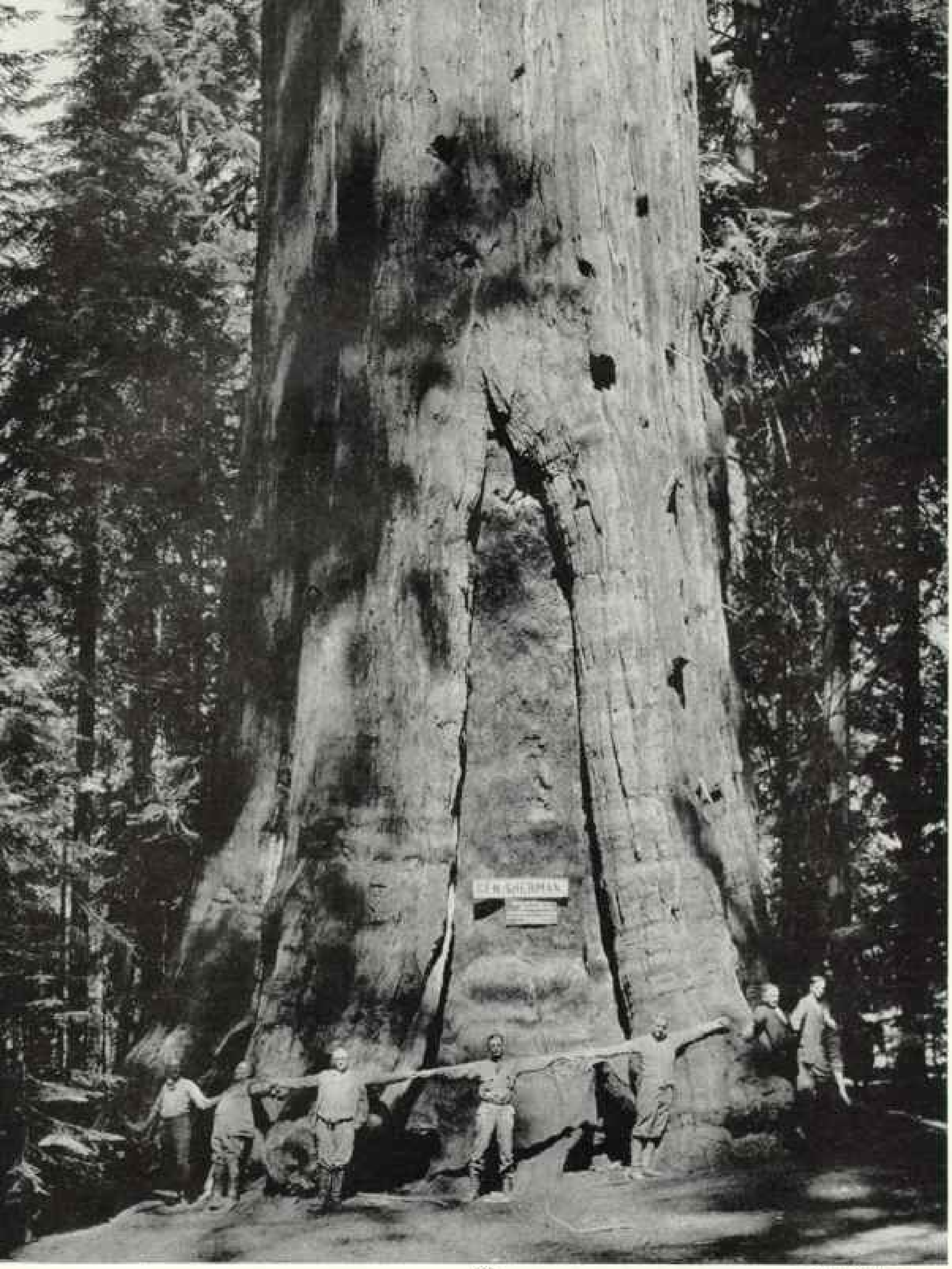
An artist, Edward Vischer, later drew sketches of the Dancing Stump and other scenes in the grove to publicize the arboreal marvel. One of his drawings showed a herd of camels plodding past the huge trees.

This was no imaginative fancy, but a true record. For Vischer accompanied nine Mongolian bactrians when they shuffled past the sequoias in 1861, bound across the Sierra for Nevada silver mines.

When Big Tree measurements first were quoted abroad in scores of feet, listeners were vehement in protest: "You must mean inches!" was the reaction.

For proof, promoters skinned alive at least two great trees in the North Calaveras Grove. Carefully marked for lifelike reassembly, the

* See, in the National Geographic Magazine: "Among the Big Trees of California," by John R. White, August, 1934; "National Geographic Society Completes Its Gifts of Big Trees," July, 1931; and "Our Big Trees Saved," January, 1917.



680 Gilbert Grosvenor

Twenty Men, Finger Tip to Finger Tip, Barely Encircle General Sherman's 102-foot Waist

When the privately owned Giant Forest was threatened with lumbering in 1915, Stephen T. Mather (third from right), founder of our National Park Service, invited a group of eminent Americans to see the Big Trees and camp in Sequoia National Park. Gilbert Grosvenor, Editor of the NATIONAL GEOGRAPHIC MAGAZINE, photographed Mr. Mather and his guests measuring this 272-foot king of trees. Later the National Geographic Society, Mr. Mather, and friends subscribed $100,000, which, added to a congressional appropriation, helped save precious groves.

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Big Tree Visitors for a Hundred Years Have Made Murphys Hotel a Way Stop

Long before automobiles, stagecoaches stopped at Murphys (formerly Sperry's) Hotel (page 682). From the town of Murphys travelers rode 16 miles to North Calaveras Grove. The inn has changed little in a century, but it now advertises, in glowing neon (right), drinks unknown to forty-niners.

sections of foot-thick bark were shipped off to exhibitions in New York and London to silence skeptics.

Soon the North Calaveras Grove was known as one of the wonders of the world. Visitors from many countries flocked to it. A hotel built in the grove became a renowned resort.

Lumbermen inevitably coveted the Calaveras trees, a threat that evoked the sarcasm of naturalist John Muir: "No doubt these trees would make good lumber after passing through a sawmill, as George Washington after passing through the hands of a French cook would have made good food."

It was the peril to the Calaveras Big Trees that first aroused the Nation to the defense of *Sequoia gigantea* and, later, of the redwood (*Sequoia sempervirens*) of the coastal ranges of California and southern Oregon. (The generic name given to the two species by botanist Stephan L. Endlicher undoubtedly was in honor of Sequoyah, the half-breed Cherokee Indian who devised an alphabet of 86 characters for his tribe's speech sounds.)

Of the two *Sequoias*, the Big Tree of the Sierra grows older, craggier, more massive, and attains greater girth. The coast redwood, glory of California's Redwood Highway, towers higher and has a more graceful, symmetrical look. Redwood lumber—abundant, durable, and beautiful—always has been a premium construction wood.*

The redwood's tall bole suggests a mighty mast; the Big Tree's broad-based pillar, a lighthouse.

Unique to California (except for transplantations), *Sequoia gigantea* grows in scattered groves among other conifers along 250 miles of the western slopes of the Sierra Nevada. Much more abundant at the south end of its range, the Big Tree lives between 4,000 and 8,000 feet elevation.

Estimates of the total population of all the

* See "California's Coastal Redwood Realm," by J. R. Hildebrand, NATIONAL GEOGRAPHIC MAGAZINE, February, 1939.

60 or so Big Tree groves count only about 20,000 individuals 10 feet or more in diameter. Of this number, about 12,000 grow in Sequoia and Kings Canyon National Parks.

All Big Trees Would Not Cover Half the District of Columbia

All the living Big Trees left standing in their native range occupy scarcely 15,000 acres. If miraculously transplanted across the continent, they would not cover half the area of the District of Columbia.

By contrast, 1,947,000 acres of redwood *(Sequoia sempervirens)* remain.

First white men to see Sierra sequoias (in what is now Yosemite National Park) were members of the exploring party led by Joseph Reddeford Walker, journeying overland to California in 1833.

But the Big Trees of the North Calaveras Grove, "effectually discovered" in 1852 (there were some earlier claims), were the first giant sequoias to become known to the public.

Soon much visited, the North Calaveras Grove, with only 158 trees, was thought for several years to be the most extensive group of Big Trees. But when the groves of Yosemite and the southern Sierra were opened up, the trees of Calaveras lost their exclusive claim to interest.

By 1870 most of California's Big Tree groves had been located. One small group of giant sequoias, however, was reported as recently as 1933.

Oddly enough, the South Calaveras Grove, least-known major stand of Big Trees, lies but a scant five airline miles from the historic North Grove.

The 1,400 acres of the South Calaveras Grove extend for three-and-a-half miles along both sides of sparkling Big Trees Creek. Here is a wilderness reach sheltering 947 giant sequoias (563 of them more than six feet in diameter at a man's height). The tract also contains some of the finest remaining giant sugar pine and other Sierra conifers.

The North Calaveras Grove became Calaveras Big Trees State Park in 1931 as a result of the successful campaign of the Save-the-Redwoods League and the Calaveras Grove Association.

It lies close to a paved highway. Only fire and logging roads as yet reach the isolated South Grove.

South Grove Sought to Enlarge Park

The U. S. Forest Service, the State of California, and the private owners of the South Calaveras Grove have been negotiating for several years, with the goal in view of setting aside the South Grove for a State park to be linked with the North Grove. The present owner is the Pickering Lumber Corporation.

Before leaving the Calaveras grove area, I stopped at Murphys Hotel (formerly Sperry's Hotel) in the little foothill town of Murphys. I wanted to see the copy of the inn's historic register. Old-time visitors used to rest here on the way to the Big Trees (page 681).

The register of that gold-country hostelry held nuggets of interest. John Hanson vaguely claimed the "mountains" for his home, J. R. Kennedy the "valley." Old Dan the Guide registered from "God Knows Where."

U. S. Grant, Mark Twain, Horatio Alger, Jr., Wm. R. Hearst, John J. Astor, Henry Ward Beecher, Charles Francis Adams, and Josh Billings signed the book exactly as here printed. A "Miss Rasberry" wrote her name just before J. Pierpont Morgan and Mrs. Morgan. (The Morgans got the Parlor.)

One Gilbert Miller was billeted in the "Hall," but the room assignment was later crossed out and "Not Wanted" written in. One guest registered for "Imp. G. P. Burlingame & 19 of the Chinese Embassy," adding, "from the balance of the world struck this for the last place—want to see the big trees & die."

Tree and Plate Honor Stephen T. Mather

We motored south to Big Tree forests of Yosemite National Park and Sequoia and Kings Canyon National Parks. In every grove we saw individual trees of melodramatic bulk and soaring russet groups.

In Yosemite's Mariposa Grove stands a very special young sequoia. It is appropriately marked in memory of Stephen T. Mather, the father of our National Park Service and its first director. A bronze plate in Sequoia National Park also honors the illustrious businessman-turned-conservationist.

It was New Year's Eve, and snow blanketed the ground, when we reached the Giant Forest in Sequoia Park. Here, in 2,387 acres of glorious Big Trees within sight of jagged snow peaks, are concentrated forest scenes of overwhelming grandeur.

In contrast to the aloof General Sherman Tree, largest sequoia of them all (page 680), are the vast red organ-pipe clusters in the Congress Group. Above them on a hill broods the colossal President Tree.

We climbed in and out of the Room Tree (page 689), tilted our heads to see the High Pine growing out of the broken top of a tall sequoia, and examined the foot-deep claw marks in the Bears' Manicure Tree.

Not only in awe-inspiring aspect but also

Earth's Senior Residents, Big Trees Stood in Christ's Time; the Oldest Spans 3,500 Years

South Calaveras Grove, only major group left in private hands, shelters 947 giant sequoias *(gigantea)* in the California Sierra. They share their domain with sugar pine (left) and others. Most are fire-scarred (center).

Paintings by Raymond Moulin

Youth Treads on 13 Centuries; Dancing Stump Is 27 Feet Wide

This North Calaveras giant was cut in 1853. Five men took 22 days to do the job. A bowling alley was laid out on the fallen trunk. Sections of the bark were shipped east and set up like a living tree to convince unbelievers of the Big Trees' existence.

Quivering, Quagmire Roads Isolate South Calaveras Grove

Primitive trails lead to the forest. Rain turns them into bogs littered with parts jolted from venturesome vehicles. Such wilderness conditions keep the grove unspoiled. This jeep spent a muddy day on its floorboards. The author (foreground) helped dig out.

Ektachrome by Raymond Moulin

Fire, the Big Trees' Worst Enemy, Burns Harmlessly as Forest Rangers Stand By

These campers are a dozen of the estimated 10,000 who have seen South Calaveras Grove. Helmets protect rangers against falling branches, "widow makers." A sequoia stands on the left; lesser trees are firs.

Baby Sequoia Resembles a Christmas Tree

The Sierra's Big Trees were discovered in 1833 by Joseph R. Walker's expedition. Coast redwoods, more readily accessible, were found by Spaniards in 1769.

When an English botanist in 1852 named the Sierra tree *Wellingtonia* in honor of the British general, American patriots made haste to find a native name. They were delighted when scientists decided the Big Tree belonged to the coast redwood's genus, which in 1847 was named *Sequoia* for the Cherokee who gave an alphabet to his tribe.

Sequoia gigantea has the bulk of a lighthouse. *Sequoia sempervirens*, the coast redwood, is taller but thinner.

Out of Tiny Seed Cones Mighty Sequoias Grow

Earth's biggest living thing may sprout from one of the some 200 winged seeds shed by this cone. In theory, one ounce of seeds can produce 6,700 trees. Actually, any seed has but one chance in a billion. Coast redwoods may sprout from stumps, but Big Trees grow only from seeds.

Kodachromes by Andrew H. Brown

Ektachrome by Raymond Moulin

Nomadic Cowboys Who Spent Nights in This Hollow Tree Called It "Palace Hotel"

Though fire has eaten this South Calaveras giant's heart, the shell supports the tree even in 60-mile gales. Old-time herdsmen cooked and slept in its shelter. Rains, trickling into the hollow, gave them "running water."

Sequoias Long Ago Covered the North; the Ice Age Leveled All Save a Few

In the Eocene and Miocene eras, 30 to 60 million years ago, ancestral forms ranged across northern Eurasia and America. Rooted to the earth, the giants were unable to escape when glaciers crept out of the north.

For years it was assumed that California and Oregon held the only survivors. In 1944 Chinese foresters startled the world with their discovery of the dawn redwood (*Metasequoia glyptostroboides*), a "living fossil" thought to have been extinct millions of years.

China's largest example measures only six feet in diameter and 98 feet in height. Unlike its evergreen American cousins, the dawn redwood is deciduous, shedding its needles.

