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Rhode Island, Modern City-State

With 11 Illustrations and Map
19 Natural Color Photographs

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With 19 Illustrations and Map

NANCY BELL FAIRCHILD BATES

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Rhode Island, Modern City-State

BY GEORGE W. LONG

With Illustrations by Staff Photographer Willard R. Culver

HIGH ABOVE the geographical center of the pocket-size State of Rhode Island and Providence Plantations we hovered in a throbbing, wingless, man-made bird.

"Higher!" I shouted to the helicopter's pilot above the engine roar. Nodding, he touched the controls, and up we shot, as in an elevator, several hundred feet.

"Observation platform," he shouted back, "but don't get out!"

With near-perfect visibility we could see the 48-by-37-mile length and breadth of this little State with the big name. It spread below us like a mottled green carpet, wrinkled in the northwest into low-lying hills. Smoothing southward, it met the wide Atlantic in a fringe of white beaches. Here and there, like scattered gems, glacier-gouged lakes and man-made reservoirs flecked the green with blue.

Eastward lay the broad expanse of long-fingered, island-dotted Narragansett Bay. Geologic ages ago the sea stole in and pilfered 100-odd square miles. In exchange it gave the future State a magnificent anchorage, set the stage for its early commercial prosperity, and made it world-famous for yachts and yachting (Plate II).

The pilot nudged me. Pointing through his queer craft's Plexiglas nose, he shouted, "That's Rhode Island!"

Urban Area Crowns the Bay's Head

I knew what he meant. Ahead, in a wide arc crowning the head of the Bay, was the State's densely populated, heavily industrialized nucleus. There half a dozen cities and towns merge into one large urban area, where two out of three Rhode Islanders live. From

its center rose a cluster of tall office buildings and the gleaming marble dome of the Statehouse in Providence.

Probably no other American city is so much the big frog in the small puddle. Providence, New England's second city, is the State's capital, industrial giant, chief seaport, and its financial, medical, and cultural center.

Any corner of the State can be reached by car within 75 minutes from the Statehouse, and 90 percent of its people live within a 15-mile radius of that classic building. When Rhode Islanders say they are going "down city" or "to the city," they mean Providence. Rhode Island, like the small States of classic Greece, is a city-state.

Founded for Religious Freedom

But that is a modern development. In 1636 Roger Williams, fleeing Puritan Massachusetts, founded a settlement at the head of the Bay and named it "in commemoration of God's providence." To all men it granted "full liberty in religious concerns."

Seeking that liberty, others found this haven on the Bay. One group, led by William Coddington and the courageous Anne Hutchinson, settled Portsmouth and Newport, on opposite ends of the largest Bay island. Another, under Samuel Gorton, founded Warwick, on the Bay's west side. These first towns, settled by refugees of independent spirit, distrusted central control; each preferred "to get clear and be of ourself."

To hold the struggling settlements together Roger Williams went to England in 1643 and brought back a charter from Parliament. It incorporated the towns under the name "Providence Plantations."

About then, Newport's town fathers voted that "this ysland, commonly called Aquidneck, shall be from henceforth called the Isle of Rhodes, or Rhode Island."

They followed the lead of Italian navigator Giovanni da Verrazano, who cruised these shores in 1524. He had reported an island "in size about equal to the island of Rhodes." Probably he referred to offshore Block Island, but the name stuck to the island where Newport stands (map, page 141).

Smallest State Has Longest Name

With the return of the Stuart kings in 1660, the colony sent Dr. John Clarke to England for a new charter. Being a Newporter, he had the colony incorporated as "Rhode Island and Providence Plantations," still the State's official name. In its usual shortened form the name harks back to a faraway Mediterranean island; in its proper, compound form it reflects the local loyalties of long ago.

As recently as 1900 this smallest State had two capitals. For many a year its General Assembly "rode circuit," meeting in turn in half a dozen towns to make the colony's laws. Later it confined its sessions to Newport and Providence, and only the completion of the Statehouse in Providence marked that city's final dominance (Plate I).

Atop the Statehouse dome, high above the swirl of modern traffic, is an allegorical bronze figure, the Independent Man.

"He's the symbol of our history," a young Providence man told me. "From Roger Williams on, we've been an independent people; jealous of our rights but tolerant of others'."

"Long before Lexington the British found us hard to handle. For instance, one dark night in 1772 some leading Providence citizens blacked their faces and boarded and burned the British revenue sloop *Gaspee*, grounded in the Bay. Some people say it was a curtain-raiser of the Revolution.

"Not only that," he went on, "but we were the New World's first independent State. On May 4, 1776, two months before the Philadelphia Declaration, the General Assembly declared Rhode Island's independence. May 4 is our Independence Day; it's a legal holiday here.

"And we stayed independent longer than any other colony. Maybe you know what a struggle it was to get us to join the Union! We came around only when Congress began to treat us like a foreign state, more than a year after Washington took office."

We talked on about the State's eventful past and her favorite sons—Nathanael Greene, second in command of the Continental Army;

Oliver Hazard Perry, victor in the Battle of Lake Erie; his brother Matthew, who opened Japan; Gilbert Stuart, painter of Washington portraits (page 158); William Channing, "apostle of Unitarianism"; George H. Corliss, ranked with Watt in the development of the steam engine; Senator Nelson Aldrich, "general manager of the United States" in the early 20th century; and others.

When I commented on my friend's knowledge of his State's history, he grinned.

"Lay it to the war—and Texas," he said. "I was stationed there for two years. Texas is more than 220 times as big as Little Rhody, and many a Texas county is larger than this whole State. So I *had* to study up."

Sea-borne Commerce Brought Prosperity

In the city of Roger Williams we began our on-the-ground scrutiny of Rhode Island.

For almost a century after 1636 it remained a struggling farm village. Then her sons took to the sea, trading with the West Indies and privateering in England's wars with France. By 1775 Providence was a busy port; masts were thick in its sheltered harbor.

After the Revolution her merchants, led by the four Brown brothers, reaped handsome profits, but about 1807 war and the embargo ended the heyday of this golden commerce.

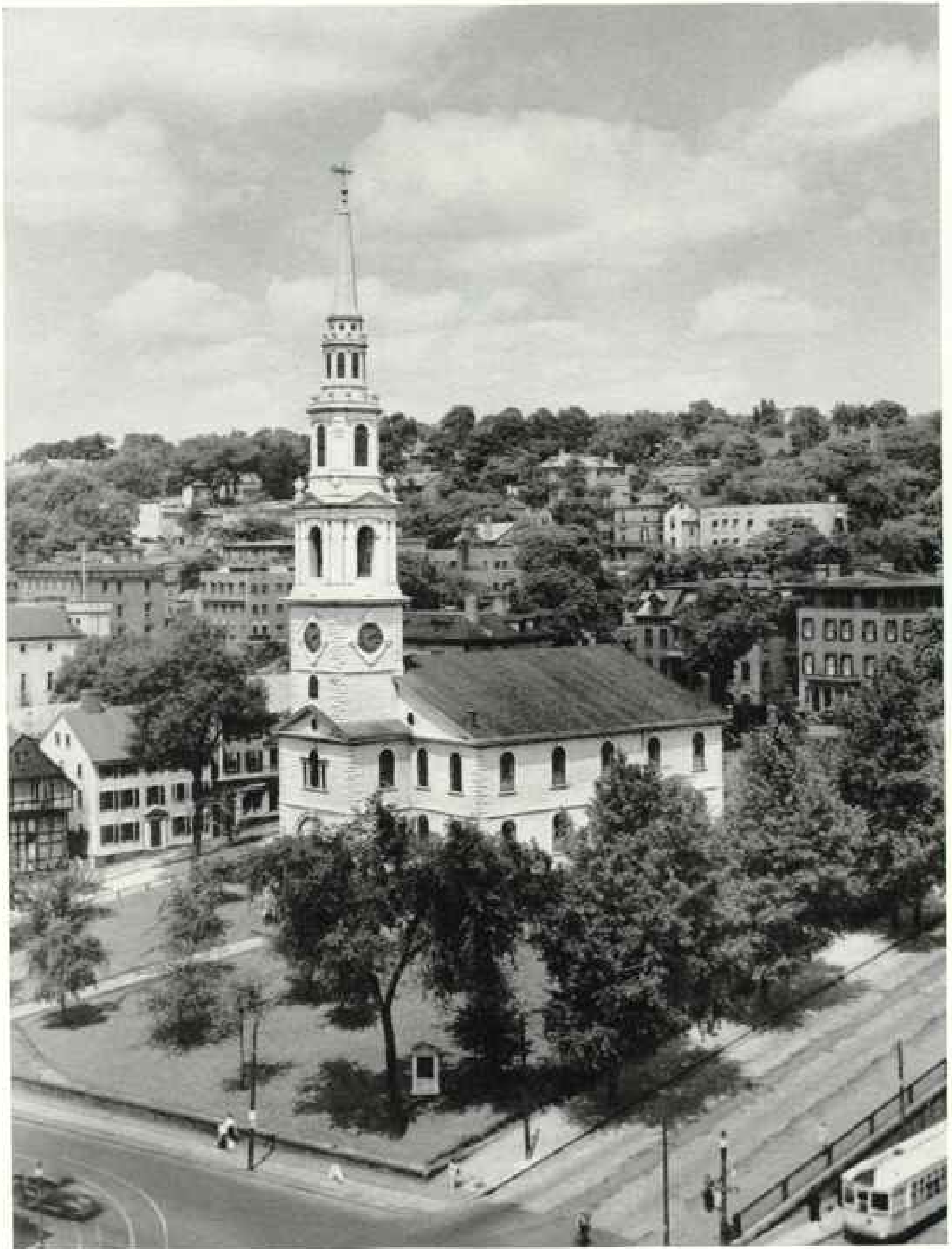
Some years before, shrewd Moses Brown had toyed with the idea of spinning cotton by machine. In near-by Pawtucket he vainly tried to build machines that would work. In 1789 he received a letter from a newly arrived English textile worker, Samuel Slater, modestly offering help. Answered Quaker Moses: "If thou thought thou couldst perfect [the machines] and conduct them to profit, . . . come and do it."

Slater came, saw, and made from memory workable copies of Arkwright's English machines. Installed in a small wooden mill on the Blackstone River's banks, they ushered in America's machine age and set the industrial pattern of this modern city-state.

Silent now, the mill stands in Pawtucket, looking, with its small-paned windows and belfry, like a New England village schoolhouse.

War and embargo, which killed Rhode Island commerce, breathed life into its infant industry. Commerce-created capital built the mills which mushroomed along short, swift rivers, and the whir of factory wheels replaced the hum of wind in the rigging of ships.

With industry came immigration, chiefly from Great Britain, Ireland, French Canada, and Italy, until in 1910 one in every three Rhode Islanders was foreign-born. Today the ratio is about one in five.



A Village Church in the City Houses the New World's First Baptist Congregation

Since it was organized by Roger Williams in 1638 the Providence group has had a continuous existence. In 1775 it built this meetinghouse "for the Publick Worship of Almighty God, and also for holding Commencement in." Since then, Baptist-founded Brown University has held year-end exercises in it. The graceful steeple is from an unused design for St. Martin's-in-the-Fields, London. Built by ship carpenters, it withstood the hurricanes of 1815 and 1938.



Family Rivalry Inspired "The Breakers," Queen of Newport's Palatial Summer "Cottages"

Early in the gay nineties Mrs. W. K. Vanderbilt erected her magnificent "Marble Palace." With this mansion Mrs. Cornelius Vanderbilt, her sister-in-law, soon eclipsed it. From 1890 to World War I, Newport was the fabulous summer social capital of New York's glittering 400. Empire builders spent kings' ransoms on Newport show places. What will become of the largest mansions now is the local \$64 question (page 160).

Rhode Island packs its people in 674 to the square mile, compared with the national average of 44. About 92 percent of the people are classed as urban dwellers. Yet only in the Providence area and the Blackstone and Pawtuxet Valleys is there a sense of crowding.

Two-thirds of the State's land is classed as forest area, and in rural townships population may average as little as 10 to the square mile.

A Highly Industrialized State

Today Rhode Island is this Nation's most highly industrialized State. Manufacturing engages nearly half its workers and accounts for almost three-quarters of the total pay roll. Its 1,700 factories carry on more than 100 types of manufacturing, and Rhode Island products by the score have won national or international prestige.