As they grow taller, the Sierra's Big Trees lose lower branches and develop domed or flattened tops. Limbs, thicker than ordinary trees, start 100 feet or more above ground.

Mature sequoias show little taper in the trunk; hence their enormous mass. Experts say none ever dies of disease or senility. Flooding, fire, and lightning are the Big Trees' enemies.

When This Fallen Monster Blocked the Road, a Tunnel Kept Traffic Flowing

An old-time plant explorer shipped Big Tree seeds to a nursery. From them came the young (100-year) sequoias now growing in Europe. Many British country estates boast sequoia parks; 100-foot trees line one road for half a mile.

Gigantea's timber is so brittle that it shatters on falling, but its high tannin content resists insects and fungi. For decay-proof raisin trays, shingles, and flumes, it is ideal. One Big Tree made 7,700 fence posts. *Sempervirens's* stronger lumber is prized by builders.

These pictures show specimens of the Giant Forest in Sequoia National Park. Here 3,500 trees exceed 10 feet in diameter. Left: Boys and girls climb the Room Tree, an arboreal cavern hollowed by fire.

Kodachromes by Andrew H. Brown

Kodachrome by Andrew H. Brown

McKinley Tree Soars 291 Feet. The Statue of Liberty Barely Tops It

Whitened by January's snows, the shaggy veteran of Giant Forest makes ready to bear February's golden blossoms. Prehistory's primitive mammals were known to its ancestors.

in geologic history, structure, and life habits, *Sequoia gigantea* is a wonder tree.

Ancient lineage as well as age distinguishes the Big Tree. Its earliest ancestors shared living space millions of years ago with giant reptiles—plesiosaurs, ichthyosaurs, dinosaurs, and pterodactyls. In the age of early mammals sequoias became widespread over much of the Northern Hemisphere.

Sequoia gigantea, *Sequoia sempervirens*, and China's recently found *Metasequoia glyptostroboides*, the "dawn redwood," are simply last survivors of those ancient forest types.

Fossil sequoia cones and foliage differ but little from those of today's species.

Trees 1,000 Years Old at Birth of Christ

What a fabulous, enduring mechanism the Big Tree is!

The life span of some sequoias has paralleled the recorded history of mankind for the last 3,000 years. Some, still vigorous, were seedlings five centuries before the Periclean period of ancient Greece.

From pinhead seed to monumental adult bulk, the Big Tree's story is an epic of tenacity and adaptability.

It is late winter (February or March) when millions of tiny blossoms gild *gigantea's* green top. Although it can produce cones before its fifth decade, the great tree is several centuries old before it reaches full productive maturity.

Clouds of male pollen fall on the female blossoms, from which the cones develop. Two-and-a-half years later the cones are ripe, having attained about the size, shape, and color of a lime (page 686).

The dried cones shed brown, flat, wing-margined seeds somewhat resembling dried rolled oats. Weighing 6,700 to the ounce, the minuscule seed carries little stored food with it to the ground; any single seed has less than one chance in a billion of germinating, sprouting, and growing up.

Tiny flakes of maroon gum are released with the seed; they make good reddish-brown writing fluid. With sequoia ink John Muir wrote letters that still are legible today.

Big Tree seeds are choosy about where they grow. They need sunlight, plenty of moisture, and soil fairly free of forest litter. Many seedlings spring up on rich, mellowed humus of root craters torn open by the fall of ancient trees.

Disturbing and exposing the mineral soil multiplies *gigantea's* chances for taking hold. Seedlings have come up thick as weeds on cleared land and on worked-over earth of new road embankments.

Young sequoias have a symmetrical "Christmas tree" shape, with dense branches cloaking the trunk right to the ground. Their feathery foliage is made up of minute overlapping scales (page 686).

As the trees weather adolescence (100-200 years old), they lose lower branches and start thickening out in the trunk. Their tops, however, hold a flame or spear shape for a few more centuries.

Young trees grow much more rapidly than mature ones; a stripling may add an inch of width in six years, while an old tree may take 40 years to achieve the same increase.

Rate of growth in mature trees varies greatly with food and water supply. One of the largest trees ever felled (the Dancing Stump in the North Calaveras Grove) revealed only 1,244 annual rings across the radius of its 27-foot diameter.

Another cut-down tree, just 11 feet 7½ inches across, was 2,017 years old.

As *gigantea* reaches early maturity (500-600 years), it thrusts out stout lateral limbs. Storms and food starvation after fires rob it of smaller branches. Its top, now perhaps 270 feet above ground, takes on a dome shape. Foliage grows in cloudlike tufts.

With full maturity and old age (700-3,000 years) often comes a craggy, weather-beaten look. People have said these veteran sequoias look archaic, prehistoric, "too old to die." Foresters estimate that Yosemite's Grizzly Giant has seen 3,500 years come and go.

Branches wither and perish; eventually they plunge to earth. Forest rangers call such woody swords of Damocles "widow makers."

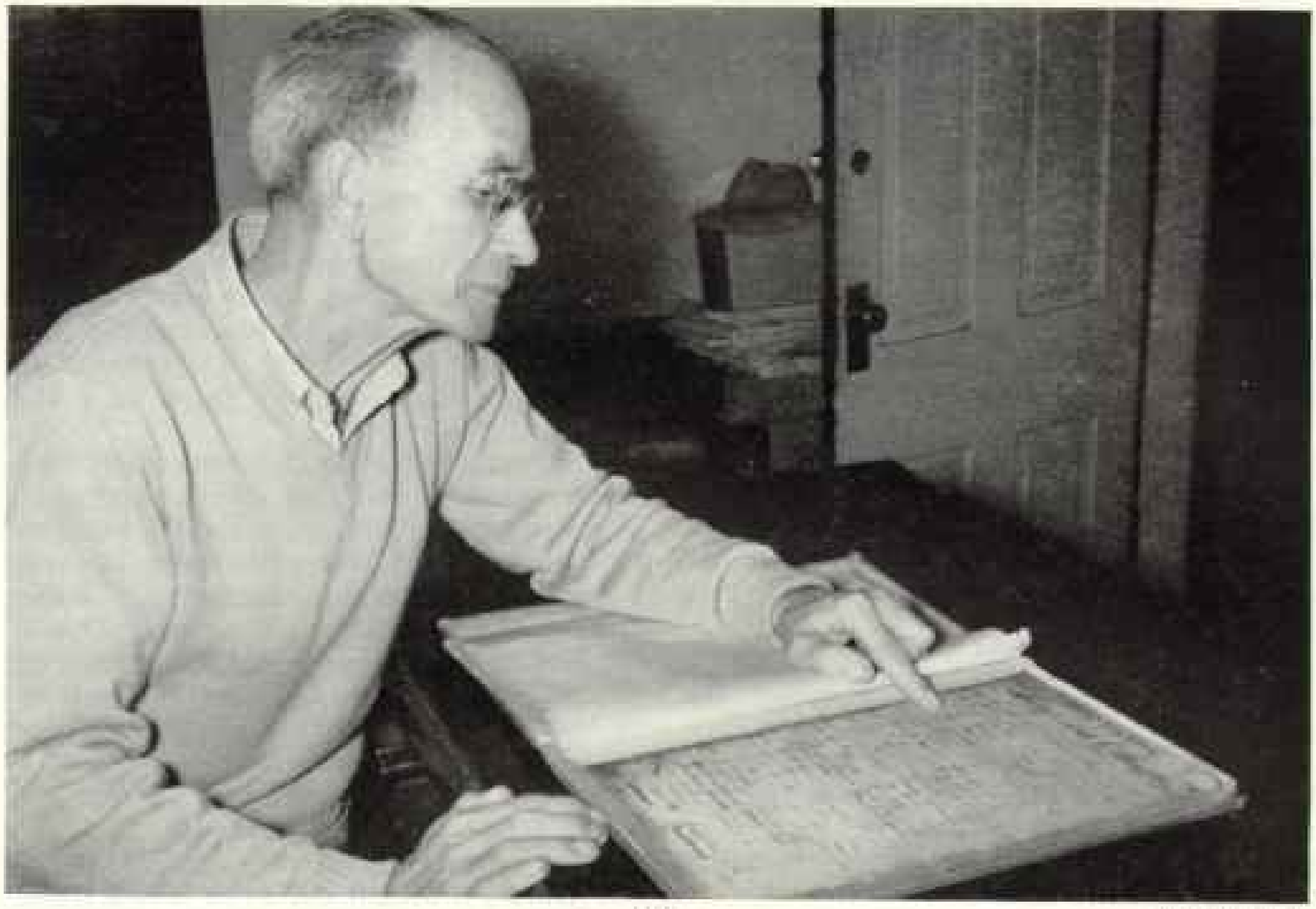
About 300 feet is *gigantea's* maximum height. The tallest usually scale between 250 and 290. These Goliaths often show little taper from the ground to their first limbs.

The Big Tree's flat pedestal of closely matted roots is disproportionately small to support so huge a trunk; yet the trees grow so erect and nicely balanced that they seldom topple unless undermined by fire or flood.

Sawed Through, Sequoia Still Stands

Loggers cut completely through the Sawed Off Tree in the Mountain Home Forest about 60 years ago, and it soon died. But the great sequoia still stands, the saw that killed it jammed in the cut.

Under the thick outer bark lie the thin, generative cambium layer and the narrow band (a few inches) of cream-colored sapwood, the only living parts of the sequoia trunk (page 695). The vastly preponderant mass of pink-to-purplish heartwood is built of cells that have died.



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Andrew H. Brown

Famous Names Fill an Old Register

Bound for the Big Trees, Ulysses S. Grant, Mark Twain, Horatio Alger, and J. P. Morgan signed in at Sperry's (now Murphys) Hotel (pp. 681, 682).

A Pioneer Made This Tree His Home

Hale D. Tharp, discoverer in 1858 of Giant Forest, lived many summers in the fallen log. Naturalist John Muir called it a "noble den."

Andrew H. Brown

693 Raymond Moulin

Imagine Camels Walking Beneath These Forest Lords! They Did in 1861

In 1852 A. T. Dowd was pursuing a bear when he came upon North Calaveras Grove. Awestruck, he hurried to camp to tell what he had seen, but his friends scoffed. Later Dowd inveigled them into the grove on the pretext of retrieving a grizzly he had shot. Confronted with the Big Trees, the doubters believed. After the Mexican War camels were imported for western transport. A Bavarian artist sketched a caravan of nine passing through the North Grove (page 679). Symmetrical trees in the left center are called the Three Graces.

Big Trees are rich in tannin, a chemical whose presence in such heavy proportion helps make the tree highly resistant to fungus and insect attack. This largely explains the tree's longevity.

Almost every mature *gigantea* shows fire scars. Frequently the wounds are grievous. The Big Tree's ability to survive devastating fire is astonishing (pages 683, 687).

Deep black caverns in the bases, with almost all the central heartwood burned out, are common. Awe-struck visitors stare up through "chimney" trees, their hearts completely reamed out by flames.

Forest fires, roaring through the woods at intervals over the centuries, have eaten away all of some trees' underpinning save great knotted fingers with "breezeway" gaps between. Somehow, uncannily, they still support clear, healthy trunks.

No tree of shorter life span could repair hurts as deep as those the sequoia unhurriedly mends and covers over. Centuries may be required to heal even lesser scars. Major wounds the tree simply walls off with new growth. Large holes remain for the life of the tree.

Big Trees inhabiting slopes usually show fire scars on the uphill sides. These charred flanks are evidence that burning lesser trees and forest litter have piled against them from above.

The giant sequoia's spongy, asbestoslike bark does not burn readily.

Unless the bark already has been scorched off, a single fire seldom can reach the wood. But a sustained fire, fed by adjacent torching trees and blazing debris, may kill the cambium layer. After the charred bark falls off, subsequent fires easily ignite the exposed wood, inflicting ever deeper damage.

Flames have consumed four-fifths of the bark and sapwood at the base of the Grizzly Giant. Living tissues linking trunk and roots are largely severed. Perhaps to compensate for this loss, "Old Grizzly" has thrust out massive buttresses.

And still the battered warrior carries on, the epitome of stubborn will-to-live!

Lightning-struck Tree Burned Four Months

Hulking mammoths, towering over the forest, are favorite targets of lightning. Many Sierra sequoias have been struck.

Lightning can—and does—shatter *gigantea* tops and stripe the trunks with long scars. But it rarely, if ever, kills a tree. Biggest damage is from fires the high-voltage bolts set off.

Some years ago in Sequoia Park one lightning-struck Big Tree smoldered uncontrolled through four months, from August to December. Learning of this, I asked, "Why didn't the rangers put out the fire?"

"Are you kidding?" came the answer. "How would they get up there to fight it, with the lowest limb 100 feet above ground and the fire 100 feet above that? They don't equip us with extension ladders!"

Observers have watched lightning strike a single tree six times during one storm, piling heaps of cones and shattered branches at its base.

The world's biggest tree in bulk and probably the oldest, the giant sequoia ranks third or fourth in height. Its cousin, the coast redwood, grows taller, and so do some Douglas firs. A few specimens, too, of Australian eucalyptus, or mountain gum, may outtop it.

Of known trees, only the famed Tule cypress of Oaxaca, Mexico—an admitted freak, which may be a fusion of several trees—exceeds the Big Tree in diameter and circumference.

Biggest Weigh as Much as Small Ships

How much do the biggest sequoias weigh? Short of cutting down a tree and putting every fragment on the scale, there's no way to find an accurate answer.

It's not too difficult, however, to compute the poundage in a single big trunk; some weigh 1,200 to 1,500 tons. The most ponderous Big Trees probably approach 2,000 tons, displacement of a small steamship.

Looking at *gigantea's* mass of wood another way, the General Sherman Tree contains as much lumber as a dozen acres of average California pine forest. Using every bit of wood in it (impossible, of course, because of logging and sawing losses), it would build about 25 six-room houses.

But the fact is that Big Tree lumber, very soft and brittle, is not a good construction wood. *Sequoia gigantea* is not normally a profitable species to cut. Its limitations start with felling: its great weight shatters the bole upon impact, and it tends to break across the grain as well as along it. Handling the big chunks is a major engineering problem.

As a result, waste in lumbering the Big Tree averages 45-50 percent. In large individuals it may run as high as 80 percent.

Big Tree wood uses reflect its unusual durability.

Grape stakes, raisin trays, fence posts, siding, and flume boards still consume thousands of board feet.

A single sequoia 20 feet in diameter from Redwood Mountain yielded 7,700 seven-foot fence posts. Two hundred giant sequoias

Travis Ris

How Are the Mighty Fallen! This Colossus Will Be Cut into Vineyard Stakes

Two men and a power saw can overthrow in a few hours the patient work of centuries. Only today's inflated timber market makes it profitable to log the Big Trees for their soft, brittle wood. This sequoia, perhaps 2,000 years old, was felled in the Dillonwood tract of the southern Sierra. Living, cream-colored sapwood (positively not painted!) rings the dead, pink heartwood. Thick bark is fire-resistant.

were cut for lumber last year in the Dillonwood tract.

Only small groups of trees remain in private holdings, with the notable exception of the South Calaveras Grove. That last unprotected important stand of *gigantea's* noble race still is in mortal danger of death by ax and saw.

Fire and flood, gale and lightning, tough old *gigantea* survives them all. Yet man, in one day, can wipe out what it has taken Nature 3,000 years to produce.

The Nation cannot afford to lose the South Calaveras Grove.

Public opinion has been quickly aroused against threats to the Big Trees almost since their discovery. Witness comments in *Gleason's Pictorial Drawing-Room Companion* for October 1, 1853, on the felling of a giant sequoia for exhibition:

> To our mind it seems a cruel idea, a perfect desecration, to cut down such a splendid tree . . . But, seriously, what in the world could have possessed any mortal to embark in such a speculation with this mountain of wood? In its natural condition, rearing its majestic head towards heaven, and waving in all its native vigor, strength and verdure, it was a sight worth a pilgrimage to see.

Sequoia gigantea still is that.

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Bruce E. Hutchins

A Living Torch, the Firefly's Tail Glows with Cold Chemical Light

Two to five greenish-yellow flashes are the mating signal of this male, *Photuris pennsylvanica*, enlarged about 8 times. With her answering flash, the female sometimes lures alien males and eats them (page 702). Eyes are large, "the better to see you with, my dear."

Catching Fireflies for Science, Baltimore Boys and Girls Net Cash

Nimble young netters get 25 cents a hundred from Dr. William D. McElroy, Johns Hopkins University biochemist. Each year he needs 300,000 lightning bugs for his studies of Nature's cold light, far more efficient than man-made illumination (pages 697-8 and 701).

National Geographic Photographer B. Anthony Stewart

Torchbearers of the Twilight

By Frederick G. Vosburgh

DAYLIGHT dims; on the darkening lawn a puzzled kitten leaps at living sparks that flare, go out, and flare again. More arise as shadows deepen, until the whole outdoors is dancing with the lights of love—fireflies flashing signals to their females in the grass.

Down there among the sprouting blades a momentary glimmer answers, not too soon and not too late. In *Photinus pyralis*, a common eastern species I watch at Washington, D. C., the female's answering lamp shines forth two seconds after the male's—a split second sooner on warm evenings, a shade later if the night is chilly. To me it seems a glow of pleasure, a thrill translated into light.

Like larger lovers everywhere, these little bearers of the torch are vulnerable to jest. If you shine a small flashlight in imitation of his signal, you may get an answer from a female in her grassy rendezvous. What hopes must such a lordly light awaken in her breast!

Her lord and master too can err. Mask the flashlight in the grass and, when a firefly spark appears, give answer after just the proper ladylike interval. Down he comes to your mating beacon—and mayhap some of his rivals too.

Seeking the Secret of Cold Light

Science knows more than 1,500 species of fireflies (Lampyridae, from a Greek word meaning "bright"), and each has its own system of signals. For instance, Mr. Pyralis emits a lone, lingering yellowish flash at intervals of about six seconds, usually on a short rising flight.

Codes of some of the other kinds suggest series of dots or dashes.

Watching the winking in the night, one wonders at the work of Nature which taught these blinking little beetles their distinctive courting codes. More wondrous still is their cold light, more efficient than any illumination mankind has yet devised.

Over at near-by Baltimore, children bearing jars, cans, and bottles of fireflies beat a path to the laboratory door of Dr. William D. McElroy, inquiring-minded biochemist of Johns Hopkins University. They come in answer to the announcement that fireflies are flying money, worth 25 cents a hundred to genial Dr. McElroy.

For several seasons now, the lightning-bug legions of the Maryland metropolis have financed such essential purchases as marbles, dolls, sodas, and bubble gum, or added their mite to funds for future college educations. One girl showed all the enterprise of a Tom Sawyer whitewashing a fence; she enlisted the energies of her friends and collected $75 last summer—from 30,000 fireflies. They have to be fresh; no mail contributions accepted.

Losing their lanterns in the laboratory, these thousands of fireflies are martyrs to science. (As adults they would die soon, anyway.) But their light lives after them. In one of Dr. McElroy's darkrooms I saw the ghostly glow of 400 fireflies that departed this life in 1948. Their powdered tails had been resting in peace in a deep freezer at 17 degrees below zero, Centigrade.

"We've kept some of this for as long as three and a half years and found it would still glow," Dr. McElroy said as he took from the freezer a test tube of the brownish powder.

In the darkroom he poured the powder into a bowl and added a little water. The mixture shone with a faint greenish-white light.

"That's pretty good; some energy is left after more than two years," the scientist observed. "But now watch this."

He poured a clear fluid into the bowl.

Instantly the weird light greatly increased in intensity.

The fluid that produced the flare-up was a high-energy phosphate compound isolated from muscles of rabbits. It might be called energy in chemical form. Vitamins in food help make this adenosine triphosphate—ATP, for short—which is present in all living things. It provides the energy that enables my fingers to type these words, a rabbit to jump, a firefly to light. Thus the strength of rabbit legs was kindling anew the lights of long-dead lightning bugs.

How the Firefly Lantern Lights

Scientists studying fireflies' strange cold light have found that the flash is caused by oxidation of a substance they call luciferin, from Latin words meaning "to bring light." A second substance, luciferase, is an enzyme, or catalyst. Acting like a clergyman performing a wedding, it enables the luciferin and oxygen to unite.

Both luciferin and luciferase are contained in the fireflies' myriad microscopic light cells, along with the necessary moisture and oxygen. Tiny tubes ventilate the living lantern (page 702).

If you imitate Nature by putting these substances together, you get a flash, but only one.

After that, the mixture seems as dead as a burned-out match.

Yet the firefly lights again and again, mused Dr. McElroy in his laboratory. Something must regenerate the luciferin, he decided. What could it be but the energy that moves us all? He tried his ATP and it worked. Every time he poured it on, a flash resulted.

Here, then, was the firefly's secret. The chemical energy in its protoplasm revitalized the luciferin after each flash and made it ready to flash again. Luciferin and luciferase seem inexhaustible, never consumed.

"There's got to be a source of energy. Now we'll supply it another way," said Dr. McElroy, turning to a test tube of cloudy fluid. "This is a highly concentrated extract of firefly lanterns."

He switched on an ultraviolet lamp, and suddenly the test tube glowed with fluorescent firefly light, room-cool to the touch (page 701, right).

Light Virtually Without Heat

In the average electric bulb only about 3 percent of the electrical energy goes into visible light; most of the rest is lost in heat. In the firefly's light, heat is virtually nonexistent. The insect's temperature is lower than that of the air through which it flies.

Firefly light itself is not well suited to human use, because its bluish, greenish, or yellowish cast makes some colors invisible in its glow. But fireflies and other luminous creatures are important in helping man learn the principles of chemical light.

"Is it really possible," I asked, "that man will eventually learn to make useful light on the firefly principle?"

"Absolutely," Dr. McElroy answered. "I feel sure that man will be able to create cold light chemically and use it."

In answer to the same question, Dr. E. Newton Harvey, of Princeton University, leading authority on animal luminosity, said: "It is possible at the present time to produce chemiluminescent light as bright as the light of the firefly from pure organic compounds, and the isolation and synthesis of luciferin from luminous animals is just a matter of time. It is doubtful if these compounds will be used for illumination of houses, but they may be used for other purposes."

The question of practicality of chemical light was answered by Mr. Sylvester P. Guth, of the General Electric Company's lamp department, with an emphatic "no."

"Cold light," he observed, "can be produced by chemiluminescence—the oxidation of certain chemical substances. But the cost has been estimated at $25 for the same amount of light produced for one 5,000th of a cent in a 100-watt filament lamp and for a 15,000th of a cent in a typical fluorescent lamp."

No one knows what would be the cost of light produced from man-made luciferin, since science as yet has not succeeded in making it artificially.

Dr. Harvey's Princeton associates, Dr. Aurin M. Chase and Dr. Howard Mason, are working on the problem of purifying light-producing luciferin from a small marine crustacean, *Cypridina*, while Dr. McElroy and his former Johns Hopkins colleague, Dr. Bernard L. Strehler of the Oak Ridge National Laboratory, Tennessee, are concentrating on firefly luciferin. Next step would be to make the compounds synthetically.

To these scientists, however, creating chemical light is only incidental. Biochemists McElroy and Strehler are delving into a much bigger problem, the secret of life itself.

"All energy on earth comes from light, the light of the sun," Dr. McElroy explained. "Sunlight makes plants grow; we eat vegetables and gain energy that they acquired from the sun, or we get it second-hand by eating meat from animals that got their energy that way. Fireflies acquire energy in exactly the same fashion.

"In the firefly the energy cycle goes full circle, from light to light. By tracing that cycle backward, through luciferin and luciferase, we hope to find out how plants and animals make use of light for life and growth."

Mysterious 24-hour Rhythm

Fireflies begin to twinkle at twilight. How do they know when it is time to light up?

Laboratory experiments by Dr. John B. Buck, formerly of Johns Hopkins University and the Carnegie Institution of Washington and now at the National Institutes of Health, Bethesda, Maryland, shed some literal light on the subject. They show that fireflies react to degree of darkness and also to passage of 24-hour periods of time, almost as if they came equipped with a photoelectric cell and a clock.

In the laboratory these big-eyed beetles showed plainly that they favor a dusklike dimness as a setting for romance. They flashed readily in dim light, not at all in bright light, and rarely in prolonged total darkness.

If favorable light conditions were provided continuously, Dr. Buck's laboratory lightning bugs (*P. pyralis*) had periods of flashing that recurred at regular 24-hour intervals. Though the room was windowless, they began flashing each evening at the same time their free

699 Yoji Okamoto

Beauty-loving Japanese Gather Fireflies to Adorn and Police Their Gardens

To signify hard study, the Japanese have a word, *keisetsu*, meaning fireflies and snow. It calls to mind scholars so poor but determined that, tradition has it, they studied by firefly lanterns and snow-reflected light. This woman plucks the insects, like glowing flowers of the night, at Uji, famed for its fireflies. Professional catchers sometimes pop them into their mouths for temporary safekeeping. Japanese buy thousands of the insects in little cages. The firefly's predatory larvae devour field and garden pests (page 703).

brethren outside were beginning to light their torches.

How could the captives know it was evening? Did they sense the setting of the unseen sun or react to changes in cosmic-ray activity or to some other influence connected with the passing of the day? Dr. Buck found that the answer is no. Fireflies don't really know the time of day. What they have is a 24-hour rhythm, some sense that tells them a full day has passed.

This the experimenter discovered by throwing his fireflies completely off schedule. He exposed his evening-caught fireflies to bright light for 12 hours, then plunged them into darkness followed by dim light. When the time in darkness and dim light totaled 24 hours, they began flashing, but now at 8 o'clock in the morning instead of 8 in the evening. Clearly, the 24-hour cycle had no direct connection with time of day and must be the result of an inherent periodic rhythm within the firefly.

Whenever the period in blackness followed by dimness added up to 24 hours, or to two days, three days, or four days, the fireflies began lighting up. But when the period was 12 hours, a day and a half, two days and a half, or three days and a half, they didn't.

What man in a dark dungeon could tell unerringly whether he had been in his cell three days, exactly, or three and a half? Yet a firefly can—by some uncanny instinct that is one of Nature's secrets.

High-speed "Switch" Controls Flash

Just how the firefly switches its light on and off is still not definitely known. One theory has been that the light is controlled by opening and closing the tubes that carry oxygen to the light cells (page 702).*

"In fact," says Dr. Buck, "some biologists have thought they could see microscopic valves in the little air pipes.

"But there are also reasons to doubt this explanation. One is the speed of the flash. It is difficult to imagine a valve capable of turning air on or off in a matter of a hundredth or a thousandth of a second. A second reason is that the luminous reaction requires only the merest trace of oxygen, perhaps not much more than the cell needs just to stay alive. So it is hard to conceive of a valve efficient enough to exclude oxygen so completely from the cells.

"Probably the flash is controlled by a very complex mechanism, set off by the nervous system. The control mechanism may be

James L. Mooney, Jr.

Off Go the Lights. Fireflies Alone Bathe Tina's Face in Faint, Unearthly Radiance and Put Stars in Her Eyes

James L. Mooney, Jr., *Chattanooga News-Free Press* photographer, put about 75 fireflies in a pickle jar, added a tinfoil reflector, and made the picture at right entirely by firefly light. Pinpoints in his daughter's eyes reflect flashes of insects during the two-minute exposure. Film was developed three times longer than normally.