Big Four of Rhode Island industry are textiles, machine tools and metal goods, jewelry and silverware, and rubber products. Giant

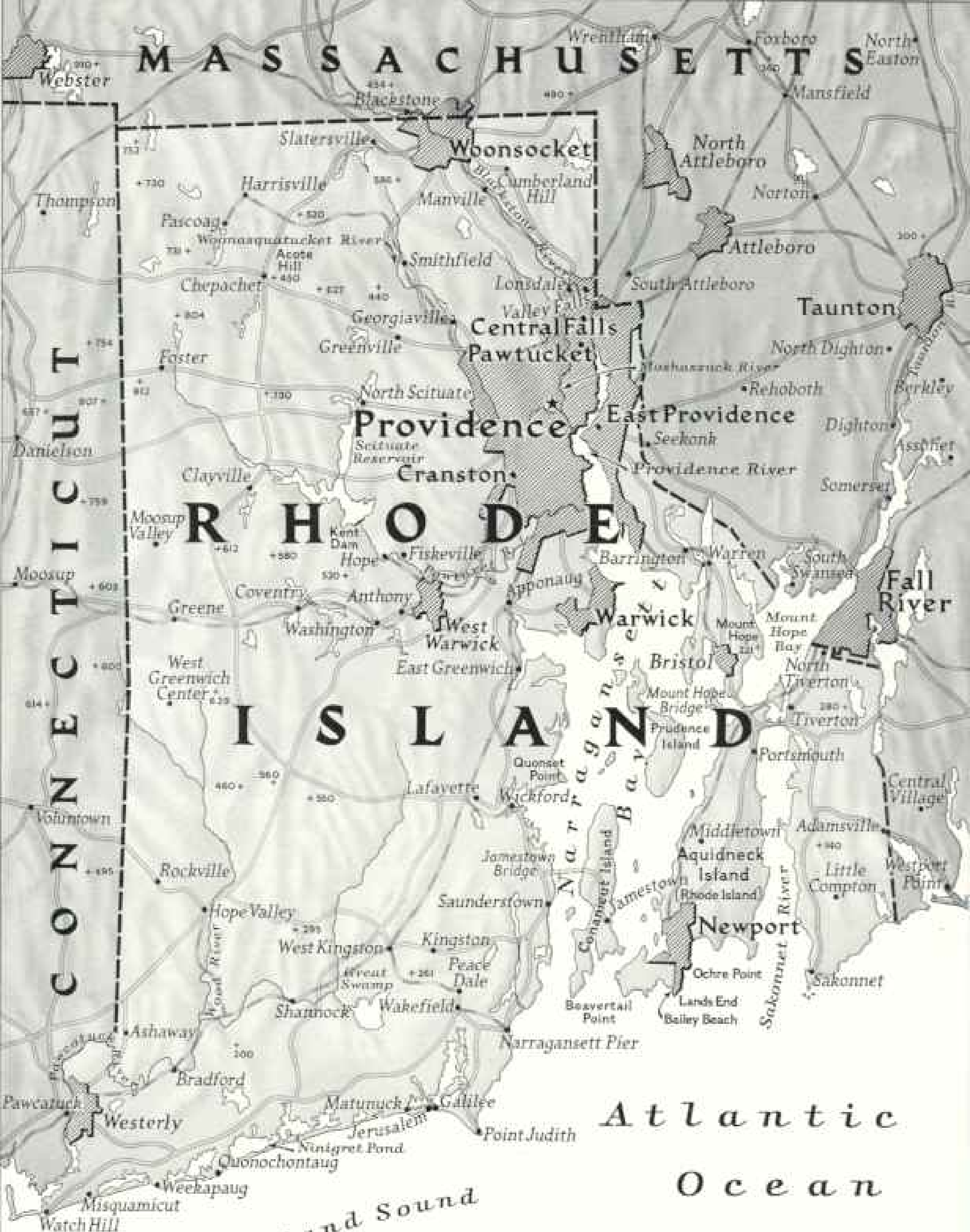
of these is textiles, for more than half the State's industrial workers punch the clock in its 350 textile and related mills.

Many employees "have the lint on their shoulders"—are third- and fourth-generation textile workers. With skill they handle practically every known fiber, natural and synthetic, though by far the most important are men's worsteds and other woolens (Plate XI).

Most of our domestic lace is made in Rhode Island, where 60 percent of all the Levers lace machines in America are located. I watched a score of these mechanical monsters, weighing up to 33,000 pounds and guided by pattern cards punched like player-piano rolls, produce incredible wisps of lovely lace.

Each machine takes two men from ten days to two weeks to thread. Ready to go, each contains more than 11,000 threads, which, if tied together, would span the country twice.

I saw Yankee mechanical skill aplenty in Rhode Island's foundries and machine shops,

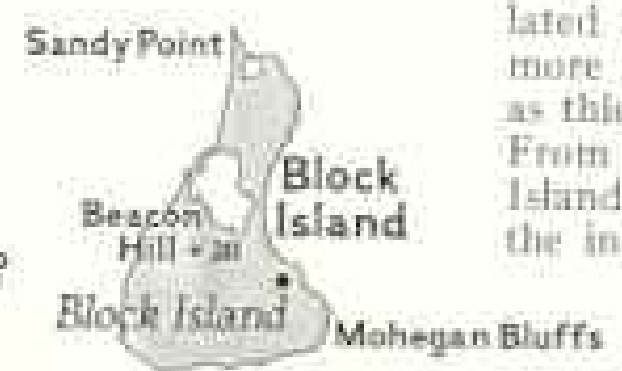


Block Island Sound

Atlantic Ocean

Rhode Island—Smallest of the 48

The Nation's most highly industrialized and densely populated State measures only 48 by 37 miles. Giant Texas is more than 220 times as large. If the Lone Star State were as thickly settled, Texans would number nearly 178,000,000! From deep, island-studded Narragansett Bay early Rhode Island ships sailed the seas. Capital from commerce started the industries that feed its people.





With a Stone-wall Tablet Rhode Island Honors Its (Nonpolitical) Reds

Far and wide the little State's red hens are known as splendid layers and excellent table fowl. Their origin goes back more than a century to southern New England's farm-reared whaling captains who brought strange red- and black-plumaged fowl called Shanghais, Great Malays, and Javas home from the Orient. Capt. William Tripp of Little Compton and a friend, crossing them with Cochin Chinas, Light Brahmas, Plymouth Rocks, and Brown Leghorns, produced the celebrated Rhode Island Red. The bronze tablet stands in Adamsville.

They turn out a bewildering variety of indispensable metal items from screws to sprinkler systems and are noted for textile machinery, precision gauges, and machine tools.

In Providence's world-famous Brown & Sharpe Manufacturing Company I saw the sleek machines they make, marvels of functional design, performing with near-human intelligence and more-than-human precision.

At another Providence concern, a nationally known maker of mechanical, electronic, and air gauges, we saw the ultimate in industrial precision. On an air gauge resembling a physician's blood-pressure indicator engineers were measuring wrist pins for one of America's largest auto manufacturers.

"How exactly does it measure?" I asked.

"Half an inch on that 'thermometer' equals 1/10,000 of an inch—roughly 1/25 the diameter of an average human hair," my guide

answered. "On this type gauge we can read variances of 1/40,000 of an inch.

"And that," he added, "is splitting the hair 100 times!"

Costume Jewelry Capital

From machines and precision we turned to glitter and glamour, for Providence is America's costume jewelry capital. Its hundreds of jewelry establishments turn out a radiant flood of decorative pieces which retail anywhere from a dime to \$100. Providence and near-by Attleboro, Massachusetts, make 90 percent of the costume jewelry produced in the United States.

For this, Providence can thank enterprising Nehemiah Dodge, goldsmith and watch repairer, who set up shop there in 1794. He developed a method of plating base metals and created what amounted to a mass pro-



Golf Balls by the Millions Ride This Conveyor on Their Way to the Nation's Tees

Nearly a thousand spotless U. S. Royals are visible here at the trademark-lettering station in the U. S. Rubber Company's Providence plant. Before reaching this point they have passed a battery of exacting tests, including X-ray. Rubber is busy Rhode Island's fourth biggest industry. Products from its 17 rubber plants range from infants' nipples to giant tank linings.

duction business. By 1880 Providence led the Nation in producing the less expensive types of jewelry.

About 15 years ago the business struck its Klondike. During the depression some precious-jewelry craftsmen changed to mass production houses and raised their standards fast and far. The world of glitter was revolutionized; costume jewelry became the thing. Sales zoomed, fortunes piled up, and today the business is a shining cog in Rhode Island's industrial machine (Plate V).

In 1818 Jabez Gorham, a former apprentice of Dodge, opened a modest shop in Providence and later specialized in silver spoons. His son John, among the first to use machines to work precious metals, lived to see the Gorham Company one of the world's largest producers of sterling silverware.

Today in its 33-acre Providence plant 1,000-ton presses and other machines roar

and clatter, but in designing, die cutting, chasing, and the finishing of hollow ware highly skilled hands do the job. I watched them work, these men and machines, and saw their shining, artistic creations. Craftsmanship, I found, had held its own.

Less known, but famous in its field, is the Gorham bronze-casting division. More than 120 well-known Gorham bronzes, such as Augustus St. Gaudens' Lincoln, in Chicago, memorialize American ideals and heroes in 31 States and the District of Columbia. Others stand in Canada, England, France, Iceland, and Argentina (Plate IV).

From Rhode Island's 17 rubber plants flows a vast flood of products for modern living. In the U. S. Rubber Company's highly diversified Providence plant we saw giant wads of rubber, crackling like rifle shots, kneaded and cooked between enormous rollers. From the production lines came an amazing assort-

ment—soles and heels by the millions, gloves, bathing caps, hot-water bottles, Lastex yarn, sheeting, golf balls, and 40 more items (p. 143).

The State "Lives by Its Wits"

"Rhode Island lives by its wits," her people say. Other States have vast mineral deposits, wide stands of timber, miles of fertile fields, or luxuriant grazing lands. Rhode Island has none of these. Yet, without a single important natural resource, it supports more people per square mile than any other State.

Its factories reach far and wide for raw materials, converting them into quality products which add more than half a billion dollars to our manufactured national wealth. Most of its factories are small; many are family businesses in which industrial know-how has accumulated through several generations.

A Pittsburgh man, probing the possibility of weaving ramie fibers into cloth, summed it up when he said: "When I need a doctor, I'll get the best. When I'm in need of expert textile work, I come to Rhode Island." As much might be said of many another Rhode Island industry.

In its farming youth, Providence Plantations covered most of the northern part of the State. Today the city squeezes into some 18 square miles, a bewildering pattern of factories, historic landmarks, and educational institutions. Providence conforms to no regimented plan; its small area magnifies its many contrasts.

Like Boston's Back Bay, the city's center stands on made land. Long ago the Moshassuck and Woonasquatucket Rivers flowed from north and west into a wide cove, which emptied via the short Great Salt River into Narragansett Bay. As commercial town grew into industrial city, the rivers were canalized and the cove was filled. Great Salt became the noisome Providence River, partly covered in its downtown section.

Most of the city's tall buildings and its central square and railroad facilities stand where early citizens sailed and fished (Plate VIII). Just north, the handsome Statehouse crowns a green hill.

To the south are the busy shopping section's traffic-tangling streets. Eastward, across the half-concealed river, historic Providence climbs the steep ascent of College Hill.

Here the first refugees staked out house plots and lengthy Towne Street along the river. Later, merchants built mansions high on the "Neck," as they called the East Side. Less pretentious clapboard homes nestled into its slope. Warehouses, stores, and counting-houses lined street and river.

To much of the East Side the years have been kind. The city's industrial growth passed it by; time stood still. Spacious colonial mansions, lovely doorways, and brick-walled gardens remain. Elm-shaded streets bear such names as Hope, Benevolent, and Benefit. Walking their brick sidewalks, the visitor steps back into earlier, less hurried centuries.

I rode shanks' mare to explore the Neck. Along the city's first street many a historic house, jacked up to admit a store below, stood stranded by the high tide of a business that had ebbed across the river. Alleys with names such as Guilder, Sovereign, and Doubloon suggested the old Indies trade. On a side street I found the modest home of Stephen Hopkins, ten times governor and a signer of the Declaration of Independence.

"My hand trembles, but my heart does not," he said when, with palsied hand, he wrote his name.

Flanking the foot of steep College Street are the imposing Providence County Courthouse and the nationally famous Rhode Island School of Design (Plate V).

Before them is Market Square, the colonial town's civic center. Here, on March 2, 1775, the "Independent Man" burned 300 pounds of British-taxed tea. The old Market House, built in 1774, stands restored but empty. On an exterior wall bronze plaques mark the levels floodwaters reached in the city's greatest catastrophes, the Great Gale of 1815 and the hurricane of 1938.

Remote is the Great Gale, its memory preserved only in plaques and old prints. Real and vivid is the hurricane which smashed the Rhode Island coast 125 years later and funneled a raging flood tide into the heart of Providence. Angry Bay waters, whipped by 90-mile-an-hour gales, swirled six feet deep in downtown sections. Throughout the State some 300 lives were lost, and property damage reached \$100,000,000.*

Firm through gale and hurricane stood the graceful spire of the First Baptist Meetinghouse, built by ship carpenters in 1775. This New England meetinghouse is, in a sense, the mother church of American Baptists, for here in 1638 Roger Williams organized the New World's first Baptist congregation (page 139).