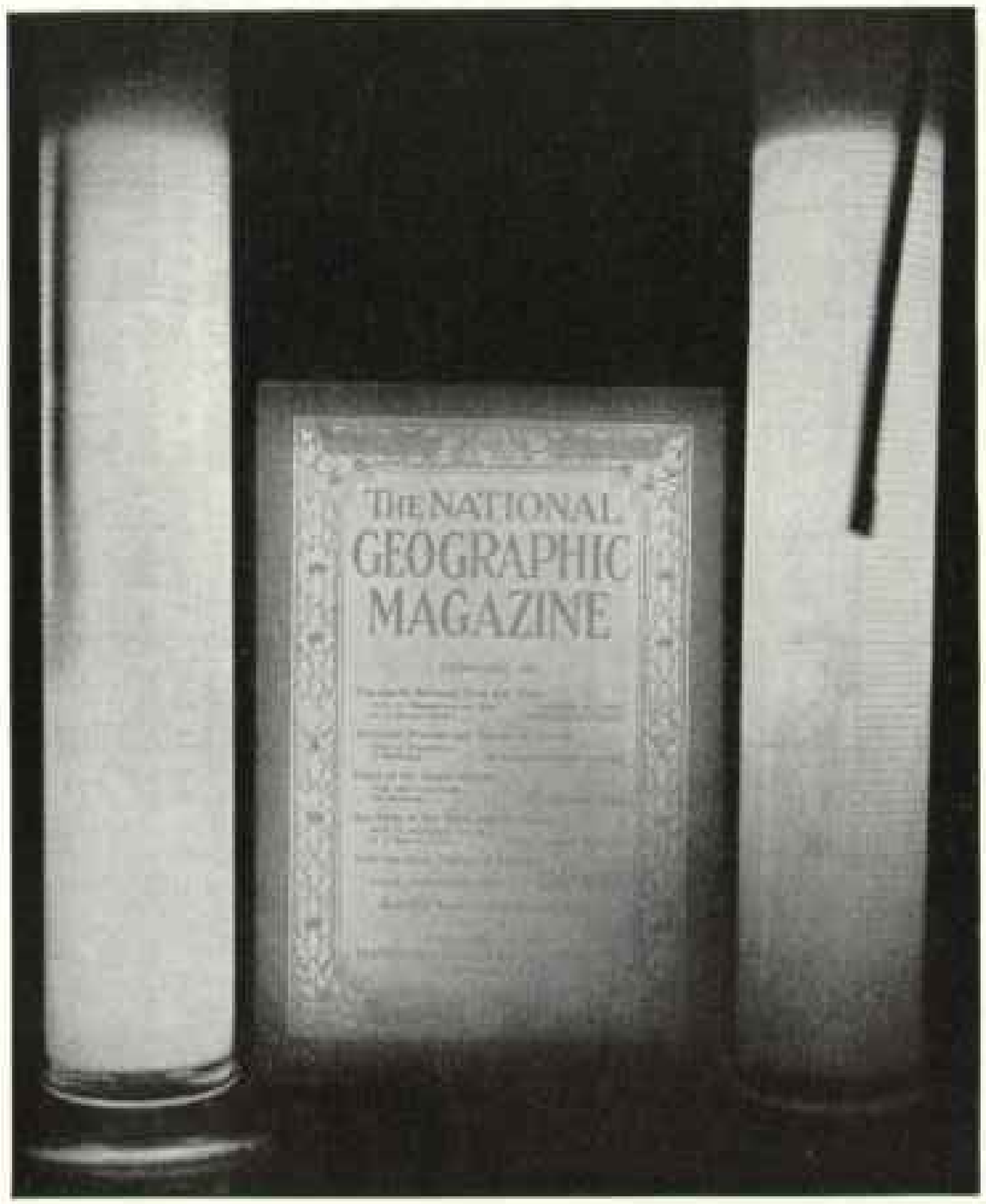
Ten Thousand Billion Luminous Bacteria from Sea Water Light Up The Magazine. A Tube of Firefly Extract Glows in Ultraviolet Rays

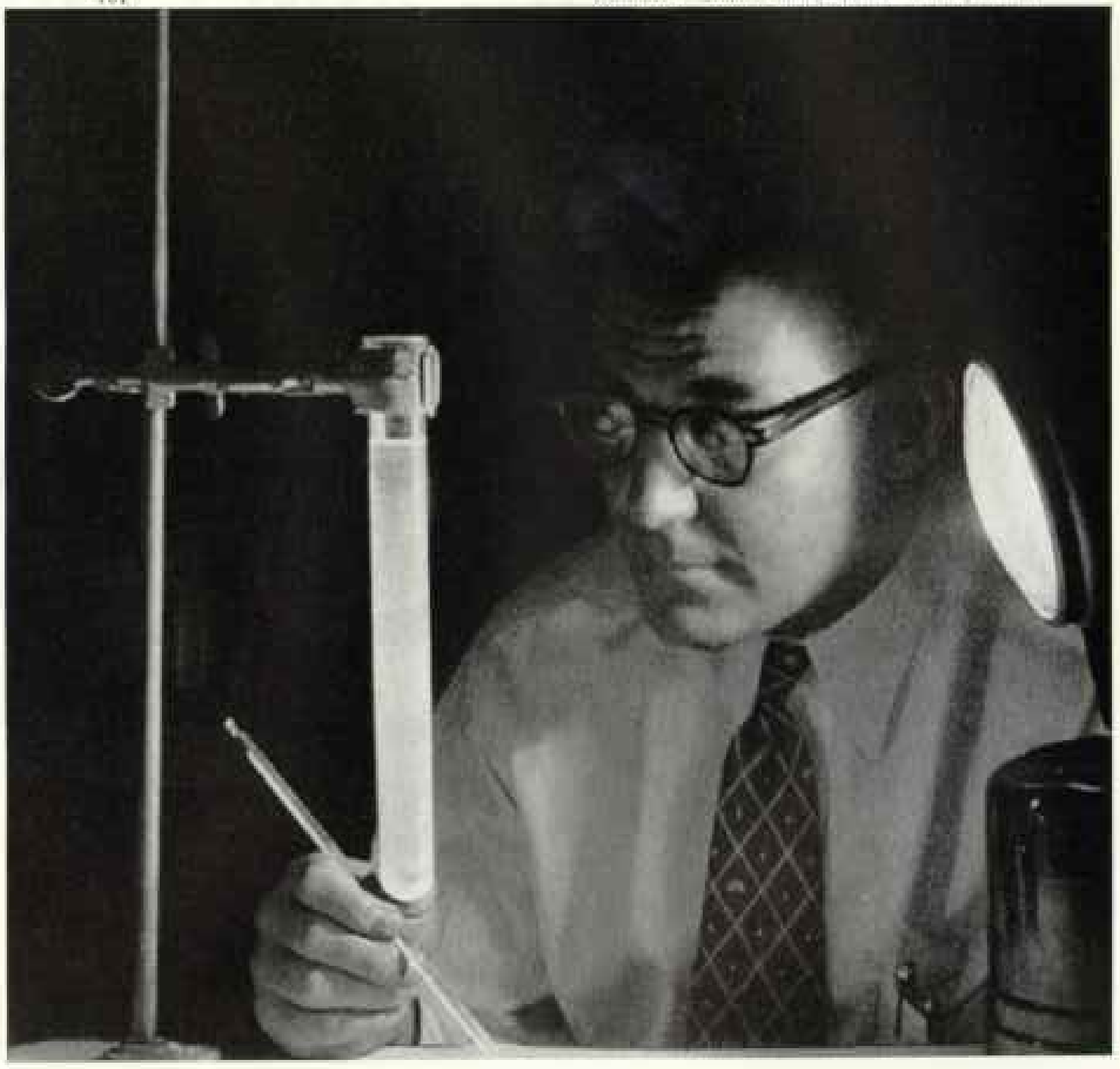
Both pictures were taken in the laboratory of Dr. McElroy (right) in the Biology Department of the Johns Hopkins University, Baltimore (pages 696-7). Experimenting with cold light, he uses fireflies and other luminous organisms.

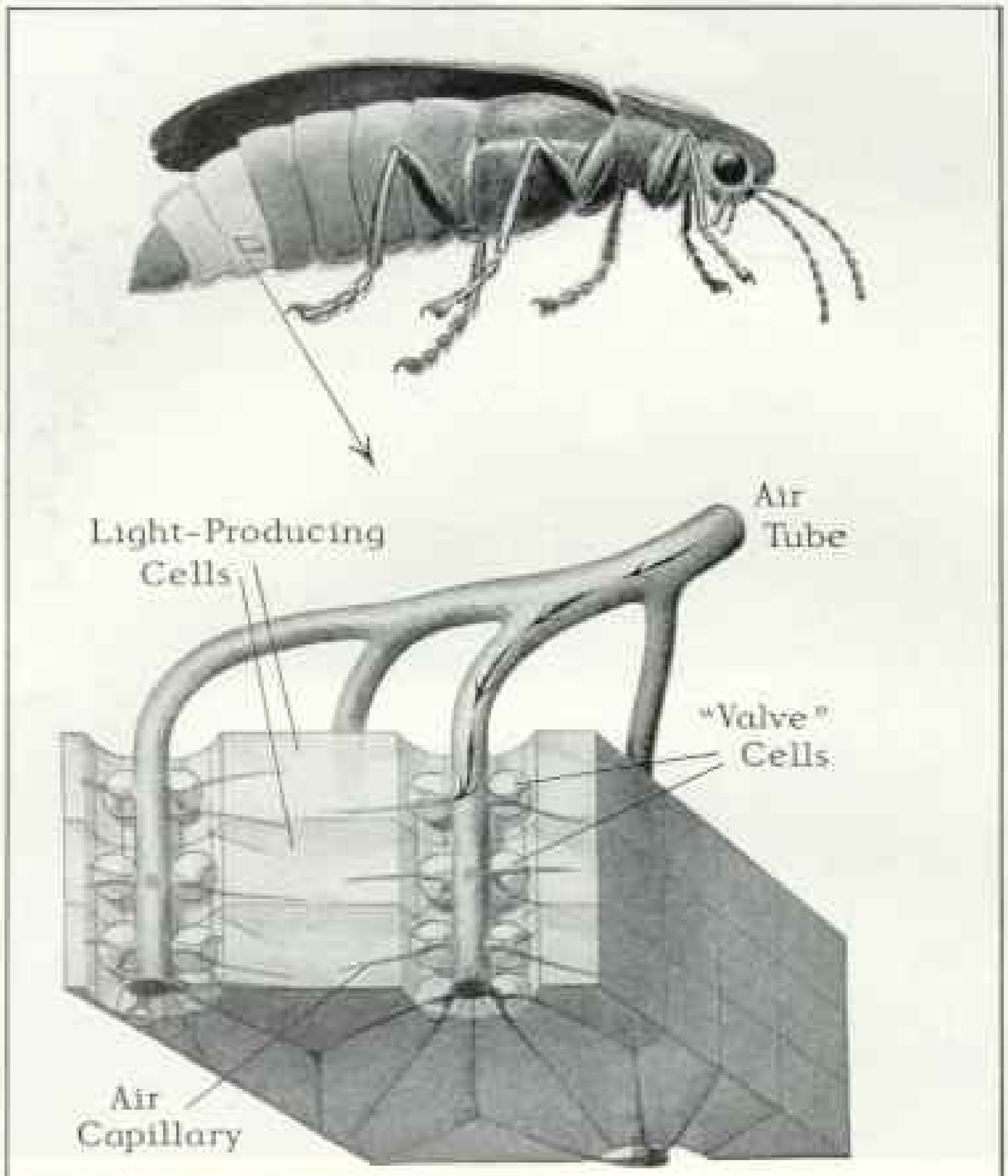
Left: This 20-minute exposure, with the lens diaphragm set at F5.6, was made by light given off by two cylinders of salt water containing laboratory-cultured bacteria like those that make the ocean luminous. Their light alone enabled the photographer to read even the fine type. Dark tubes descending into both cylinders release oxygen; they serve the same purpose as the firefly's tiny ventilating pipes (page 702). Without oxygen there could be no oxidation and hence no light.

Right: Energized by the ultraviolet lamp, a tube of powdered firefly lanterns dissolved in water looks like a fluorescent light (page 698).

National Geographic Photographer B. Anthony Stewart







Schematic Drawing of Small Section of Luminous Tissue

Drawing by Walter A. Weber

Tubes Carry Oxygen to the Firefly's Light Cells

Just as a fire will not burn in a vacuum, the insect's cold combustion cannot take place without oxygen. Its branching ventilation system ends in minute tubes supplying air to each cell. There light results from the combination of oxygen, moisture, and two remarkable substances, luciferin and luciferase (pages 697–8). The chemical energy present in the firefly, as in all living things, regenerates the luciferin after each flash. Some scientists have thought the microscopic round cells in the air pipes might be control valves, but the theory has not been proved. Here the artist has simplified a section from the light organ and enlarged it about 500 times.

similar to the also unknown mechanism that actuates our muscles. Nothing happens until a nerve impulse pulls the trigger, so to speak."

Miss Pennsylvanica a Fatal Siren

When the evening is warm, the living lanterns of both sexes shine at slightly shorter intervals than when the air is cool. Unduly high or low humidity may cancel the whole show.

Fireflies seen on the wing are almost always males. Females of some kinds have wings but seldom fly. Even the larvae and eggs of many are luminous.

Females of at least one species are deadly sirens to an alien male, enticing him to his doom. Reports a Wilmington, Delaware, scientist, Mr. F. A. McDermott: "Males of *Photinus scintillans* will come to the flash of a female *Photuris pennsylvanica*, with the result that they are caught and eaten." Other observers have noted her taste for the scintillating suitor.

This cannibalistic "Pennsylvanian," found from Massachusetts to Panama, responds to potential mate or prey with a single somewhat subdued flash. If the flyer's signal consists of two to five sharp greenish-yellow flashes in rapid succession, the swain is Mr. Pennsylvanica, acceptable as a husband. But if the light is very short, orange-tinted, and given at five- to ten-second intervals, she may soon make a meal of luckless Mr. Scintillans.

"*Pyralis* males also are sometimes eaten," Mr. McDermott informs me. "There is a possibility," he adds, "that *Photuris* females which do this have already mated and have a requirement for more food for developing eggs than is provided by the food they consumed in the larval state; so it may be 'Mrs.' rather than 'Miss' Pennsylvanica."

Most fireflies, however, are believed to eat nothing at all during the few days and nights of adulthood when they are sparking around. Energy for their lamps of love has been stored up in months of predatory life as larvae on and in the ground. Favorite prey are snails

and worms, including the highly destructive cutworm.

Some Fireflies Are Fireless

Although the firefly is a familiar miracle to millions east of the Rockies and in many foreign countries, transatlantic visitors often behold it here for the first time.

England knows the glowworm, as the female and larva are called, but its flying males are nonluminous or have only rudimentary lights—fireless, or virtually fireless, fireflies. The same is true in northern Europe and in our own far West.

Some of our eastern kinds, too, are fireless. True Lampyridae, they just don't have the lamp.

Prized in Japan

Both as a boon to the gardener and as a brightener of the nights, the firefly is widely appreciated in Japan. Larvae of some of the fireflies there live in water and eat aquatic snails.

Skilled Japanese firefly catchers collect thousands of the insects, to be sold in gauze-covered boxes or cages. They dislodge them from trees by striking the branches with a pole, then grab them off the ground with both hands. Professionals pop them into their mouths for safekeeping until they have time to stow them in a bag.

Japanese who buy the fireflies release them to beautify restaurant gardens, to brighten the scene outside for a party, or to add their glow to a festival such as the Battle of the Fireflies on the river near Uji, Honshu Island, in June (page 699).

When I visited Gen. Douglas MacArthur's headquarters, I found that among his many gifts from admiring Japanese was a cage containing a thousand fireflies, with a card in English explaining, "The glow of firefly are natural large spontaneity lights." The General graciously accepted the gift, designed to improve his garden and make it sparkle the more by night.*

National Geographic Photographer Luis Marden

Fire Beetles Gleaming with Uncanny Light Make Living Brooches

Panamanian women wear the greenly glowing, inch-long *cocuyos* on dress or hair on such nocturnal occasions as the Good Friday processions. The insects are attached in a way that causes them no harm (page 704). When not on display, these beetles live in the sugar-cane "jewel case."

Fireflies Sometimes Flash in Unison

Most spectacular is the rhythmic, synchronous flashing of hundreds, or even thousands, of fireflies, as if some invisible hand were operating an electric switch. Such displays have been reported for more than 200 years

* See "Japan Tries Freedom's Road," by Frederick G. Vosburgh, National Geographic Magazine, May, 1950.

by many Occidental observers in Thailand, Burma, Malaya, India, and other countries and islands of Southeast Asia.

"I saw such a sight on the river near Bangkok," Dr. Henry R. O'Brien, of the United States Public Health Service, told me recently. "A shrub about 8 or 10 feet high was full of fireflies going on and off together. Except that the lights, of course, were not as bright, it reminded me of one of those Christmas trees with lights that turn on and off automatically."

Other reports tell of the same phenomenon on a much larger scale, thousands of fireflies in riverbank trees for a hundred yards or more flashing on and off in regular rhythm. What invisible cheerleader, if any, they follow, is still the fireflies' secret.

"Look for the woman," the French say. This has been advanced as a possible solution in the case of our common *Photinus pyralis*, males of which sometimes flash in unison over a half-acre area.

What happens may be this, according to a study by Dr. Buck:

A male gets a response from a female, and several other males near by wink back simultaneously, taking their cue from her or from the one that found her first. Their lights together are bright enough to stimulate another female several yards away. Males near her answer with one accord, and their flash ignites a third female who in turn gathers her coterie of males.

This chain reaction goes on till many flying males are flashing on and off as one.

Fire Beetles Worn for Adornment

Ordinary firefly light, that of *P. pyralis*, was found by Dr. William W. Coblentz, of the National Bureau of Standards, to have a usual strength of one 400th candlepower. Less bright, but often sustained for minutes at a time, is that of the big "fire beetle," *Pyrophorus*, family Elateridae, of the American Tropics. Four or five together make a light strong enough so newspaper type can be read.

People keep these fire beetles in little sugarcane cages and wear them by night as living jewels. In religious processions in Panama, for example, beetle brooches and hairpins gleam with eerie greenish light in the darkness.*

Often more than an inch long, the beetles have twin "headlights" that glow with green light; on their underside a yellow light shines intermittently in flight. Girls attach them unharmed to dress or hair by passing a pin under a natural hook of chitin at the joint of the beetle's body (page 703).

Like our common firefly, the big fire beetle can be attracted by a flashlight mistaken for a female's glow. Collecting specimens this way in Jamaica, Dr. E. A. Chapin, Curator of the Division of Insects at the Smithsonian Institution, felt like the target of tracer bullets.

"I never got so I didn't flinch when the male came in, he flew so fast," Dr. Chapin told me.

One Looks Like a Lighted Train

With a red headlight and eleven pairs of green lights glowing along the sides, the wormlike wingless female of a large South American beetle, *Phrixothrix*, related to the firefly, looks so much like a lighted train that the creature is called the railroad worm. Similar, but lacking the red headlight, are North American species of the genus *Phengodes*.

In Cuba Dr. Harvey of Princeton found what appeared to be a luminous frog. The mystery was solved when it proved that the frog had been dining on fireflies.

Birds seem to be more fastidious. Smithsonian and U. S. Department of Agriculture studies indicate that fireflies rarely if ever are eaten by birds.

Fireflies as well as small boys appear to react excitedly to Fourth of July firecrackers. Dr. Rudolf Ruedemann, of the New York State Museum at Albany, reported in *Science* that on the evening of the Fourth he "was startled by the sudden flashing up of the entire grass plot in front of him when some boys fired cannon crackers . . . about 80 feet away." In the grass or within a foot above it, scores of firefly lights flared on and flashed at a faster pace than usual until the cannonading died.

One possible explanation might be that the little creatures were shell-shocked. The insect's sensitivity is shown by the common observation that the impact of near-by human footsteps will cause the larvae of *Photuris* and other species to glow.

When injured, a firefly seems to go into a frenzy of flashing. One has been caught in the screen door and hurt. It blinks rapidly, throbbing with light, as if its luminosity is pouring out with life itself.

Outside in the fragrant night the dance of light and life goes on, the insect constellations rising higher as dusk fades into dark. Myriad mating flashes foretell that a new generation will carry the torch when spring comes round again.

* See "Panama, Bridge of the World," by Luis Marden, National Geographic Magazine, November, 1941.

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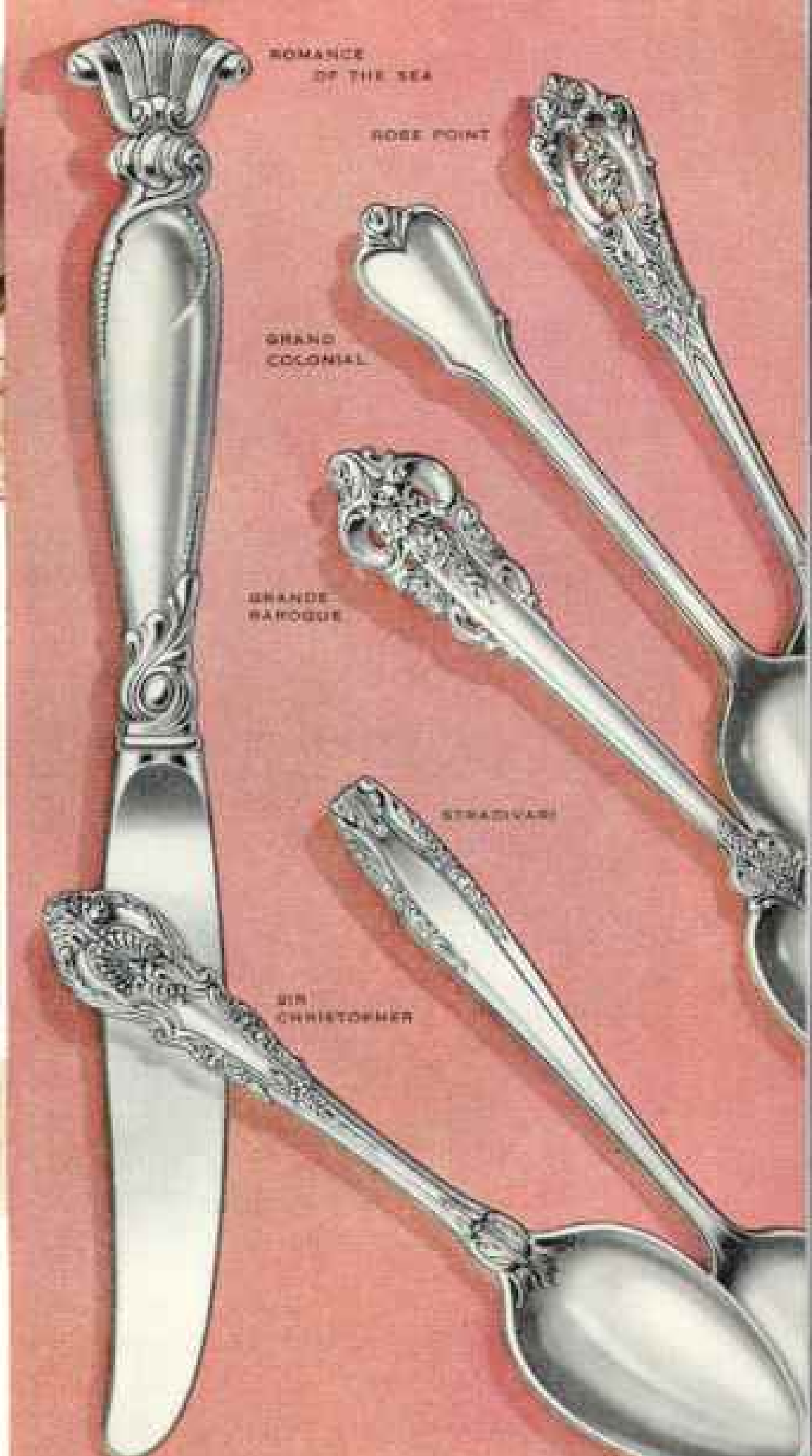

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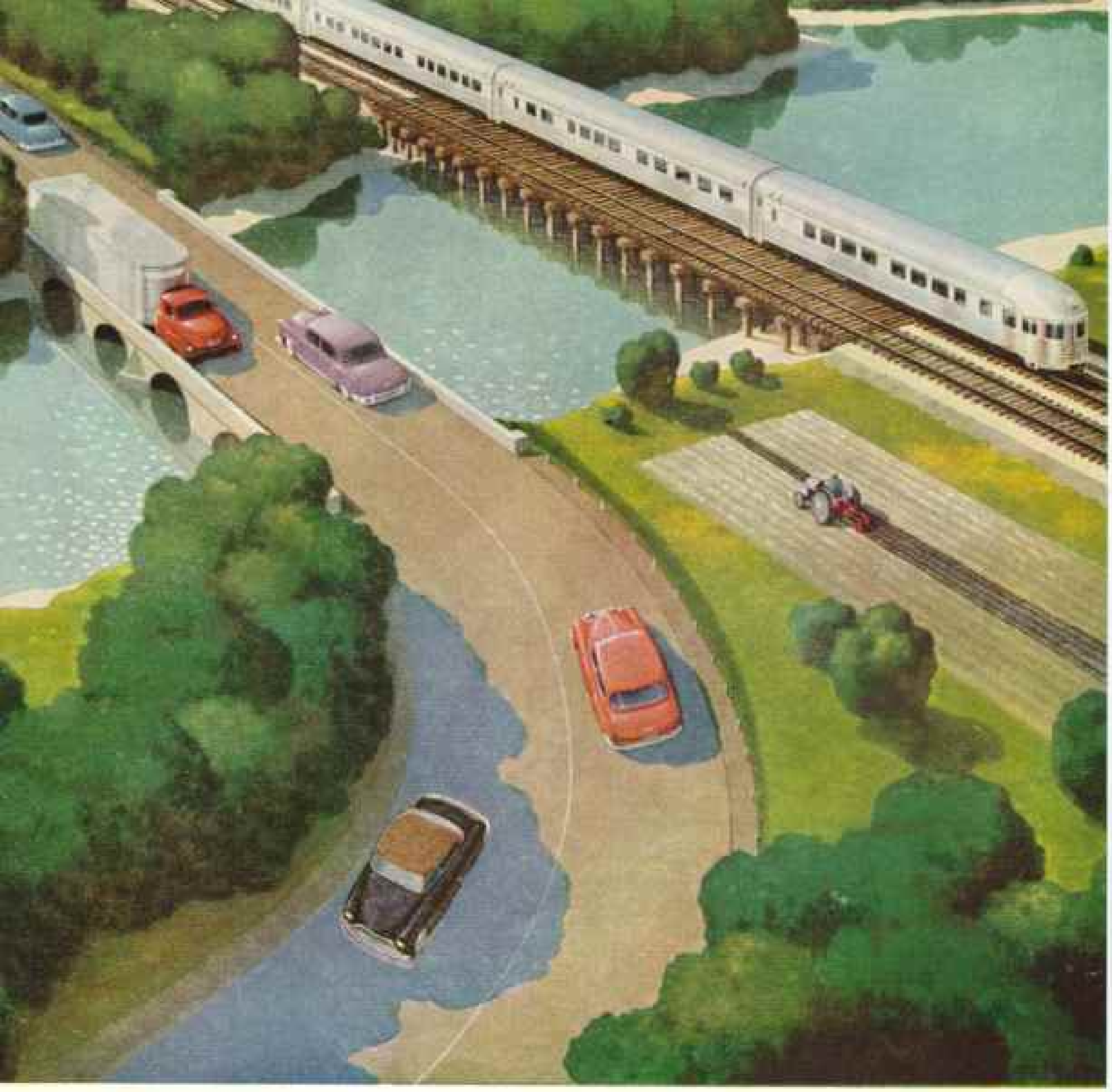

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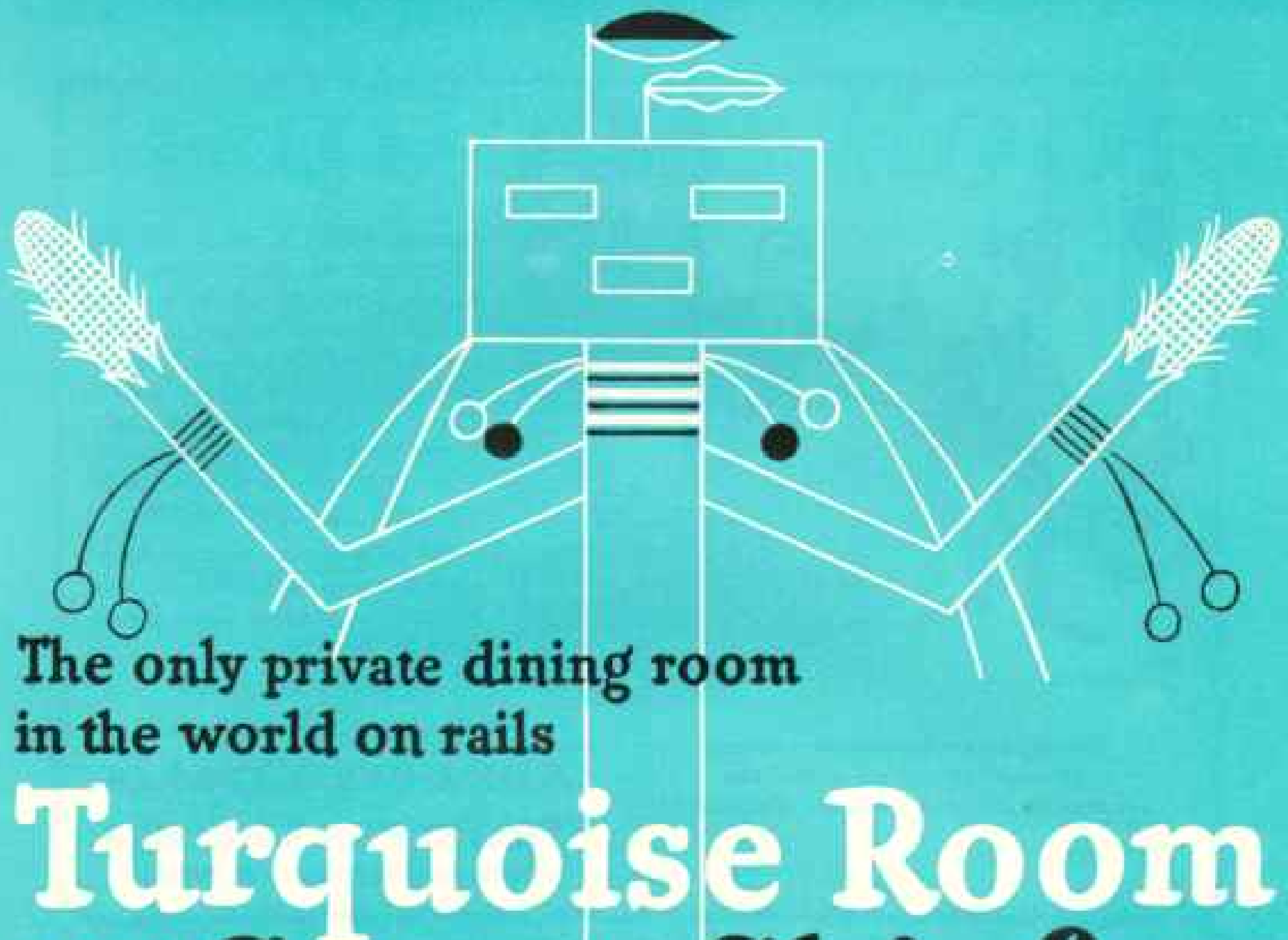