Rhode Island's "Independence Hall"

Farther along stands the old Independence Hall-like Statehouse, cradle of Rhode Island independence. Here for 139 years the General Assembly held its Providence sessions;

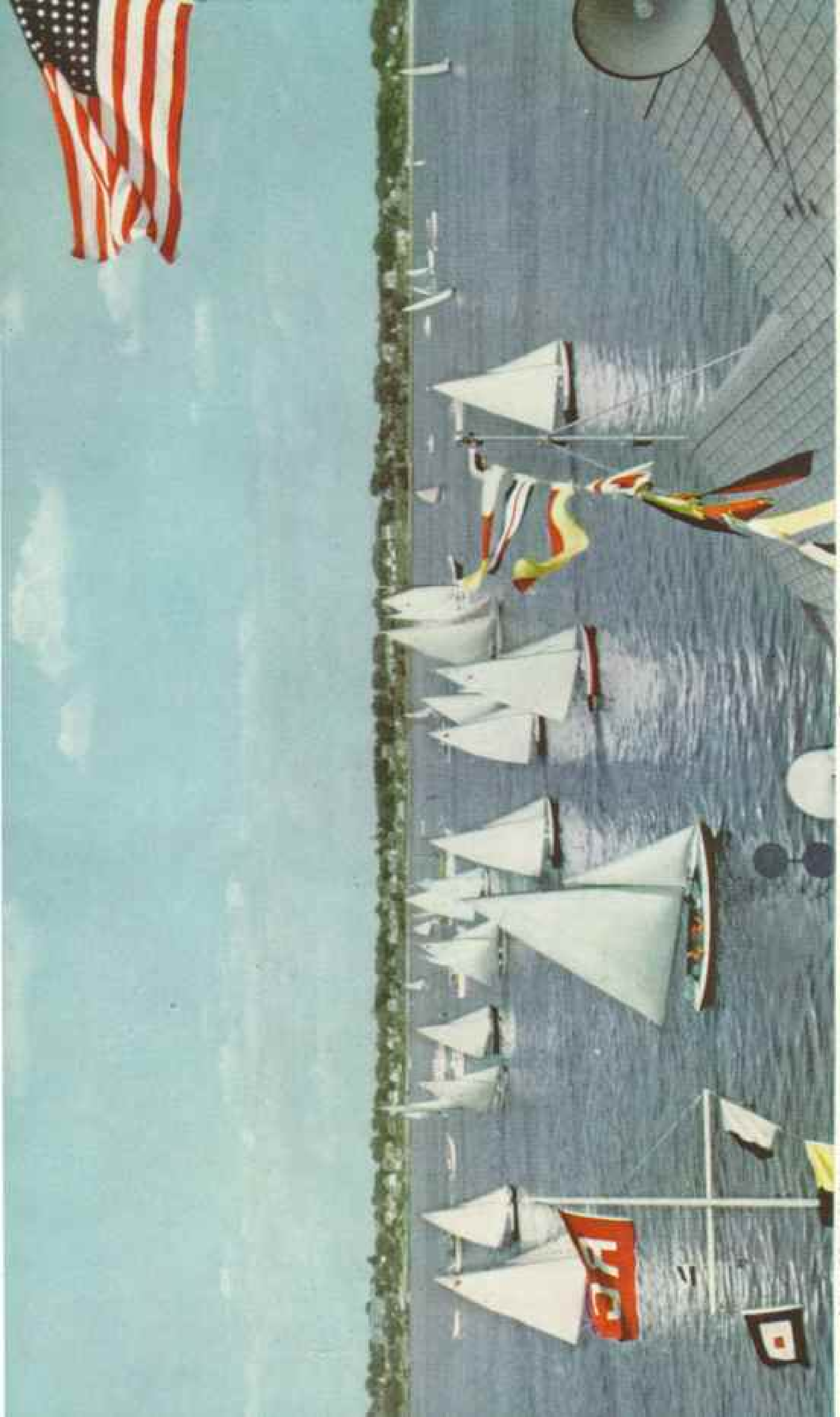
* See "Geography of a Hurricane," by F. Barrows Colton, NATIONAL GEOGRAPHIC MAGAZINE, April, 1939.



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Reproduction by Willard H. Culver

In Providence, Roger Williams Gazes at the Marble Capitol of the City-State He Founded. Rhode Island packs its 713,000 citizens 674 to the square mile. Ninety percent of them live within 15 miles of the domed Statehouse. Many American counties are larger than the Union's smallest State.



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Narragansett Bay, Which Old-time Square-riggers Called "Home," Launches a New Argosy of Sails
On a week-end hundreds of small craft dot these waters. Here 24-foot "Inlanders" start a race at the Rhode Island Yacht Club.

Reproduction by Willard B. Cutler

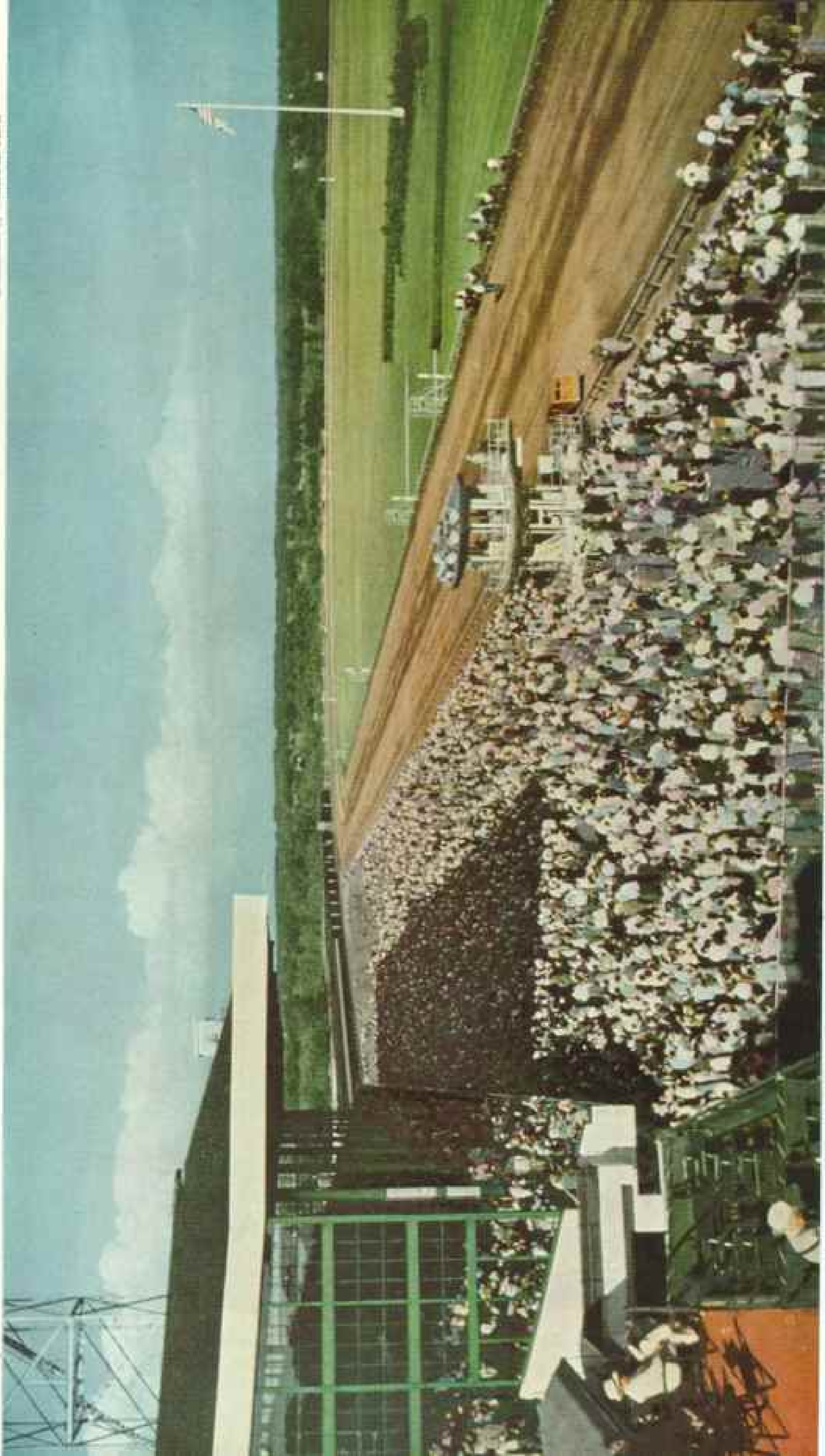
A Shirt-sleeved Crowd of 38,000 Jams Narragansett Park, Pawtucket, for Autumn's Opening Race

One of the Nation's top tracks, Narragansett attracts more than 850,000 fans yearly in 60 spring and fall racing days. Their bets total nearly \$55,000,000. These horses are parading to post on Labor Day, 1947.

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III

Illustration by Willard H. Carter





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IV

Illustration by Willard R. Carter

Yankee Rhode Island Casts a Gleaming Memorial to the Confederacy

Sculptress Laura Gardin Fraser oversees work in the bronze-casting division of the Gorham Company, Providence. The assembly is part of her double equestrian statue to Generals Lee and Jackson. It now stands in Baltimore.



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Illustration by Willard H. Oliver

★ Students at Rhode Island School of Design Work Out an Architectural Problem

In 70 years the Providence school has grown from a handful of pupils to 750 working for degrees. Function, structure, color, and texture propound questions for these two.

Providence and Near-by Areas Make 90 Percent of America's Costume Jewelry

The depression of the 1930's, making precious jewelry hard to buy, created riches for this glittering business. Its wares are priced from a dime to \$100. These pins have just been gold-plated.





Newport's Bailey Beach: Storied Summer Playground of New York's "400" in the Gilded Age

Here, in the 1910s, industrial lords appeared in bathing suits, straw hats, and motorcars; their wives carried parasols.

Newport's Rock-bound Cliff Walk Proceeds Past Miles of Velvety Lawns, Stately Mansions, and Pounding Surf

Ninety years ago land south of the town was pasture. Shortly after the Civil War Newport promoters sold visiting New Yorkers on building their own summer places. Multimillionaires vied with one another in the splendor of their palatial "cottages." On a week end amateur fishermen cast from these rocks. Laws dating from 1640 protect their rights and keep the walk open to the general public.

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Illustration by Willard H. Carter





Trackless Trolleys Make Their End-of-the-line Loop in the Hub of Providence

Exchange Place sits on artificial land made by filling a wide cove where early settlers sailed and fished. Union Station (left) and the marble Statehouse overlook the square (Plate I).

here it voted to break with Great Britain.

East Side merchants and later industrialists shared a sense of civic pride, a love of fine homes, and the habit of collecting.

From all three their city benefited. Half a dozen colleges make Providence one of New England's important educational centers, but it was Moses Brown and friends who first made it a university town. They raised the funds that brought Baptist-founded Rhode Island College from Warren to Providence in 1770. In 1804 it became Brown University in recognition of a gift from Nicholas Brown.

This seventh oldest American college was to academic freedom what Roger Williams was to religious liberty, for 184 years ago its charter boldly stated: "All members hereof shall forever enjoy full free absolute and uninterrupted Liberty of Conscience."

Between 1785 and 1815 East Indies trade built on the hill a dozen fine foursquare mansions. Stepping out of this world into the gas-lit Edward Carrington House, I saw how a prosperous merchant lived 135 years ago. Imported wallpaper, Oriental works of art, Canton china, and leather-bound geographies breathe an air of foreign places.

Near by is the John Brown House, which John Quincy Adams described in 1789 as "the most magnificent and elegant private mansion I have ever seen on this continent."

Today John Brown's mansion houses the extensive library and collections of the Rhode Island Historical Society, including letters and the sundial-compass of Roger Williams. On a wall hangs the curious apple tree root found in his grave. It grew down his backbone, separated, and followed his extremities to the big toes.

Priceless 15th-century First Editions

Inside the bronze doors of the Annmary Brown Memorial priceless first editions from Europe's earliest presses are preserved. Mellowed but undimmed by nearly five centuries, they trace the early spread of the printer's art throughout Europe.

Cornerstone of this, one of the world's great collections of incunabula, are the books which contain six of the eight known statements printed before 1500 which attribute the invention of printing to Gutenberg.

In the special John Carter Brown Library, just inside the University gates, is a book exhibit that would bulge the eyes of any geographer. Part of an outstanding collection of pre-1801 Americana, it tells in centuries-old print the exciting story of the Age of Discovery by those who took part in it.

Among other rarities are a 1493 copy of

Columbus's letter to the royal treasurer, reporting his first voyage; the first printed form of the papal Bull of Demarcation dividing the New World between Portugal and Spain; an account of Amerigo Vespucci's voyage to South America, and a 1507 copy of Waldseemüller's geography which introduced the name "America"; the first printed account of Magellan's epic globe-circling expedition by one of its 18 survivors; and firsthand accounts of the conquests of Mexico and Peru.*

Near by, the University's main John Hay Library houses among its 700,000 volumes a mathematics library among the world's twelve best. Special groups include American poetry and plays, Napoleonic items, and an important Lincoln collection.

Familiarity Breeds—Appreciation

Travelers on the 60-odd trains which pass through Providence daily or vacation-bound motorists irked by the old city's narrow streets see little of its charm. Its discovery requires a longer acquaintance.

From city we struck out into State—north first, up the Blackstone Valley. In most parts of the Union Rhode Island towns would be called townships. Varying from six to 60-odd square miles, each contains a number of populated centers called "villages."

Some towns contain a village of the same name; others do not.

To a stranger it is confusing. When I visited the lovely home of Revolutionary general Nathanael Greene, I asked the caretaker its exact location. Smiling, he replied, "You're in the village of Anthony in the town of Coventry in the State of Rhode Island and Providence Plantations."

Jaw-breaking Indian names are sprinkled generously throughout the State. A friend told me of being accosted in a southern Rhode Island town by the driver of an out-of-State car, who was looking for a near-by beach, "the one with an Indian name."

"Matunuck, Quonochontaug, Weekapaug, or Misquamicut?" my friend asked.

Whereupon the driver turned to his friends and said in disgust, "He doesn't speak English."

Cutting across the State's northeast corner, the heavily industrialized Blackstone River Valley is New England's most densely populated watershed. After Slater's success, textile mills mushroomed beside its every fall.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Greatest Voyage in the Annals of the Sea (Magellan)," by J. R. Hildebrand, December, 1932; and "On the Cortés Trail," by Luis Marden, September, 1940.



The "Stone-ender" Was Early Rhode Island's Answer to Its Housing Shortage

Pioneer settlers spreading out from Providence developed this type of sturdy story-and-a-half house. They anchored its oak frame to a huge stone fireplace, which often served as one entire end. Near-by Massachusetts and Connecticut colonists raised their homes around a massive central chimney. This is the restored Thomas Clemence house near Providence, built shortly after King Philip's War made many homeless (1675).

River and valley are named for eccentric William Blackstone, first white settler of Rhode Island—and Boston. Cambridge graduate and Anglican clergyman, he came to New England in 1623 with a group who tried to settle near Boston's present site. When the others left, Blackstone moved to Beacon Hill and built a house. In 1635, five years after welcoming the Puritans, he moved southwest and settled near present Lonsdale.

There he lived for 40 years among his books, tending his apple trees and roses.

Astride a milk-white bull, tossing rosy apples to children, he traveled occasionally to Boston, whence he brought back a wife, and to Providence to "dispute" religion with Roger Williams.

In Valley Falls we left the modern world behind when we visited one of the six monasteries in the United States of the Cistercian Monks of the Strict Observance.

Here 120 white-cowled monks and brown-

robed brothers follow austere monastic rules laid down by St. Benedict in the sixth century. Known as Trappists, they eat no meat, observe silence, and fill a 17-hour day with prayer, study, and manual labor.

Hard by the Massachusetts border, at the valley's other end, is the State's northern city—industrial, French-flavored Woonsocket. Its \$100,000,000-a-year production follows the Rhode Island pattern—textiles, machinery, rubber wringer rolls. In 1900 French capital built several large woolen mills there.

French companies attracted French-Canadian workers. Today they make up three-quarters of the population. Woonsocket, as its French-descended people say it, has French newspapers, movies, and radio programs; store clerks need to be bilingual. Often French and English mix in a hybrid tongue; at a baseball game an excited fan may yell, "Frappe un home run, Joe," or "Attends un base on balls."



Once a Year Wickford's Old Narragansett Church Uses Its Cherished Queen Anne Silver

Built as a mission in 1707, the church is the Anglican faith's oldest north of Mason and Dixon's line. The next year the Queen gave it a silver chalice, paten, and christening bowl. Chalice and paten are used at a special service on the first Sunday in August. A Newport craftsman made the tankard in 1734. The prayer book, printed in 1710 and bearing the Queen's cipher, is believed to have been used in an English royal chapel.

With a Providence man I toured the sparsely settled ridge-and-valley northwest. Cattle grazing in rock-ribbed pastures, orchards bowed by fruitful yields, hilltop villages with church and grange, fields of tasseling corn, and wide stretches of scrub forest blended in a photomontage of rural countryside.

But even here industry is not to be denied. Tucked into narrow valleys, busy mill towns swell the State's industrial outpouring.

On the Verge of Civil War

In Chepachet we paid our respects to fighting liberal Thomas Dorr, who in 1842 led the struggle to replace the royal charter of 1663 with an up-to-date constitution. His People's Party drew up a new document and elected him governor. The government refused to recognize such goings on and chose its own governor. Then the Dorrites tried to seize the Providence arsenal, but failed when their museum-piece artillery, captured at the

Battle of Saratoga in 1777, failed to fire.

Later they entrenched themselves here on Acote Hill. Faced by the grim prospect of civil war, their forces melted. But Dorr won, for a State convention met in the East Greenwich Methodist Church and made a new constitution which, with amendments, still serves. Neither easily nor often do Rhode Islanders replace their fundamental law!

From western hills we coasted east to towns and villages across the Bay. While independent, Plymouth Colony claimed this deep-indented shore, and Pilgrim sons and daughters settled it.* In 1746 the king gave most of it to Rhode Island, and a land swap with Massachusetts in 1862 added the rest.

In annexing what is now East Providence, Little Rhody acquired historic land, for there Roger Williams first broke soil. Warned away by Plymouth, he paddled his canoe

* See "Land of the Pilgrims' Pride," by George W. Long, NATIONAL GEOGRAPHIC MAGAZINE, AUGUST, 1947.



A Bristol Girl Picks the Strange Fruit of Her Father's Hobby

As a reminder of his youth in sunny Italy, James Raiola tried growing fig trees several years ago. Despite New England's alien climate, a thrifty orchard now crowds his yard and yields half a dozen bushels of fruit each summer. To "winterize" the tender trees, he plants them at an angle, bends their supple limbs to the ground, and covers them. All survived last winter's bitter weather.

around to Great Salt River and began again.

Exploring this eastern shore, we enjoyed an ever-shifting scene. Factories mark its larger, northern towns, but tree-lined side roads wind past thrifty dairy farms, colonial homes, and attractive suburban developments. Seldom did we lose sight of salt water and fleets of small craft moored in sheltered coves or sailing the broad expanse of bay. Signs everywhere advertised clams and clam cakes, quahogs, and lobsters, for along Rhode Island shores sea food is king.

On its lobster-claw peninsula between Narragansett and Mount Hope Bays, quiet

Bristol bespeaks a salty past. Sea money built the fine old homes which give it a reputation for architectural treasures surpassed by few towns in America.

For 160 years Bristol square-riggers, schooners, packets, and whalers brought fame and wealth to this port, once fourth busiest in these United States.

As elsewhere, the first tolling of the bell atop Slater's mill sounded the death knell of Bristol shipping (page 138). But boats built in "ship-shape and Bristol fashion" were to carry their fame to greater heights in the world of yachting.

In 1863 blind John B. Herreshoff opened a boatyard in Bristol. In 1893 he and his brother Nathanael designed and built the bronze sloop *Vigilant*, which won the coveted honor of defending the Holy Grail of racing yachtsmen, the *America's Cup*. She defeated *Valkyrie II*, the British challenger, in straight races, and from then to the last race series in 1934 Herreshoff-built yachts successfully defended the cup against every challenger.

Crossing the high, wide, and handsome span of Mount Hope Bridge to Portsmouth, we saw the hill which gives the bridge its name. On its sunny slope Massasoit, sachem of the Wampanoags and Pilgrim benefactor, lived at peace with white men. And there his son, King Philip, fell with a bullet in his heart after waging war against his father's friends.

Seaside farms, where green pastures, stone walls, and cultivated fields reach to the water's edge, have always intrigued me. In southeastern Rhode Island, mainland and islands combine salt water and fertile acres into especially attractive sea-landscapes.



U. S. Navy, Official

Deep, Sheltered Narragansett Bay Is Home to Half of Uncle Sam's Atlantic Fleet

Carriers *Leyte* and *Philippine Sea* (background) dock at the U. S. Naval Air Station, Quonset Point (page 160). To help carriers warp into dock, planes spotted on the after flight deck sometimes conduct "Operation Pinwheel." If planes in starboard line "rev up" motors, the carrier's stern is pulled to port, as if by a tug.



Here Gilbert Stuart, Sr., Ground Snuff for Southern Rhode Island's Colonial Bigwigs

In a first-floor bedroom above this mill, near Saunderstown, his namesake was born in 1755. Young Stuart went to England, studied under Benjamin West, and won fame as a portrait painter. About 1792 he returned and painted young America's aristocracy. Specializing in Washington portraits, he made the first President familiar to generations of Americans. Stuart Washingtons appear on dollar bills and \$25 U. S. Savings Bonds and have graced numerous postage stamps. This 170-year-old water-powered mill was brought from England and installed on the original mill's foundations in 1952.

Many a local lad left farm for sea. One was Capt. Robert Gray, whose old home we visited in Tiverton. First to sail the American flag around the world, he entered and named the Columbia River in 1792 and gave the new United States an important claim to the Pacific Northwest.*

Monument to an "Indefatigable Fowl"

In Adamsville we found a monument—not to soldier or statesman but to that "indefatigable fowl," the Rhode Island Red, which has carried the State's name far and wide (page 142).†

From the fishing village of Sakonnet we looked across to near-by Newport, on the end of the Island of Rhode Island. Unlike slow-to-trade Providence, early Newport broke ground with one hand and built ships with the other. Its location soon made the town

a New England Venice, dependent on ships for its place in the sun.

By 1675 a sizable fleet carried local products to the Spanish Main and Europe. A few years later, merchants boarded that rich commercial merry-go-round, the slave trade. Soon busy "distills" were changing seas of sticky West Indian molasses into potent New England rum. Newporters bartered it for blacks on Africa's hot, fever-laden Slave Coast, selling them for more molasses in the southern islands. Round and round they went, catching at each turn the gold ring of profits.

Jewish refugees, arriving as early as 1658, made money in general commerce, whaling,

* See "Columbia (River) Turns on the Power," by Maynard Owen Williams, NATIONAL GEOGRAPHIC MAGAZINE, June, 1941.

† See "Races of Domestic Fowl," by Morley A. Jull, NATIONAL GEOGRAPHIC MAGAZINE, April, 1927.



Old World Skill Created This Storybook Menagerie in an Old Portsmouth Garden

With California privet the Portuguese gardener of Miss Alice Brayton turned her 140-year-old flower garden into a topiary wonderland. Elephants, camels, and prehistoric monsters stalk the grounds; spirals, arches, and easy chairs lend variety. In 1638 Braytons helped found Portsmouth, the colony's second settlement. It is on the Island of Rhode Island, which gives the State its name. In the background is Prudence Island, where Roger Williams corralled his pigs.

and the slave trade. One, Rodriguez Rivera, made Newport the center of a two-continent business in spermaceti candles.

In England's oft-recurring wars with Holland, Spain, and France, bold privateersmen, roaming from the North Atlantic to the Indian Ocean, brought home to Newport a wealth of captured cargo.

From 1740 to 1775 Newport lived in a Golden Age. Merchants dispensed open-handed hospitality in pretentious town houses and secluded island estates. Wealth bred a taste for good books, fine paintings, correct architecture. Social and literary clubs flourished. Visiting theatrical troupes presented Shakespeare and "modern" drama.

In 1732 Benjamin Franklin's brother, James, founded the first Rhode Island newspaper, and in 1758 James's son began the still-printed *Newport Mercury*.

Newport architects built dignified public

buildings; master craftsmen wrought exquisite silver and carved fine furniture. Painters worked on commission, and men of science found a congenial atmosphere.

Newport's cultural renaissance dated from the arrival in 1729 of George Berkeley, Anglican clergyman-philosopher. While waiting in vain for a promised Parliamentary grant to found a college in Bermuda, he brought to this provincial town breadth of knowledge, extended travel, and a wide acquaintance among literary men. He is remembered for his oft-quoted "Westward the course of empire takes its way." Restored, his country home still stands in Middletown.