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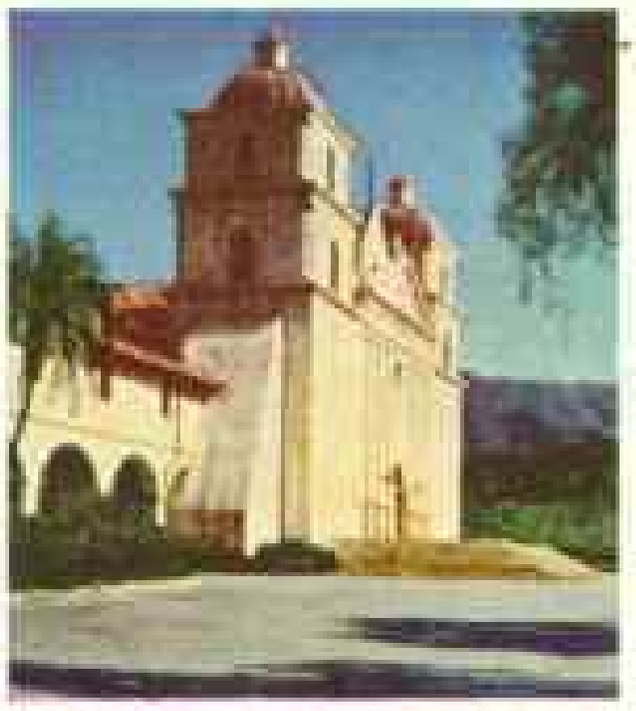

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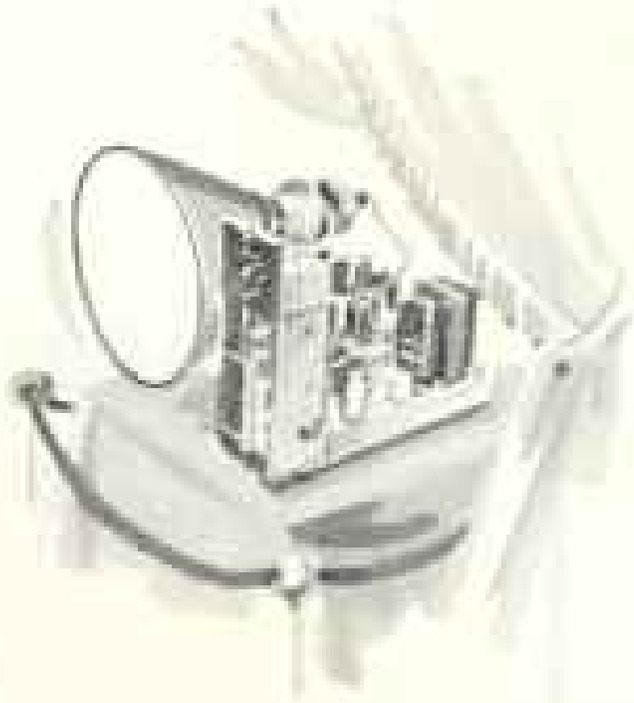

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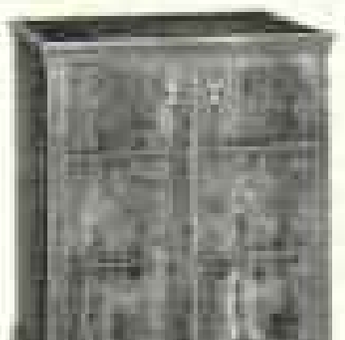

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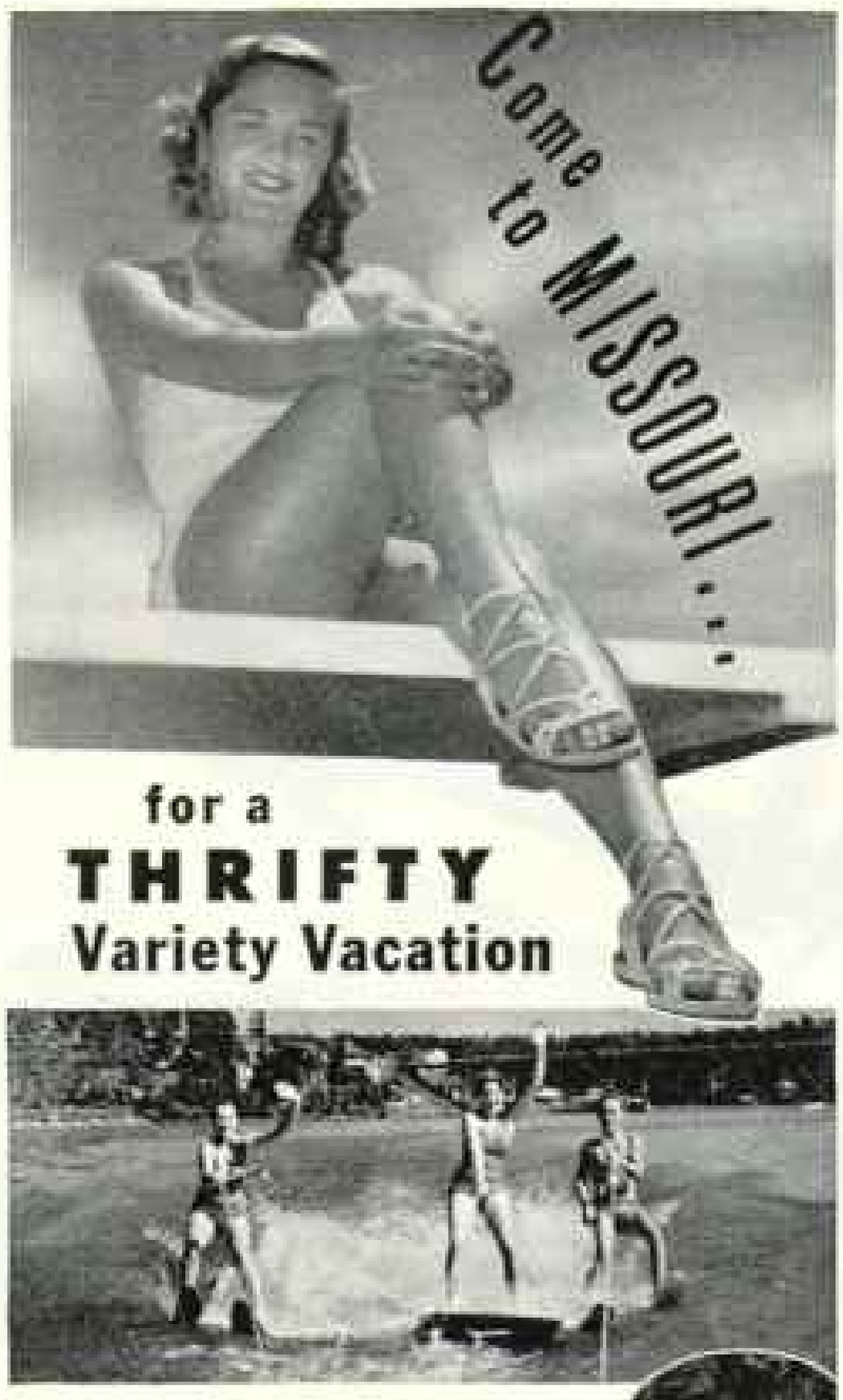

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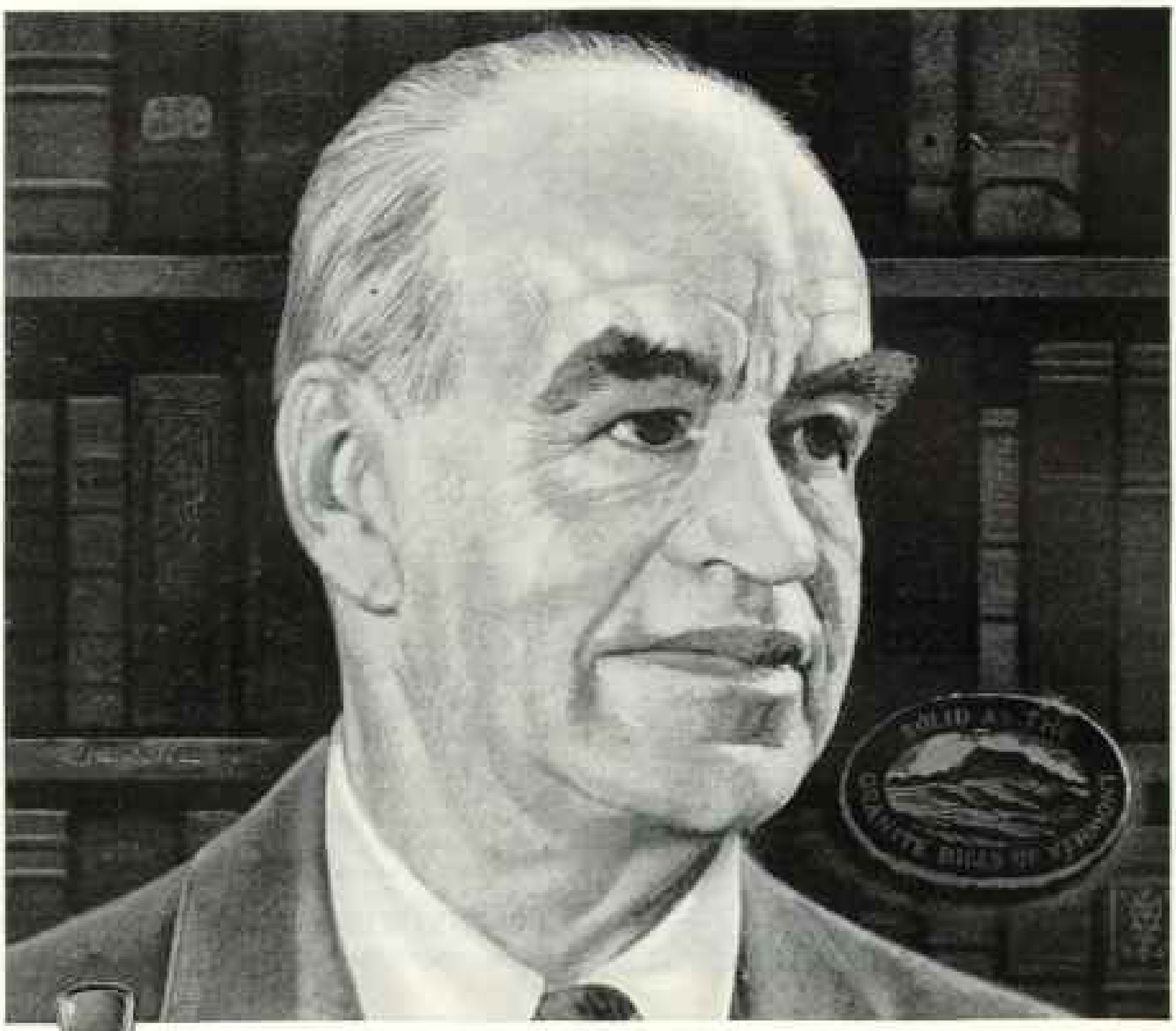

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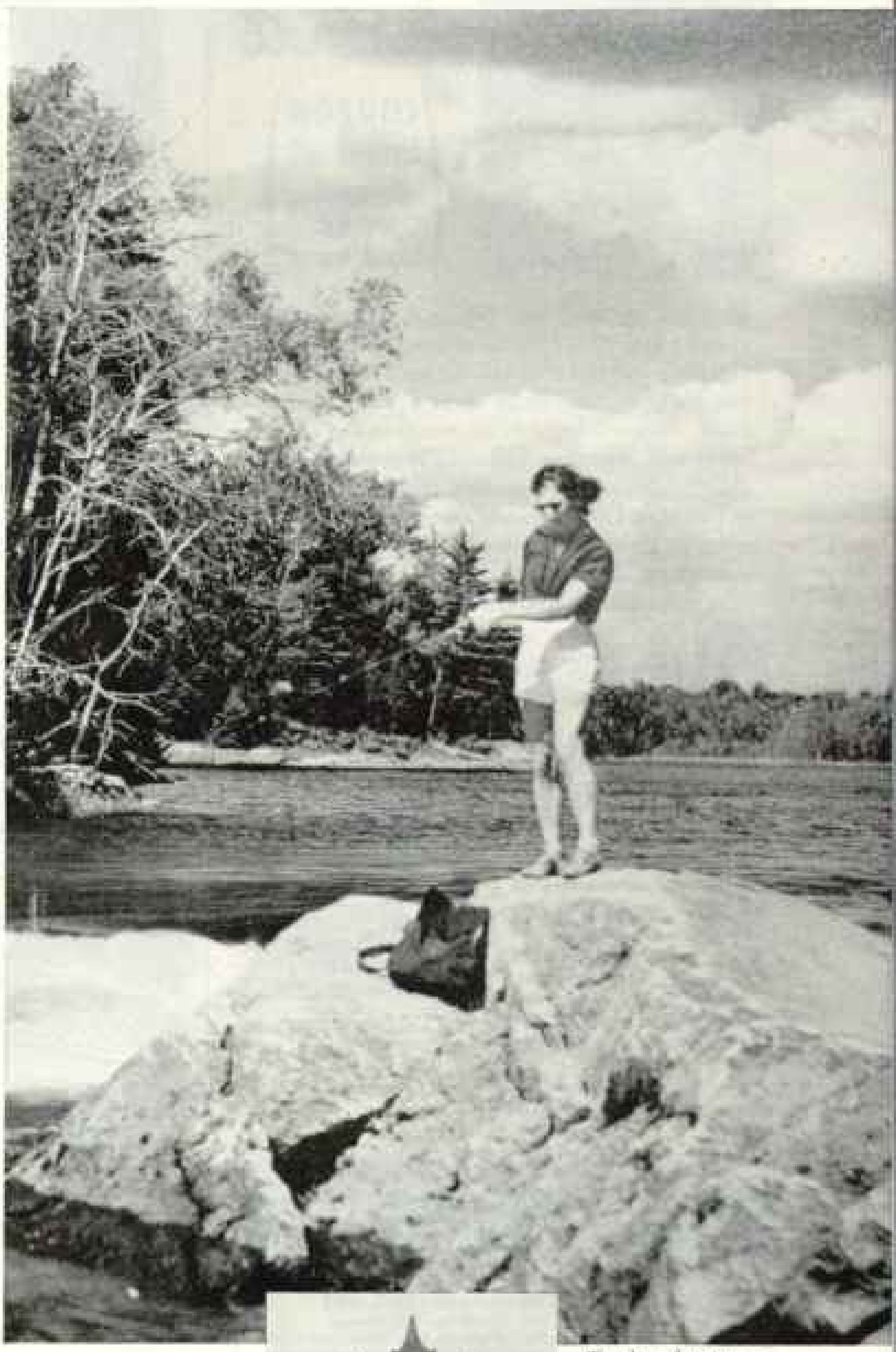