By 1775 Newport commerce reached such heights that bold indeed was any prophet who might say that New York's would one day equal it. Yet the Revolution and long occupation by British troops soon dealt this far-flung trade a fatal blow. Lacking water

power, Newport was unable, like towns farther north, to switch to industry. Population dwindled; Providence left its rival far behind.

But from its Golden Age the town inherits a magnificent group of public buildings—stately old Colony House (1739); Market House (1761); classic Redwood Library (1750); Touro Synagogue (begun 1759), America's oldest and now a national historic site; the Seventh-Day Baptist Church (1729), first of that sect in America; and famed Trinity Church (1725) (Plate IX).

More than 400 18th-century houses line the narrow streets in the town's old section.

Most puzzling Newport structure, perhaps oldest by far, is mysterious Old Stone Tower. Whether Vikings or a colonial governor built it has been a controversial subject for a century (page 170).

More vital than puzzles or departed commerce are the ocean breezes and scenic shores which have made Newport a famous watering place for 200 years. Aristocratic southern families, discovering its charms in the 1740's, made it a summer annex of the Old South for more than a century.

Newport's Gilded Age

After the Civil War Mrs. August Belmont, daughter of Commodore Matthew C. Perry, the Newporter who opened Japan, returned summers and led New York society in re-discovering her home town. It became its summer mecca, fabulous seasonal capital of New York's 400 in the lush Gilded Age from 1890 to 1914 (Plates VI, VII, and page 140).

On pastures south of the town America's empire builders competed in the splendor of multimillion-dollar "cottages." Through their spacious rooms streamed a life of high fashion and lavish display which grew legendary before it waned.

There the magnificent stage of 40 years ago is still set. Nearly 100 imposing mansions line tree-vaulted Bellevue Avenue, Ochre Point, and sea-girt "Ten Mile Drive." The local \$64 question is what will become of the largest of them. Many are still occupied and well kept; a few have become institutions. Avenue and Point look prosperous, but hurricanes and war have marred the Drive.

While record-breaking temperatures left New England limp, we visited Newport in comfort. During Tournament Week in August this is the world's tennis capital. On the Casino's velvet courts, scene of the first national championship matches in 1881, 60-odd top-flight U. S. and foreign stars battled for first-magnitude amateur honors.

Summer colonies come and go, but Uncle

Sam's Navy is this island city's year-round mainstay. Home of the Naval Academy during the Civil War, it became the site of the first Naval Training School and, in 1884, of the Naval War College.

Home Port of Half the Atlantic Fleet

Two world wars have boomed Newport into a major naval base and home port of half our Atlantic Fleet. Huge installations line the island's west shore and cover several smaller ones. Across the Bay sprawls the gigantic U. S. Naval Air Station at Quonset Point, which gave the prefab hut its name (p. 157).

After Pearl Harbor the Bay region, protected by the Army's largest guns, became a hive of Navy activity. Installations went up as if by magic.

There 14,500 officers and men were taught to handle the Navy's hard-hitting PT boats, and thousands of miracle-working Seabees were schooled. Torpedo Station personnel jumped from 600 to 13,000. Miles of submarine nets and countless floating tanks were made. And an ever-growing fleet slipped silently in and out of the long, deep roadstead.

The grim, gray ships at anchor mean much to Rhode Island. Every year the Navy spends some \$43,000,000 there, provides more than 6,000 civilian jobs, and bases about 24,000 naval personnel in the State.

And through its unusual Armed Services Book Pool Rhode Island means much to many a serviceman. Begun and directed by State Librarian Grace M. Sherwood, it stocked the State's military installations with books and sent special libraries with departing Seabee units to the Pacific, with Army Air Force groups to Europe, Asia, and Pacific isles, and with naval air squadrons wherever the big carriers sailed.

With them, too, went secretly bound NATIONAL GEOGRAPHIC MAGAZINE articles—73 titles all told, from "Aleutian Islands" to "Yunnan Province"—to acquaint officers and men with far-off places.

Nor did the Pool dry up with peace. It sends books to its service libraries afloat and to posts in Europe, the Aleutians, Marshall Islands, and the Philippines. Fitting symbol of this global service is the Grace M. Sherwood Library on Kwajalein.

Before leaving Newport we joined a holiday crowd aboard an excursion boat to the salt-air-conditioned island named for Dutch explorer Adriaen Block. Its eventful past is crammed with tales of French privateers, pirates and buried treasure, its neutrality in the War of 1812, shipwrecks, and heroic men against the sea.



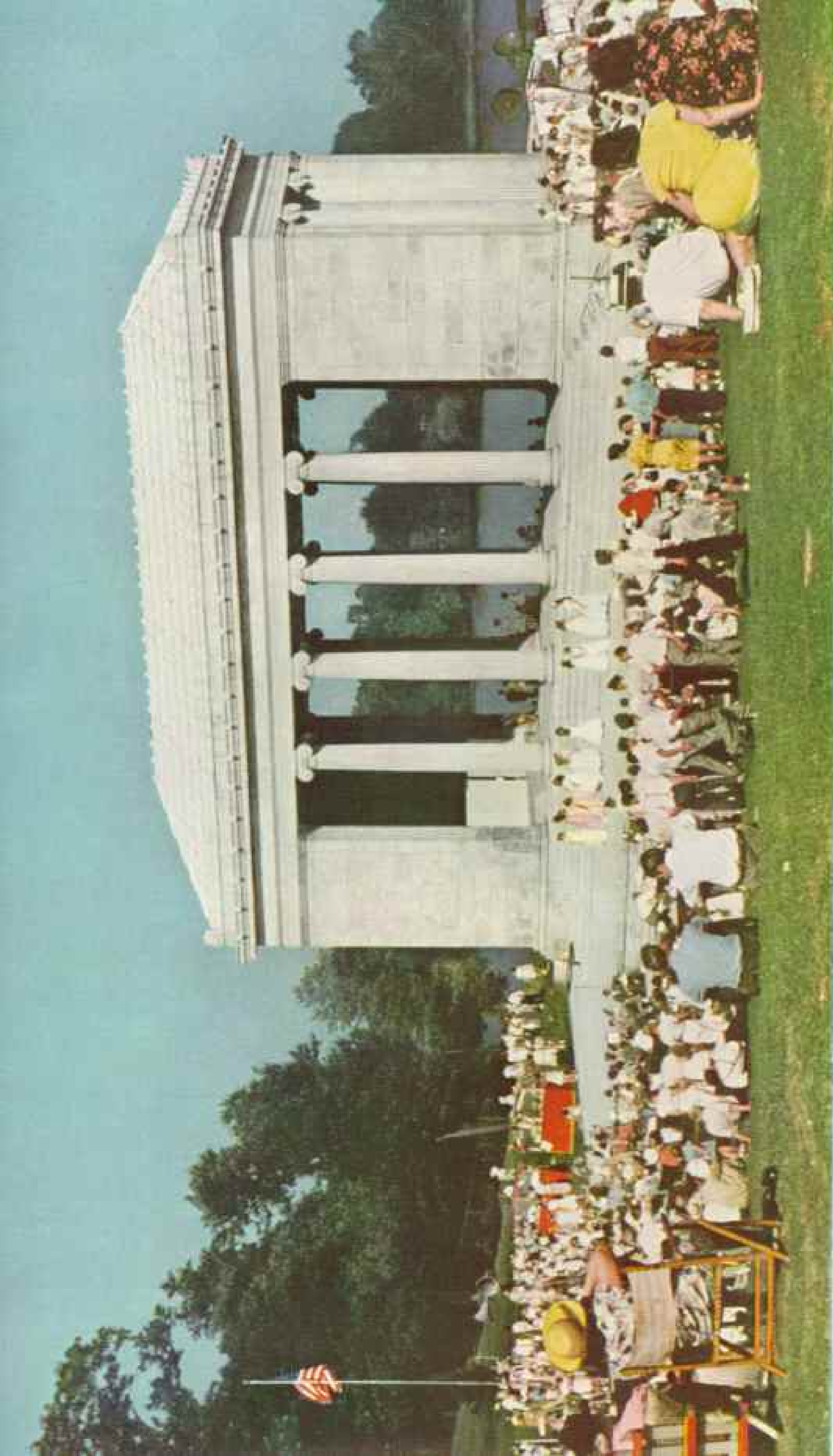
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IX

Illustrations by Wilford R. Culver

Trinity Church Is a Gem among More than 400 Colonial Buildings in Old Newport

Designed by local talent, Trinity has housed a congregation for 223 years. George Washington sat in a front pew in 1781. The original three-decker "wineglass" pulpit, with overhead sounding board, is a rarity.



© Nathan J. Desjardins/Haber

X

A Melody in Marble Is the Benedict Monument to Music in Roger Williams Park, Providence

Here, in song and dance, children climax the summer recreation programs of 43 city playgrounds.

Continued on p. 104

Providence's Paper Roses Rival Nature's

The Calart Flower Company ships its eye-appealing flowers to all 48 States and Canada. Encased in transparent plastic, its displays look like the real thing. Only the fragrance is lacking.

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Illustration by William H. Fisher

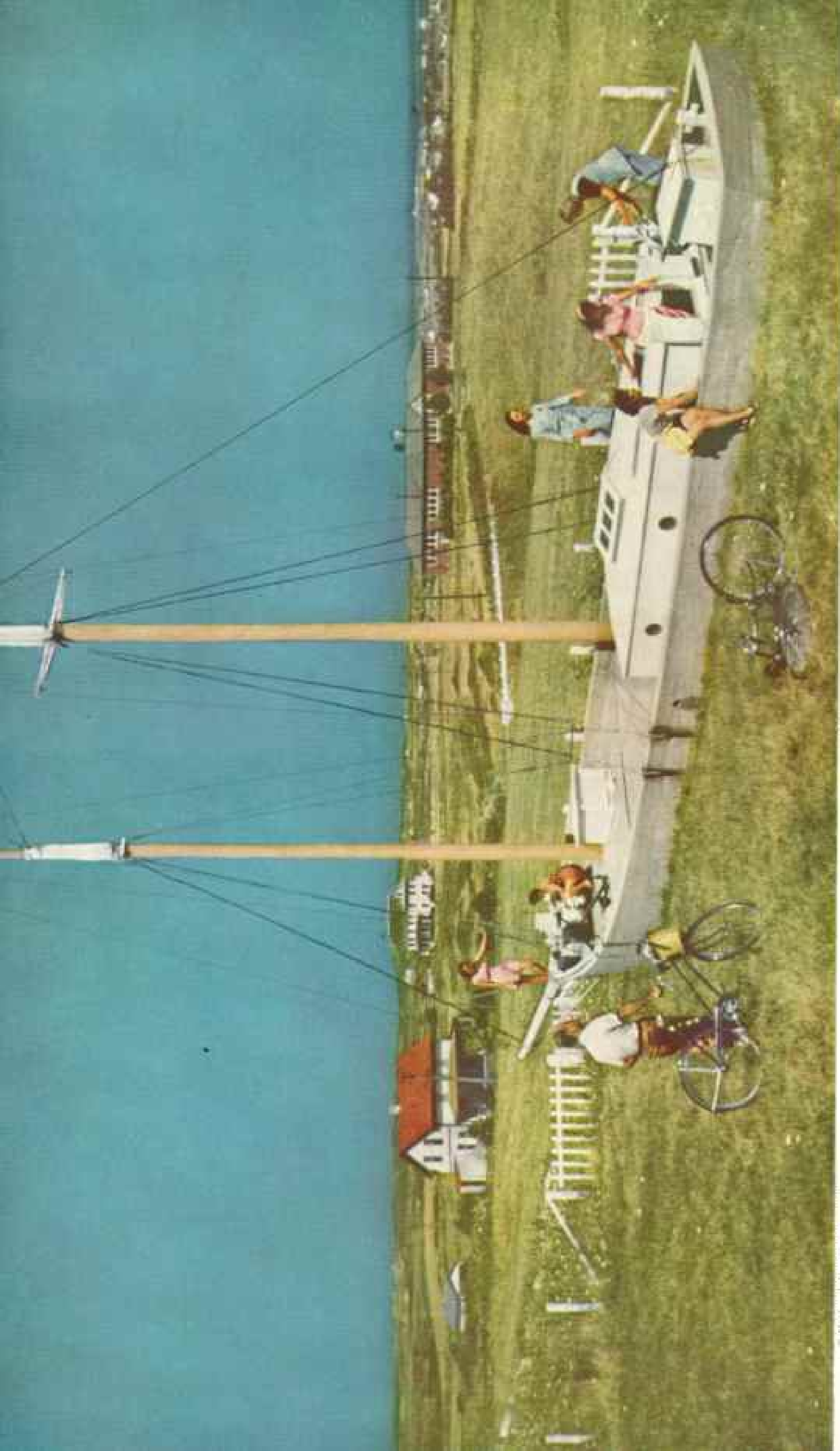


Giant of Rhode Island Industries Is Textiles

The trade employs more than half of the State's industrial workers. In the Wanskuck Mills, Providence, woolen cones unwind to form the warp. Pink color, which identifies threads for the weaver, will wash out later.

Illustration by William H. Fisher





A Landlubber Ship Which Never Saw Water Sails Block Island's Rolling Moors

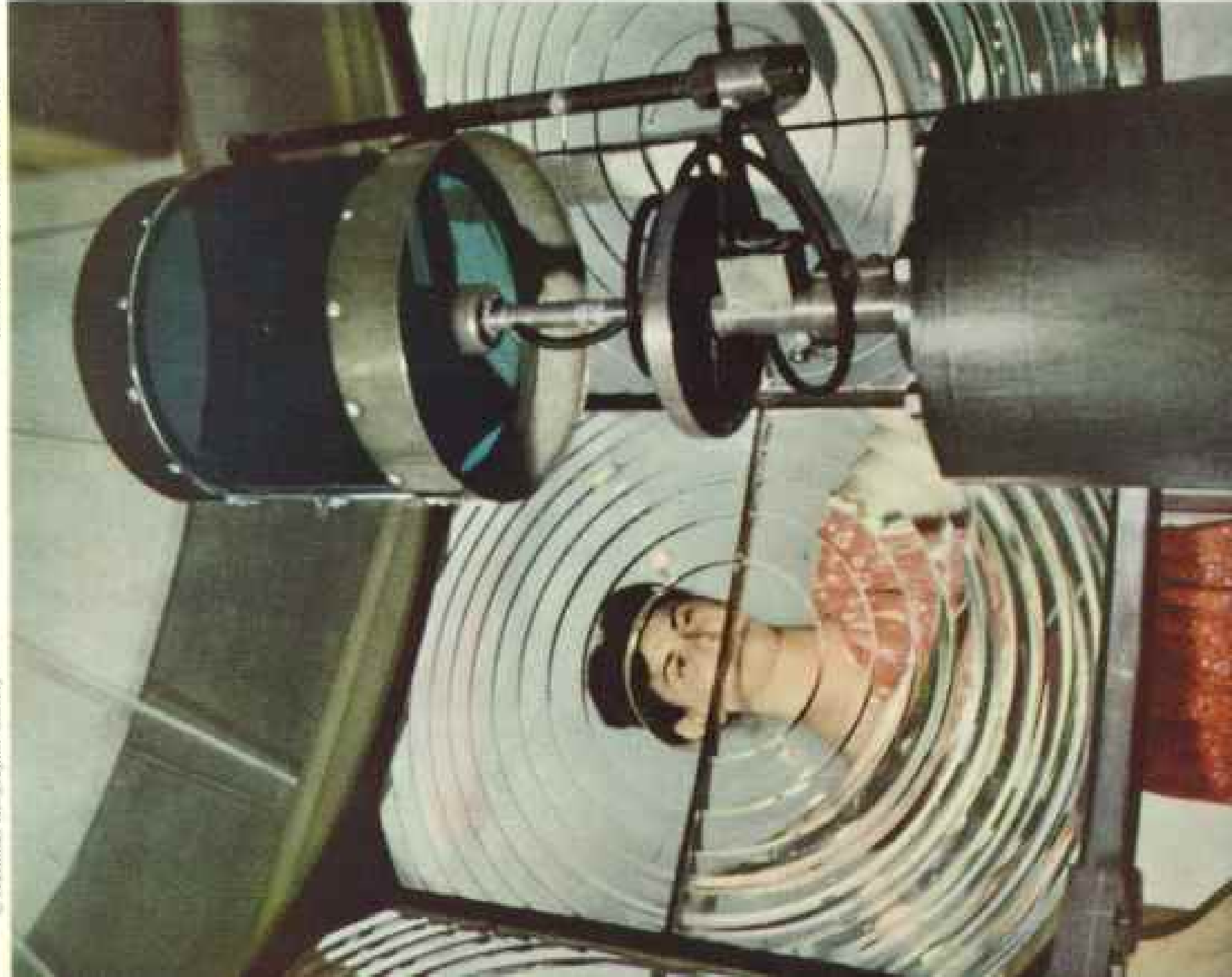
A ship carpenter built the vessel as a guesthouse for a sea-loving islander. Masts and rigging were taken from a fishing vessel.

Bull's-eye Lenses Flush a Block Island Light 24 Miles

Electric limp warns ships that Mohegan Bluffs is a graveyard.

© National Geographic Society

Illustration by William H. Fisher



Apple Parers Helped Colonial Wives Make Breakfast Pies

Three thousand old-time tools pack rural South County Museum.

Illustration by William H. Fisher





On a Summer Day "Barn" Doors Open and Matapuek's Theater-by-the-sea Moves into the Sun for Rehearsal

Seashore and country meet near these players' stage. They make their own sets. Well-worn "flats" air against the wall.

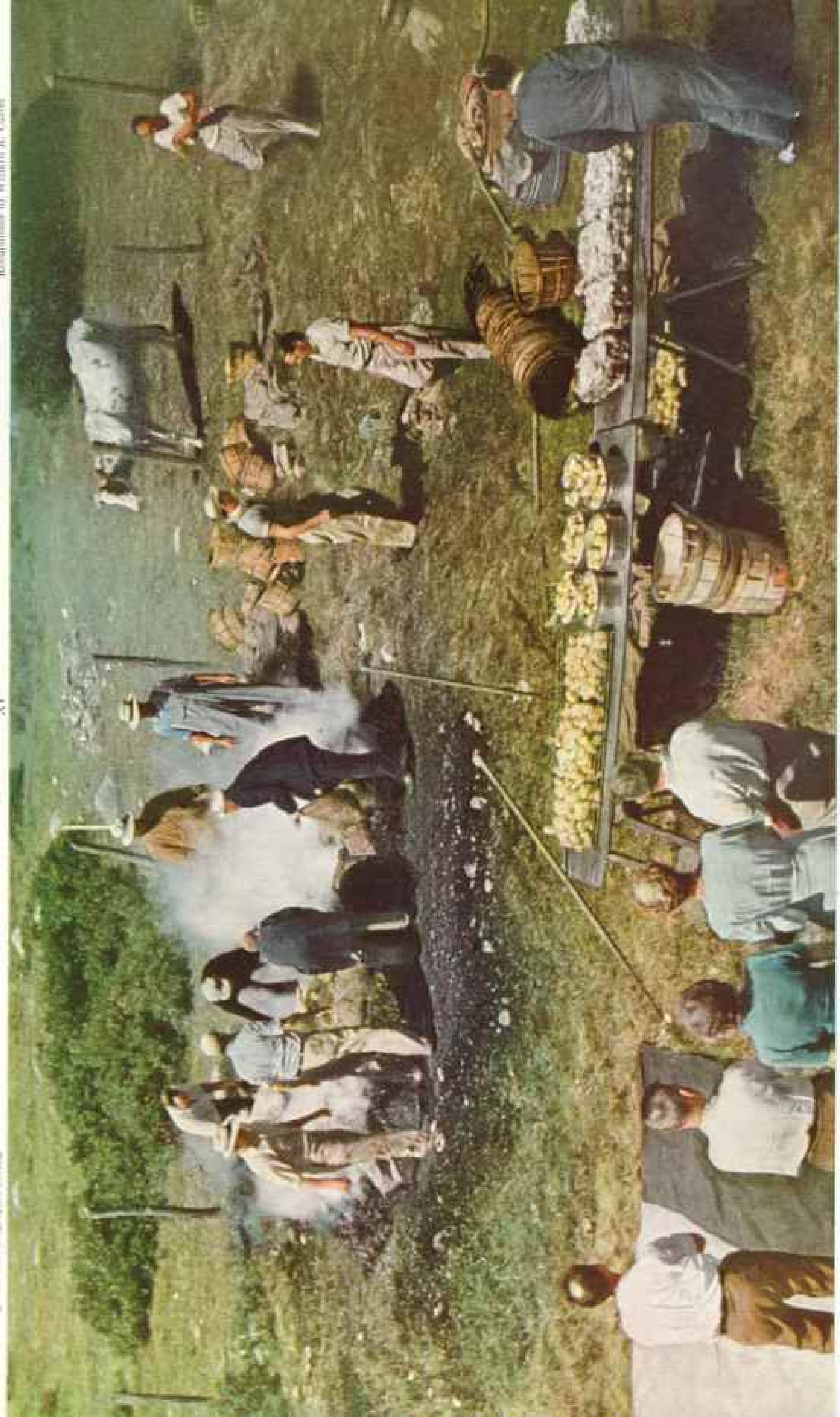
Clambake Masters Prepare an Epicurean Feast in Moosup Valley; Even the Uninvited Cow Seems to Drool

Cooks pile bags of clams atop hot rocks covered with seaweed. Next they add potatoes, fish fillets, and corn on the cob. For about an hour these steam under a wet tarpaulin. Clam cakes and chowder precede the main event; tomatoes, brown bread, watermelon, and coffee round it out.

U. S. National Geographic Society

XV

Photographs by Witherell H. Carter





© National Geographic Society

XVI

Illustration by Willard B. Carter

Sails Gone, This 160-year-old Mill Grinds No More Grist for Johnny Cake

The merest mention of Rhode Island johnny cake whets the native son's appetite. The shingle-clad mill stands on Conanicut Island. Its bonnet revolved so that sails might face into the wind.

There we hired bicycles, pedaled dirt roads past sea-gray shingled cottages, picnicked on Doverlike cliffs, and panted up wind-blown Beacon Hill for a wide view of pond-flecked moors and white-capped ocean. We haunted the fishing harbor for its sights and smells, sunned on curving beaches, and swam in rolling surf.

For hardy Block Islanders there is little rest. Not long ago their fathers farmed with oxen, gathered seaweed for fertilizer, and cut peat for fuel. But the sea promised quicker returns.

Now the menfolk slip out to sea at dawn in sturdy craft to fish for cod, yellowtail, haddock, and mackerel. In July and August the kingly swordfish, following the Gulf Stream north, is their big game.

Captain Kidd Visited Conanicut Island

In 1689 Block Island was saved from French privateers by Capt. Tom Paine, himself a retired freebooter. On Conanicut, between Newport and the mainland, we found his old home, unoccupied save perhaps by the captain's ghost and that of his crony, notorious Captain Kidd, guarding the gold that legend says they buried there.

Near by stands one of the few remaining windmills that once dotted southern Rhode Island (Plate XVI). Their fine-grained stones ground native white flint corn into a powdery meal, which early settlers cooked like flapjacks on oak planks propped before an open fire. Finding the meal handy to carry on long journeys, they called the cakes it made "journey cakes." Time made it "jonny cake," and even "johnny cake."

A few mills, turning old stones by motor, still grind old-fashioned johnny-cake meal, and a few restaurants serve the cakes as a novelty. But we ate the real thing in a farmhouse kitchen, for in such places they are staple fare.

Few Rhode Islanders agree on how to make or fry the cakes; even the legislature has been known to debate the subject. Some like them thin; some like them thick. Some mix the meal with water; others, with milk. But whatever the recipe, the faces of native sons light up at mention of those magic words.

Across Jamestown bridge, on the mainland west of the Bay, we were in what Rhode Islanders call the Narragansett Country, or South County. Its colonial past is unlike that of any other part of New England.

Early settlers acquired large plantations, used Negro slaves to work them, and lived the lives of country squires. They exported fine cheese, butter, wool, and their famous

breed of horse, the Narragansett pacer.

Eighteenth-century South County was a bit of old Virginia set down in New England. Luxury and hospitality went hand in hand. Sumptuous balls were held in candle-lighted plantation houses, and darkeys danced on sanded kitchen floors.

Hunting with the hounds was the planters' chief sport; horseflesh was their hobby. To Williamsburg they took their fleet pacers to match against Virginia's best.*

Still a fabled figure in South County is the Dr. Johnsonlike Anglican preacher, Dr. James MacSparran. In Wickford we visited the Old Narragansett Church, oldest Anglican church north of Mason and Dixon's line, where the robust doctor preached (page 155).

At State College, in colonial Kingston, we talked about Rhode Island agriculture. Historically, it crows about its famous red hens, the Greening apple, and its native bronze turkeys. Early in the century the Agricultural Experiment Station saved the Nation's turkey business, recently valued at \$220,000,000, when it discovered a control measure for the dread disease, blackhead.

In this small State, farming, which supports only three percent of the people, is a pygmy compared with the giant, industry. But it is not to be ignored. For in 1947 its farms, specializing in poultry, dairying, truck, and fruit, produced to the tune of \$19,000,000. In South County a booming enterprise is potato farming, where the good earth has yielded as much as 550 bushels an acre.