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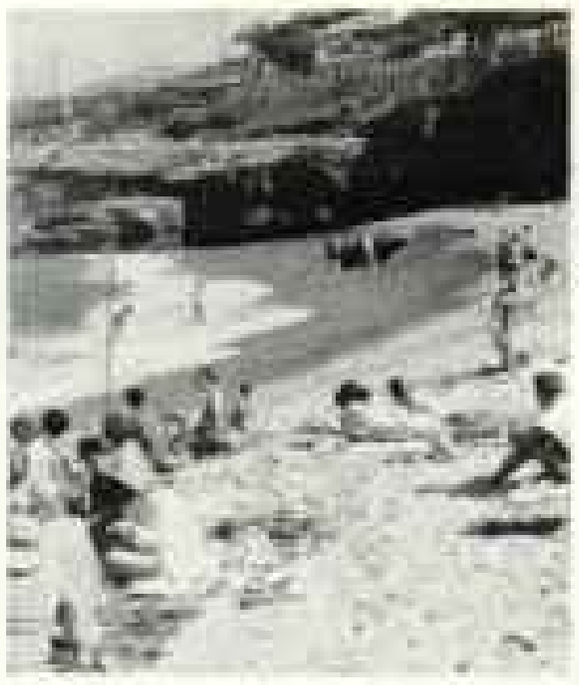

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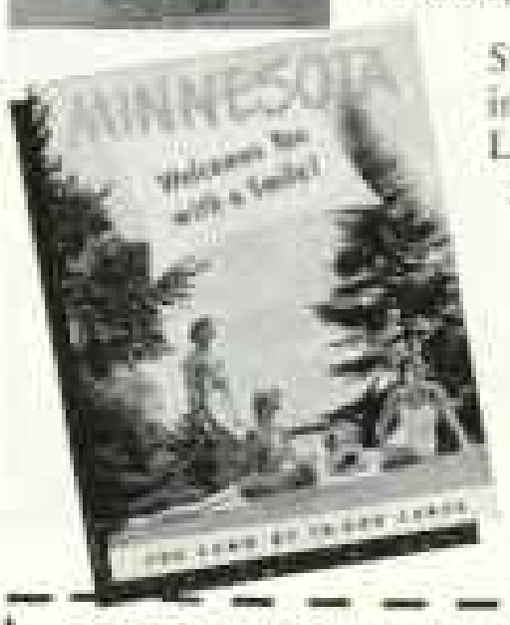

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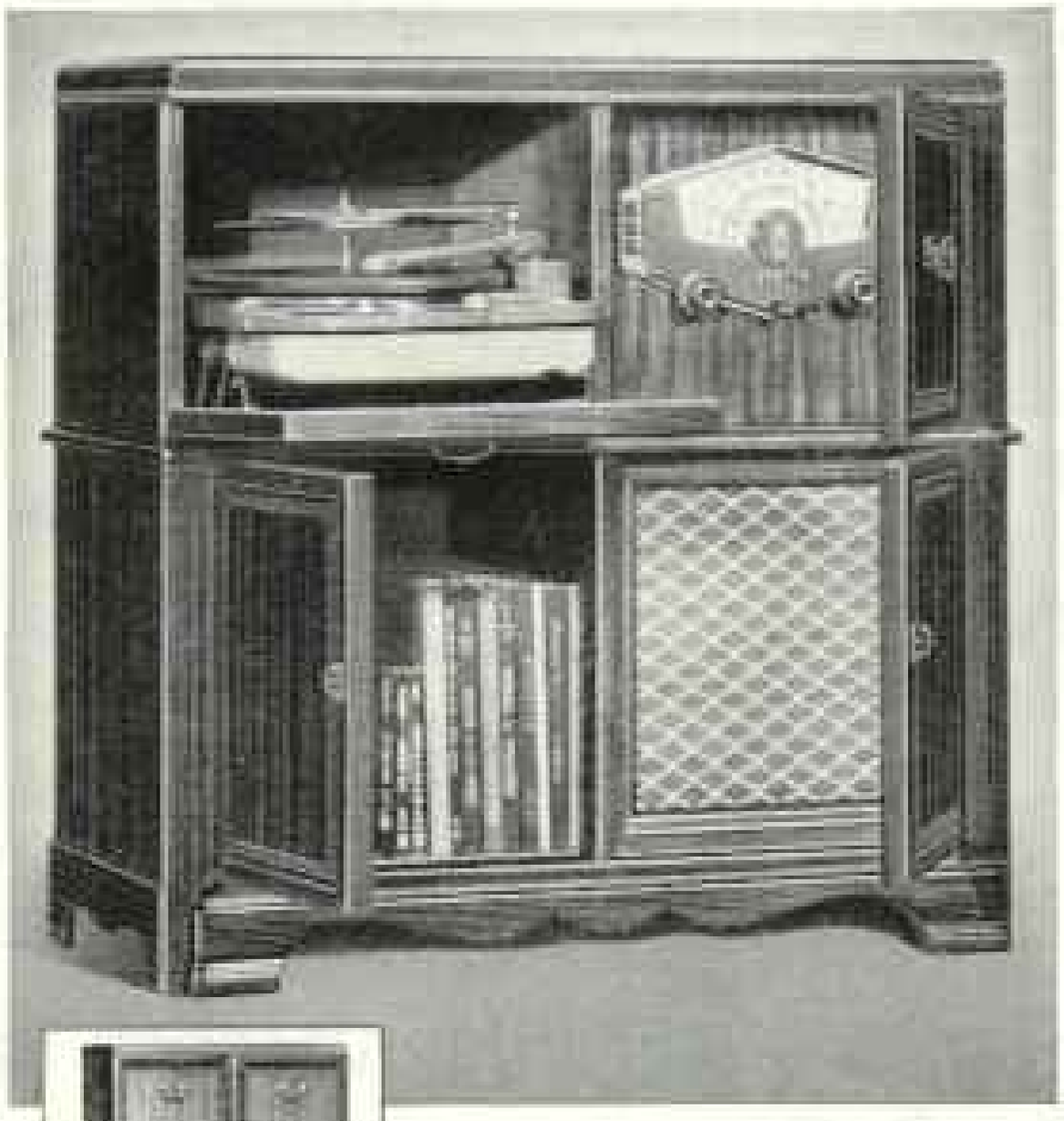

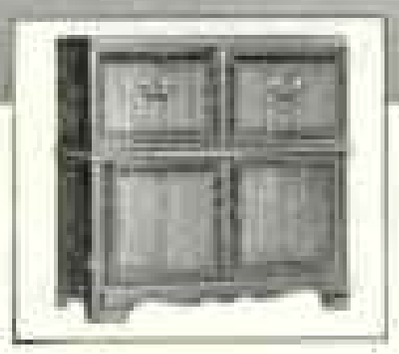

New Zenith® "Tudor" Radio-Phonograph Console. Model 1086R. Cobra-Matic record player. Super-Sensitive FM plus Long-Distance AM reception. Radiorgan® Tone Control. Stunning period cabinet in rich Mahogany veneers.

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Simplest automatic record-player ever built! Plays *all* records of any speed from 10 to 85, including the coming new 16 R.P.M.! Only two controls—one for speed, the other for record size. No spare parts to need replacing—no tricky attachments or adjustments! And you enjoy new tonal beauty that will amaze you!

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Exclusive—Pitch and Tempo Control. All turntable speeds vary. Cobra-Matic lets you adjust to the *exact* speed at which records were recorded for perfect pitch, tempo, timbre! Lets you play any record faster or slower for accompanying in perfect pitch. Widely acclaimed by opera stars, symphony conductors, true music lovers!

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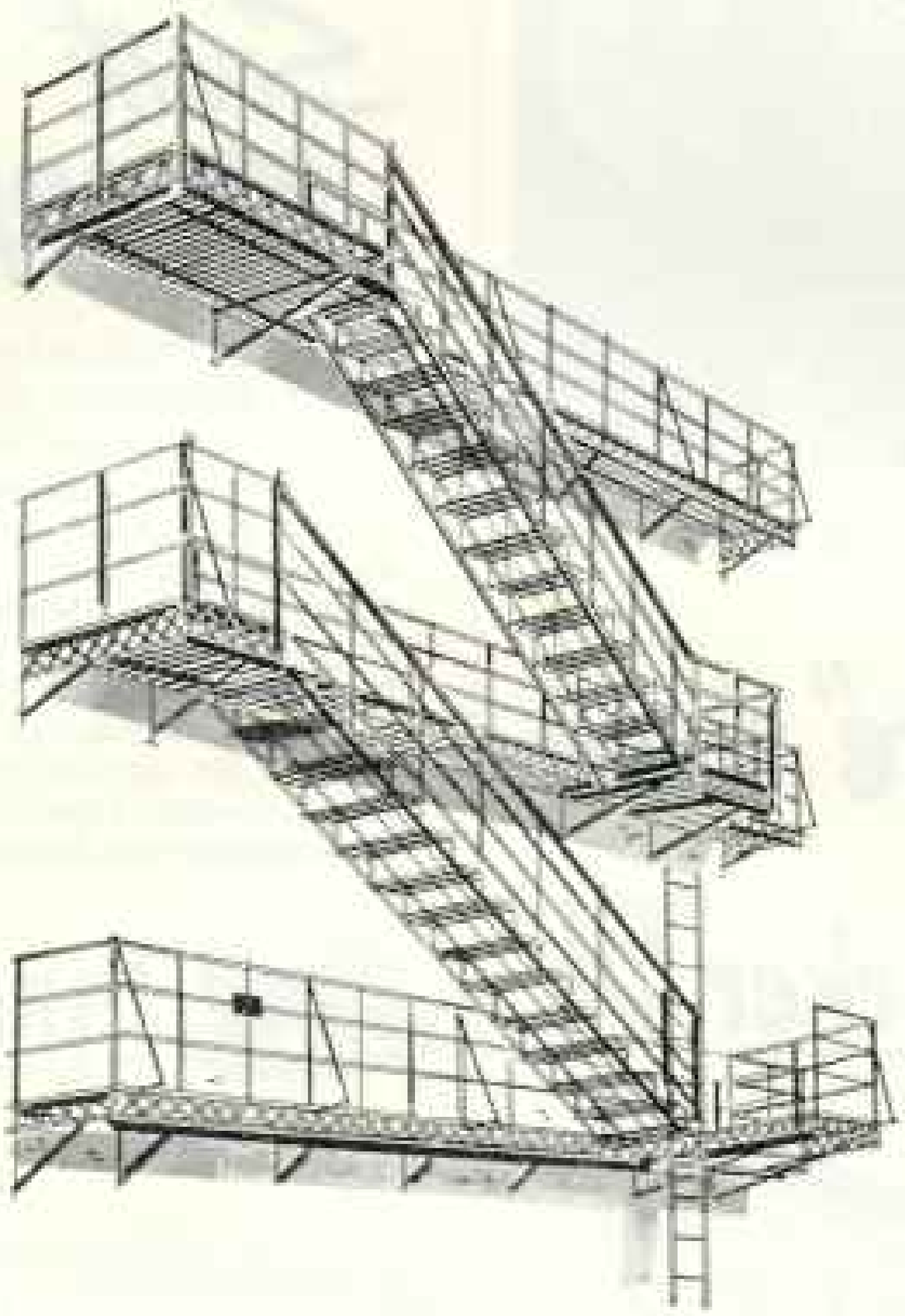

But is there one for your business records?

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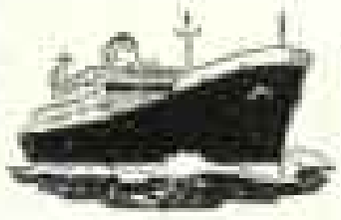

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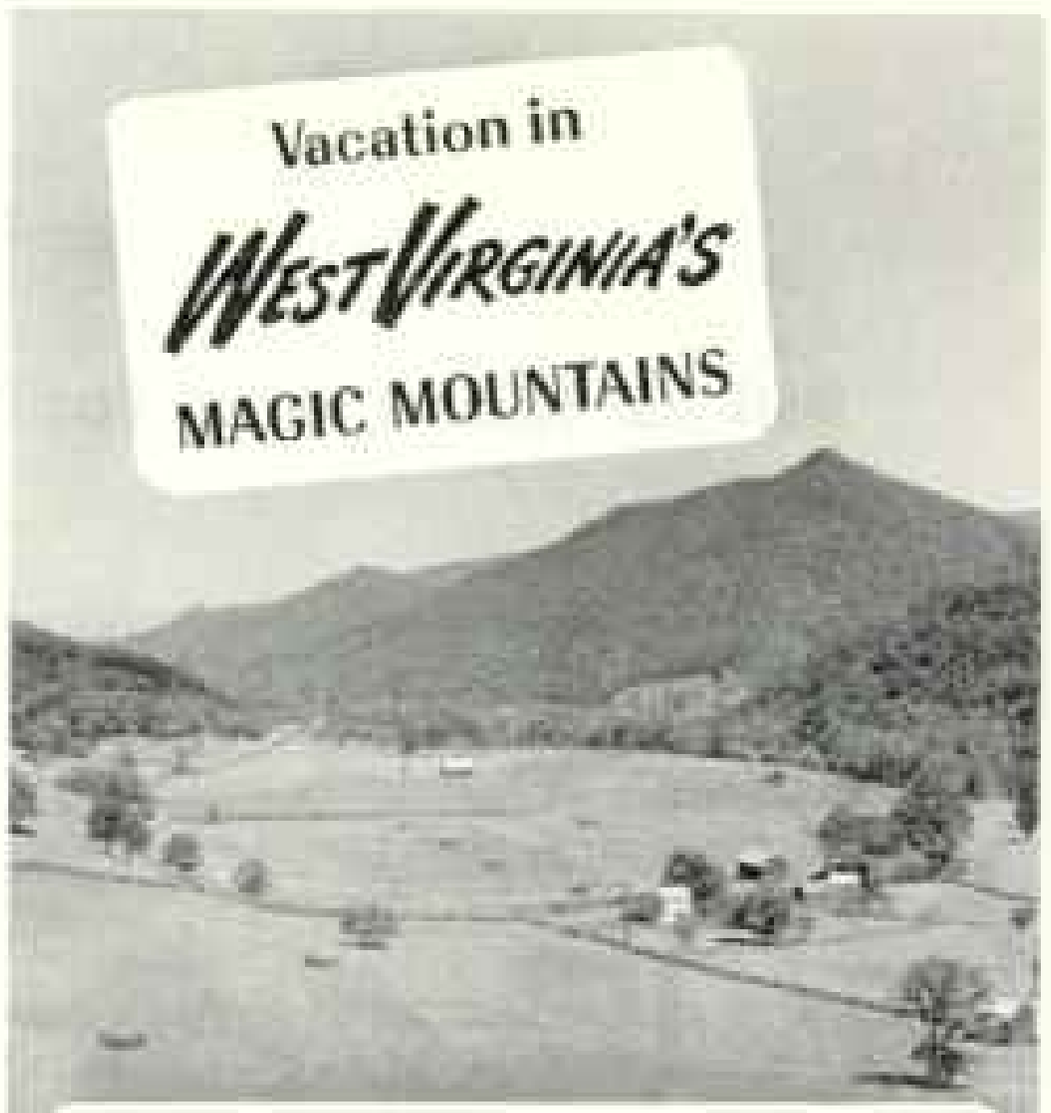