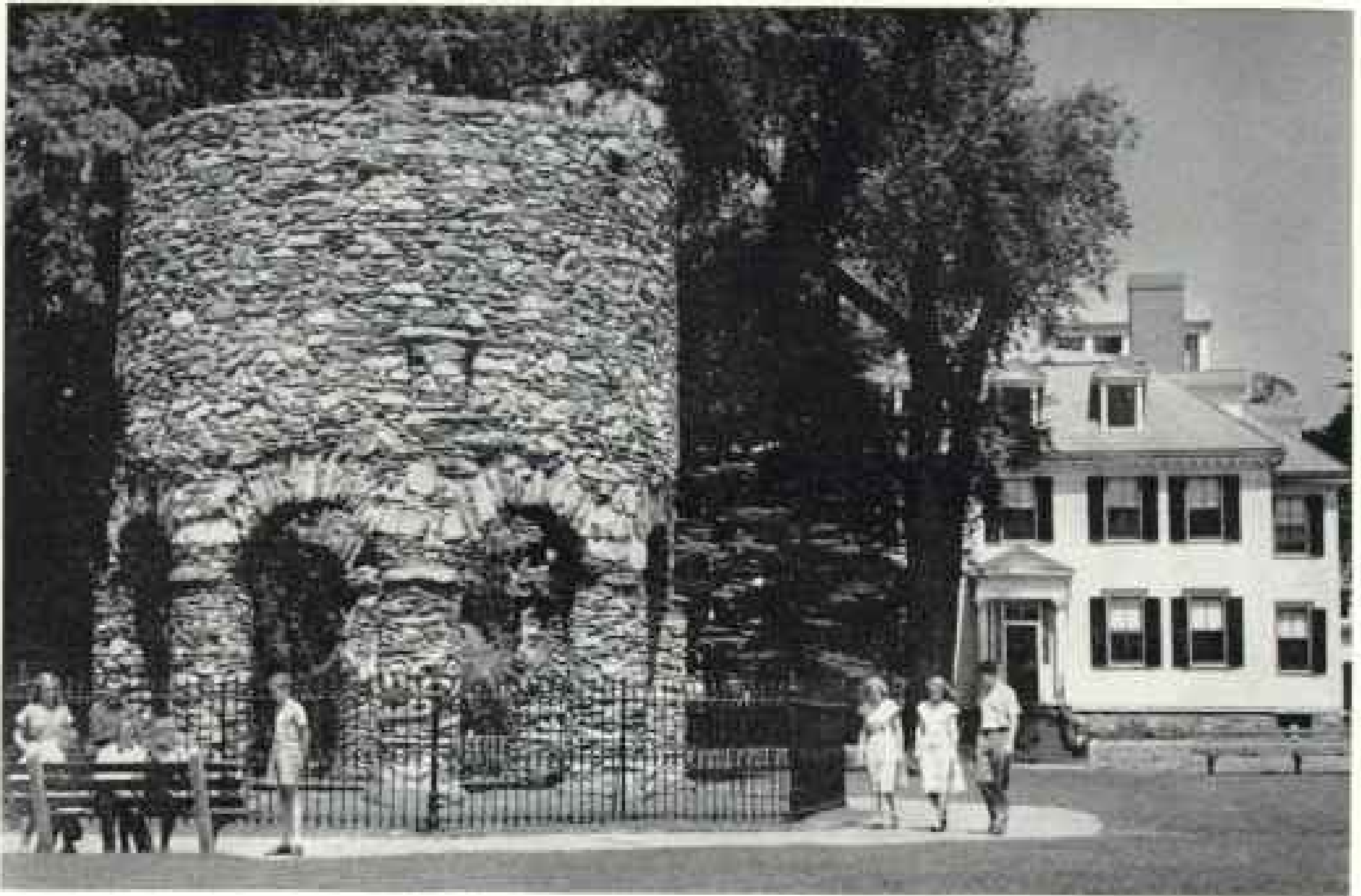
Museum Exhibits Yankee Ingenuity

In a converted barn near Wickford we saw an amazing exhibit of some 3,000 old-fashioned utensils once used to do countless chores of farm and home. Many, like the apple parer in Plate XIII, were the products of local Yankee ingenuity.

Crossing and recrossing our tracks, we found the snuff-mill birthplace of Gilbert Stuart (page 158); the home of Oliver Hazard Perry; a granite shaft in little-known Great Swamp to the men who broke the power of the Indians there in 1675; small fishing villages with Bible names, Galilee and Jerusalem; and Matunuck's summer theater-by-the-sea (Plate XIV).

To Westerly we drove winding U. S. 1 along a scenic shore, hurricane-changed since my wife and I spent our honeymoon there in 1937. Nearly 300 years before that, John Babcock and Mary Lawton, eloping

* See "Restoration of Colonial Williamsburg," by W. A. R. Goodwin, NATIONAL GEOGRAPHIC MAGAZINE, April, 1937.



Newport's Riddle of the Ages: Who Built Its Old Stone Tower?

A century-old argument swirls around the puzzling structure. Some believe Benedict Arnold, the colony's first governor and ancestor of the Revolutionary War traitor, built it as a windmill in 1675. Others hold that blond Vikings, seeking a lost colony from Greenland, raised it as a fortified round church in the 12th or 14th century. The tower had a conical wooden roof, a fireplace, and two rooms above its eight rude columns, set at compass points (page 160).

from Newport in an open boat, settled on the Pawcatuck River's banks. Others, mostly Seventh-Day Baptists, followed, founding a frontier town which fought for years a border "war" with Connecticut across the river.

Once a port and builder of ships, Westerly leads a dual life. Shopping center for first-class resorts like Watch Hill and Weekapaug, its streets in summer are crowded and festive. But the support of its steady year-round population is a sprinkling of industry and the granite quarries which pock its hills.

Since 1847 these hills have yielded a fine-grained stone capable of delicate carving. Its suitability for monuments has developed a nationally known industry.

Still a stronghold of Seventh-Day Baptists, for whom Saturday is the Sabbath, Westerly prints the only Sunday evening newspaper in the United States.

In 1914 and 1941 the Sunday evening *Westerly Sun* was the first regular edition of any paper in the Nation to carry news of the Archduke Franz Ferdinand's assassination and the bombing of Pearl Harbor.

Rhode Island bake masters carry the traditional New England clambake to perfection,

Summoning a lifetime of experience, they perform their art on beaches, in pine-scented groves, and in country pastures for the enjoyment of thousands every summer.

Our belt-loosening finale was the annual Grange clambake in rural Moosup Valley (Plate XV). From the edges of a tarpaulin-covered mound tantalizing wisps of steam escaped. Munching clam cakes or eating chowder, shirt-sleeved devotees awaited the main event.

The Main Event "Comes Down"

The bake master rolled back the tarpaulin. Gloved waiters, shouting "Comin' down," grabbed wire food baskets and rushed to the serving table. It "came down," in course after course—steamed clams, fillet of mackerel, corn on the cob, sweet and white potatoes—cooked by steam from pungent seaweed on hot rocks. This method alone imparts a unique flavor.

On the way home cameraman Culver summed up our blissful feeling. "If Rhode Island had never produced anything but a bake like that," he sighed, "it would have been enough."

Norway Cracks Her Mountain Shell

BY SYDNEY CLARK

IT IS now possible to drive one's car from Stavanger, at the southwestern end of Norway, to Hammerfest, one of Norway's most northerly towns, and thence eastward to Kirkenes and the border of Soviet Russia—a total of some 1,900 miles.

In that statement there is no trick of speech or geography, for when the U. S. S. R., at the conclusion of World War II, demanded and took from Finland the region of Petsamo on the Arctic Ocean she acquired a Norwegian frontier (map, page 174).

To this new frontier, lying but a few miles east and south of Kirkenes, run spurs of Norway's National Highway, which struggles north from Oslo to the Arctic rim of Europe.

It curves then north of the top of Sweden and even, unbelievably, north of Finland, reaching a line of longitude just short of the easternmost territory now remaining within that Republic.

New Highways and Railroads

Supplementing this artery, slender in much of its length, depending in the north upon numerous ferries across the fjords that bite so deep into the body of Norway, a general development of highways and railroads in the more populous parts of the country has gone impressively forward the last 15 years.

Most of these new lanes of traffic have no special connection with the war and would have come sooner with peace. Some, however, were born of military necessity. Some were jerry-built by the Nazis in frantic haste and have been improved and solidified by free Norwegian effort since the war.

All are now a part of the permanent structure of transportation, and one may fairly say that their combined strength has enabled Norway to crack her mountain shell.

No longer does the familiar saying, "The sea unites us; the land divides us," have its old force and aptness. The sea still unites Norway (as does the air in these days), but so also does the land, its former savagery subdued by engineering science and harnessed by the toil of man.

To Norwegian enterprise and labor, be it understood, goes the full credit for this remarkable development. The Nazis destroyed far more than they built. Their lack of experience with the monumental terrain of Norway made several of their war-born works travesties of proper construction.

Moving from south to north I saw many signs of the cracking of the Norse shell which makes many regions more accessible to the traveler.

Stavanger, Sardine Capital and Airport

"Norway Calling; Stavanger First."

This earnest slogan of travel propaganda takes on positive meaning in 1948, for Stavanger is no longer merely the sardine capital of Norway. It is in process of becoming an important transatlantic air terminal for Scandinavia (pages 188-9).

Tremendous construction work, now under way, will make its Sola Airdrome one of Europe's largest. Already much more money than the average annual prewar budget of Norway has been lavished upon it.

A substantial part of this, some \$80,000,000, was "spent" by the German forces of occupation—in their usual style of spending their victims' funds as if they were their own. This splendid landing field owes its present commanding position in considerable part, therefore, to the necessities of those who held Norway in subjection.

Sola was a key to the whole Nazi plan, and the Luftwaffe's best brains directed its development.

Nature's beneficence makes it the great thing it is, for there is virtually no fog here at any time of year, and winter's snows, discouraged by the Gulf Stream's warm breath, are light and impermanent.

The fish that made Stavanger prosperous is still its most distinguished adjunct, or at any rate its most profitable one, despite the advent of the airplane with its lucrative traffic.

Until some 60 years ago this tiny sardine-like fish, the brisling, was a mere unconscious decoy, luring to shallow waters the larger predatory fishes desired by fishermen. The value of the diminutive brislinger—to use the Norwegian plural—was finally perceived and a canning process devised.

Still, the brisling was not very important, until in 1908 a farmer's boy named Christian Bjelland came to Stavanger to sell birch brooms and remained to can sardines. He greatly improved the process and built up a business of fabulous proportions.

For more than a generation his sign, the little man with the big fish (though it should be the other way around!), has been known the world over. The Bjelland fleets of small Diesel-powered boats still roam Norwegian

waters to net the silver treasure that has built a large fortune.

The brisling are left in the nets for some 48 hours to "starve," so that their own tiny prey will be digested. Then they are brought up, strung on lines, smoked, and packed by hand in refined, tasteless herring oil.

"How many sardines, by sober arithmetic, go out to the world from Stavanger?" I asked a local fish authority, and he then gave me a bit of homework to do.

"The catch of all Norway, in a good year," he said, "is 500,000 cases, of which Stavanger accounts for 60 percent. There are 100 boxes to a case and about 20 brisling to a box."

In more time than it takes to tell it, I had the answer. Norway cans a billion of these fish a year. Stavanger cans 600,000,000.

A clever Norwegian chemist during World War II devised a method to make margarine from herring and whale oil. The oil is refined, deodorized, vitaminized, and colored. The product seemed as nutritious and delicious in taste and appearance as the best quality of creamery butter. It reacts like butter when used in frying—no scum or funny smell.

Sola boasts an interesting beach hotel whose symbol is not the sardine but "The Happy Salmon." In Norwegian it is *Den Glade Laks*.

I was surveying this symbol, trying to detect on the fishy face an expression of honest joy unclouded by jealousy of the brisling, when a shiny American car drove up to the hotel door. A man who proved to be a Norwegian emerged from it and also came to examine the jolly salmon.

I fell into conversation with him, and presently he asked where I was going. I told him that my ultimate goal was Norway's far north.

"It will be difficult north of Trondheim," he said. "The Germans destroyed Bodø, part of Narvik, and in the far north *everything*. Reconstruction is a big job." Then he added, more optimistically, "But I suppose you have your car. That will make the going easier."

"Oh, no," I said, in what I supposed was a jocular tone. "I'm a poor American. I'm going by train and bus and fjord ferry."

Help for a "Poor American"

He seemed astonished but said nothing further, as other people had joined us before the hotel. Later he saw me alone and hurried to me. It was then my turn to be astonished. In a low tone of some urgency he said, "I've long wanted to help an American, personally. Your country helps everybody, and if I can help you. . . . Perhaps you are short of funds for this trip."