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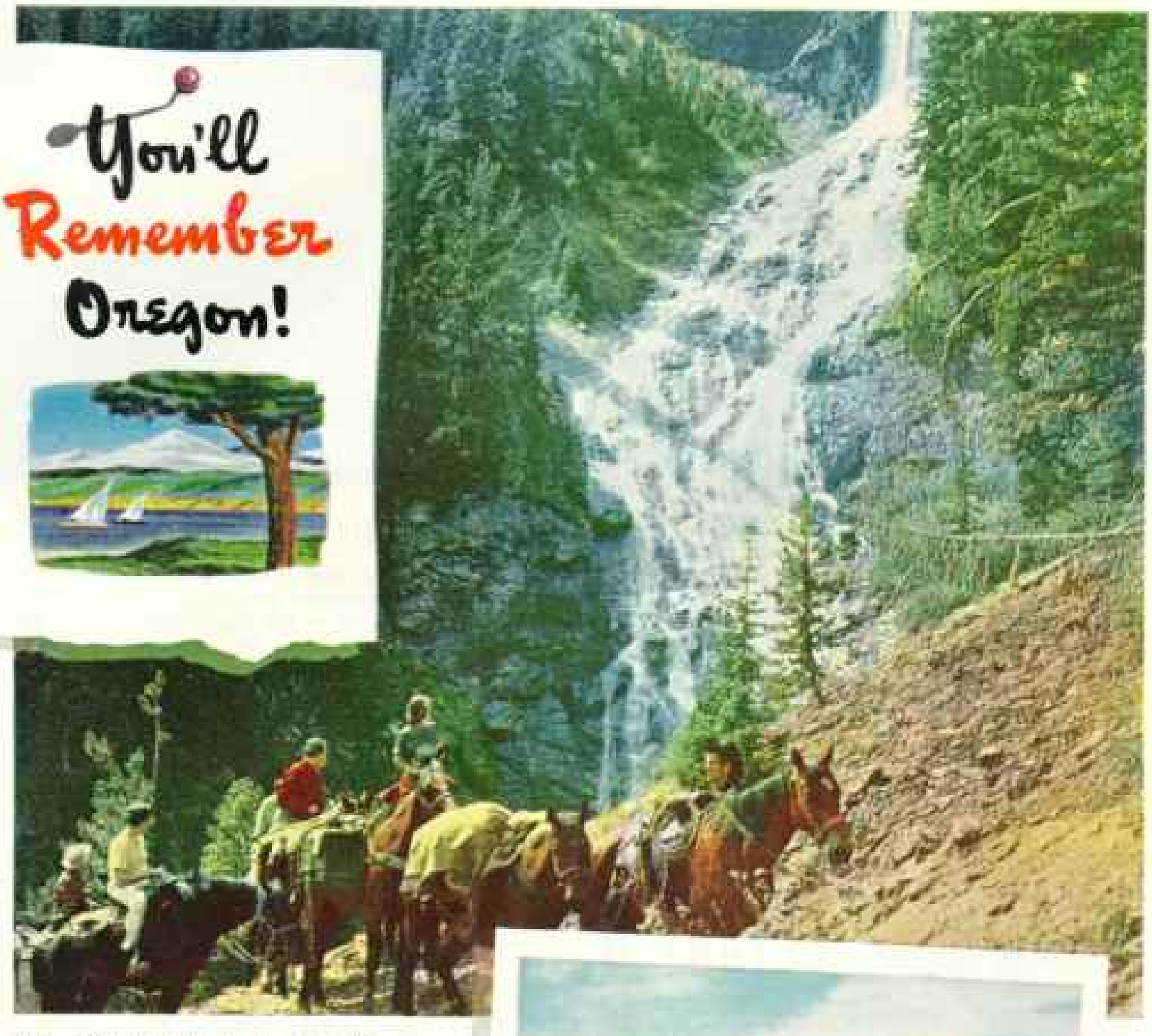

These pack trail riders stop to enjoy the beauty of Ice Lake Falls, high in the spectacular Wallowa Mountain primitive area of Northeastern Oregon.

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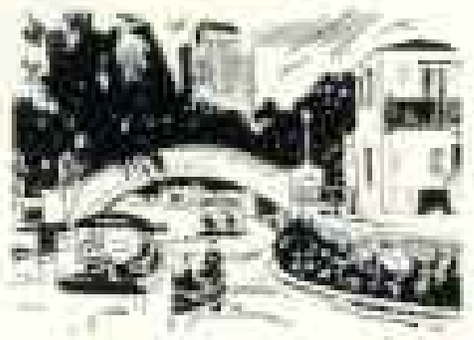

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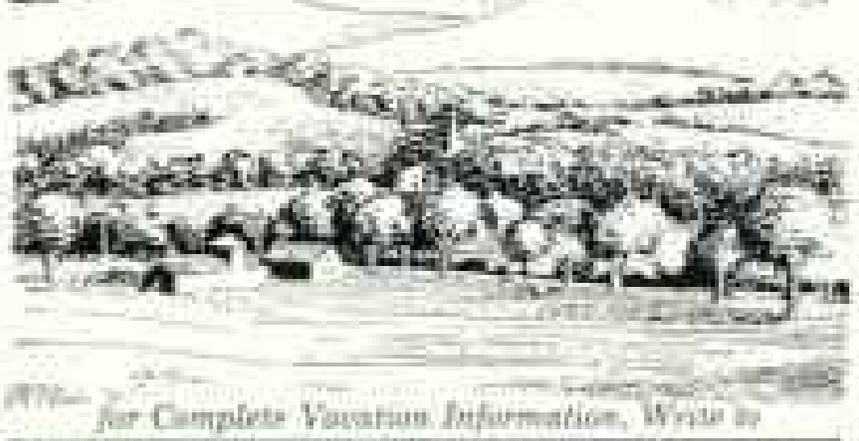

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What doctors say about Overweight

There are three **wrong** ways to Lose Weight

Through strenuous exercise

Authorities agree that physical activity alone causes relatively little weight loss. Moreover, it places an extra burden on the heart which may already be taxed from overweight. Exercise may also increase appetite and cause a person to eat more than he usually would.

Through quick reducing diets

Doctors say that practically all "get-thin-quick" diets are likely to do more harm than good. That is because sudden weight loss may lower a person's strength and resistance. Gradual weight reduction—ranging from two to three pounds a week—protects against these hazards.

Through reducing pills

Medical science has long condemned the use of self-prescribed drugs to reduce weight. Authorities say these drugs should be used only when recommended by a doctor and then taken exactly as directed. Many of them may affect the heart or cause other serious conditions.

There is one best way to Lose Weight

The best way for each individual to get weight down and to keep it there, is through his doctor's guidance. This is important because the doctor will determine the cause of overweight which, in over 95 percent of the cases, is simply due to overeating.

The doctor's help is needed, too, in determining what foods, and how much, may be eaten. He will also recommend regular exercise best suited to the individual.

With the doctor's advice, the hazards of sudden and unwise weight loss may usually be avoided . . . and weight reduction, in cases due to overeating, accomplished *steadily and safely*.

"Cheers for Chubby" is a new cartoon film on overweight. It was produced by Metropolitan, with the cooperation of the Public Health Service of the Federal Security Agency and the American Medical Association. "Cheers for Chubby" will be shown in theatres this year. Watch for it in your neighborhood.

For more information, write for Metropolitan's booklet, 551N, "Overweight and Underweight."

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The woodchopper with the big appetite

THE ivory-billed woodpecker, *Campephilus principalis*, America's rarest bird, now has a new lease on life. Thirteen hundred acres of Florida forest have been set aside to provide a sanctuary for the few ivorybills still left in the southern states.

Campephilus lives on the borers he digs from under the bark of trees which have died recently. And he needs lots of range. A pair of ivorybills, working together to feed a family, can strip the bark off all the dead trees in the neighborhood in a single nesting season. Then they must move on.

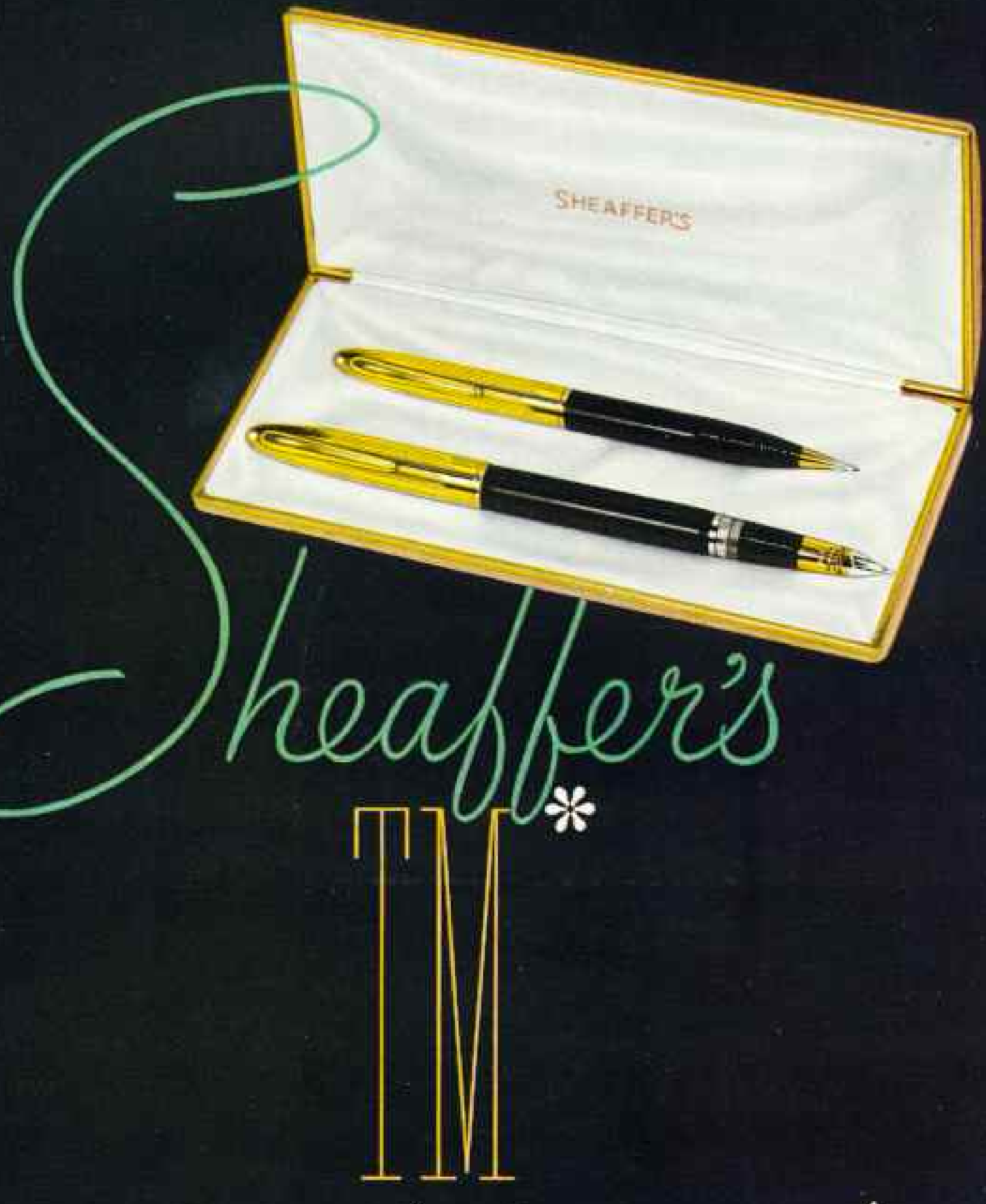
To keep eating, the ivorybill has to keep hacking away. If he runs out of dead trees, he meets with disaster—as he has already in deforested areas.

In this respect, the ivorybill is like the family man who has no insurance. Each is safe only so long as he can keep working.

If the man without Accident insurance trips on a bicycle left carelessly in his driveway and ends up in the hospital, he must dip into savings to keep his family fed until he is able to work again. And when he runs out of savings, he must borrow if he can, or be as helpless as an ivorybill with no dead trees to work on.

But with enough Accident insurance to bring a good-sized check each week, you'll be sure your family will keep on eating—sure your savings won't melt away.

As your Travelers agent or broker can tell you, accidents are happening these days at the rate of one every 5 seconds. So next time your Travelers man comes by, won't you let him tell you about the low cost of Travelers Accident Insurance?



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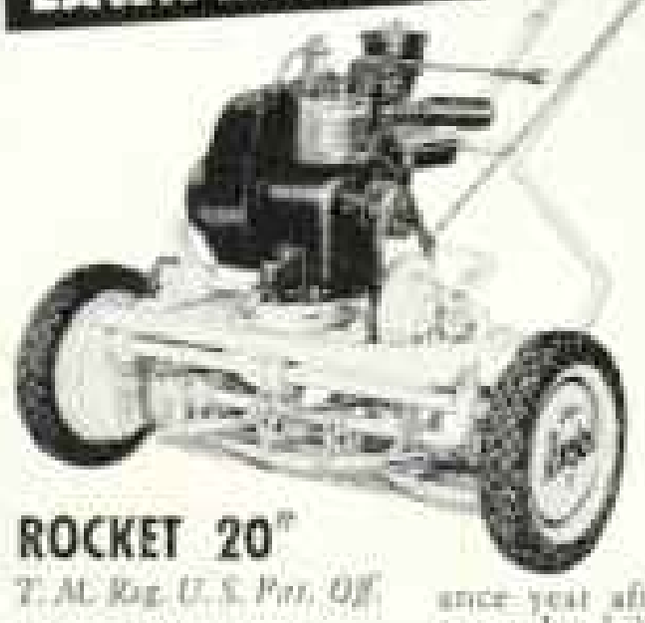

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