In my puzzled surprise I could only mumble, "You're very kind. I have plenty, really."

"Please be quite frank with me," he pleaded. "I think you said you are a poor American. I know there are some."

The light dawned on me, and I explained that the phrase was only a phrase, that it could mean anything, or nothing. His evident disappointment was as moving as his offer. I realized that Europe had spoken to America through a literalist with "a heart as big as a whale."

Railway Builders

There is a shipping dynasty in Stavanger, a family named Bergesen, typical of the driving force that is cracking Norway's shell. Three generations work and drive and dream together.

This family fathered the Sola Airdrome and also had a great share in pushing to completion the Sørland Railway from Stavanger around the coast to Kristiansand (continuing thence to Oslo). The Germans rushed through the final links in 1942 in so hasty a way that those portions are having to be rebuilt by Norwegian engineers.

The Bergesens dream and vigorously chart a direct mountain rail route to Oslo and also a National Ring Railway (*Nasjonal Ringbane*) that shall include their city; but other projects cry for priority, and if one now leaves Stavanger by rail one must follow the long coastal route via Kristiansand, near the extreme southern point of the country.

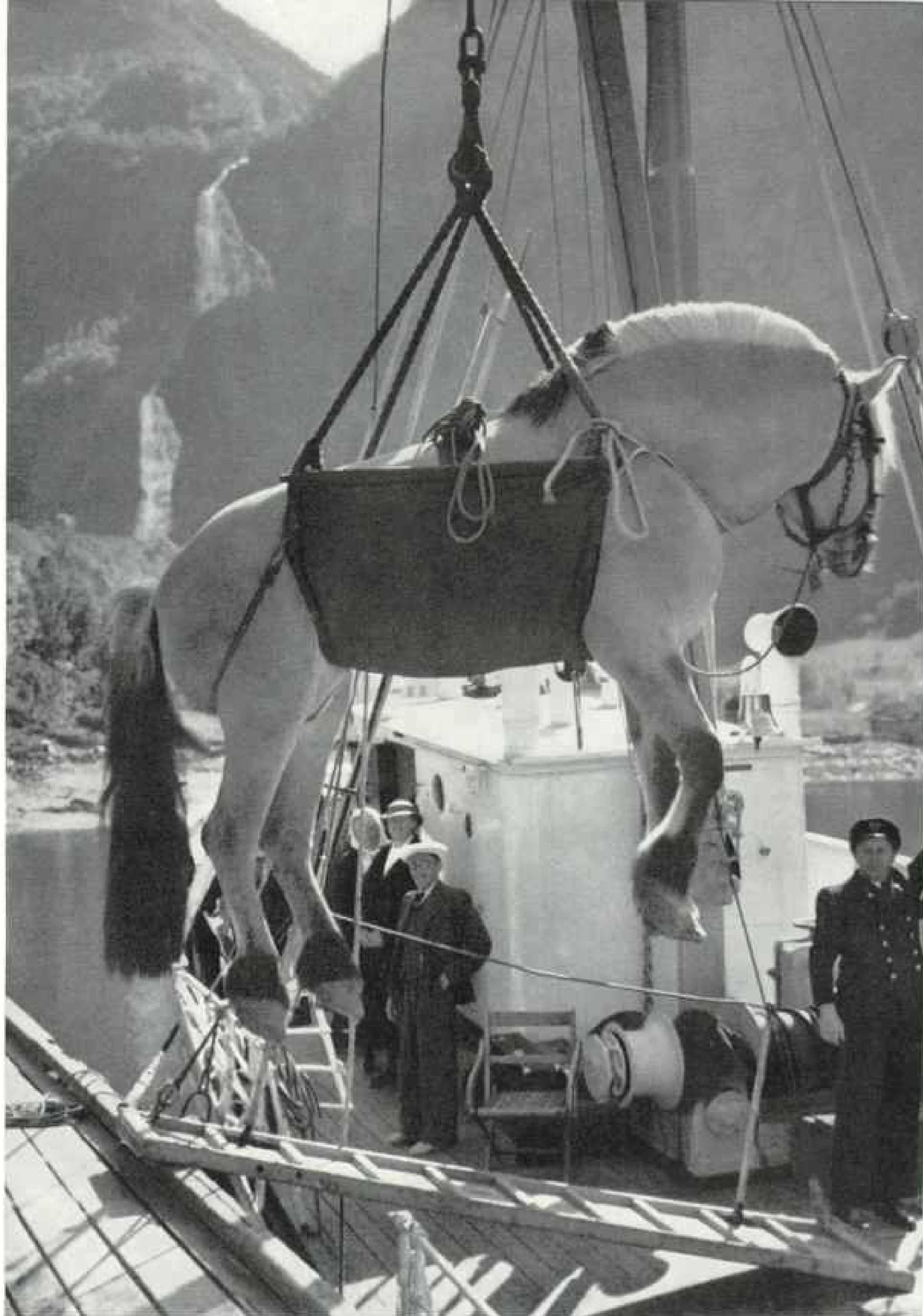
The facts of Norway gravitate naturally to Kristiansand. As one looks north, in forming a personal itinerary or merely in surveying a map, certain of them seem fairly to shout their old yet ever amazing messages.

If one were to fold this country over to the south, with Kristiansand as hinge, Hammerfest would be about on the latitude of Venice. If one were to fold it east on Hammerfest, Kristiansand would be east of Moscow.

The country is shaped like an electric-light bulb with an elongated neck. The bulb itself is the portion south of Trondheim. The neck is some 800 miles long (by air, not twisting road) and in its narrowest places only 8 miles wide, which suggests not a neck but a wire—without much insulation.

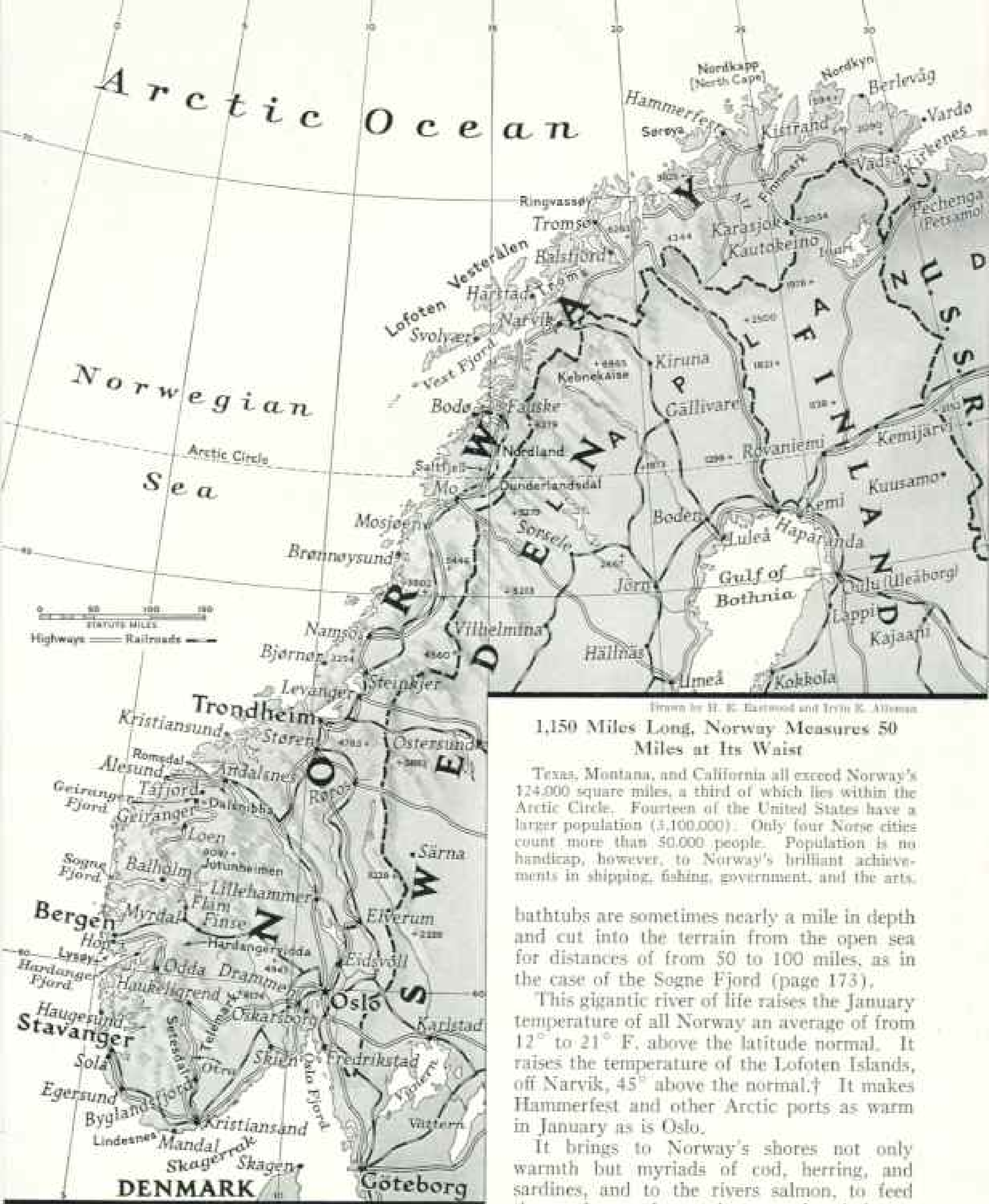
Kristiansand is on the latitude of northern Labrador; Oslo on that of southern Greenland; Hammerfest and Kirkenes almost on that of Baffin Bay.

In this strangely shaped country, so far north that its counterparts elsewhere are frozen wastes, fewer inhabitants than make up the city of Chicago have succeeded in



Curt Norman.

With Circus-horse Dignity, *Blakken* (Dobbin) Boards a Steamer in Majestic Sogne Fjord



Drawn by H. K. Eastwood and Terry K. Atman
 1,150 Miles Long, Norway Measures 50 Miles at Its Waist

Texas, Montana, and California all exceed Norway's 124,000 square miles, a third of which lies within the Arctic Circle. Fourteen of the United States have a larger population (3,100,000). Only four Norse cities count more than 50,000 people. Population is no handicap, however, to Norway's brilliant achievements in shipping, fishing, government, and the arts.

bathtubs are sometimes nearly a mile in depth and cut into the terrain from the open sea for distances of from 50 to 100 miles, as in the case of the Sogne Fjord (page 173).

This gigantic river of life raises the January temperature of all Norway an average of from 12° to 21° F. above the latitude normal. It raises the temperature of the Lofoten Islands, off Narvik, 45° above the normal.† It makes Hammerfest and other Arctic ports as warm in January as is Oslo.

It brings to Norway's shores not only warmth but myriads of cod, herring, and sardines, and to the rivers salmon, to feed the nation and sustain a major industry (page 187).

The New World may strive, by statesmanship and philanthropy, to send aid and stability to the Old, but in the case of Norway,

* See "Grandest and Most Mighty Terrestrial Phenomenon," by Rear Adm. John Elliott Pillsbury, NATIONAL GEOGRAPHIC MAGAZINE, August, 1912.

† See "Fishing in the Lofotens," 14 ills. from photographs by Lennart Nilsson, NATIONAL GEOGRAPHIC MAGAZINE, March, 1947.

building a nation which is notably successful, and in some ways a model.

Its great benefactor, the Gulf Stream, has made such a feat physically possible.* It pours 150 million cubic feet of warm water around western Norway every second of every day. This water fills the numerous fjords, making them so many bathtubs of warm water amid the glacier-topped mountains. These



Egil Alvaker

Summer's Zealous Hikers Trace Figure Eights on an Alpine Treadmill near Tafjord

After their long, dark winters Norwegians get the outdoors urge. Coasts and mountains lure thousands. They go armed with rucksacks and a few kroner; they sleep in state-owned cabins. Occasionally a shorts-clad grandfather joins the sun-tan-and-muscles parade.

as well as the British Isles, and indeed all northern Europe, it has never exported and cannot export a product a thousandth part as valuable as the water from the Gulf Stream.

One may strike off from Kristiansand due north into the interior of Norway through the Setesdal. Of all the country's lovely valleys this one was the chief stronghold of colorful isolationism for centuries. It was a narrow *lost dal* where local customs and costumes were quite untouched by conformity with the world.

A railway crept up from Kristiansand to Byglandsfjord, at the valley's mouth, as early as 1896, but the Setesdal resisted change. Until the 1930's its 17th-century charms were not seriously tarnished.

But then came the bus route from Byglandsfjord up the valley and over the top to Haukeligrend, whence branch routes diverged, eastward for Oslo, westward for the Hardanger Fjord, in the Bergen orbit. That did

it. The Setesdal was ravished. Visitors came in droves. A decade later German troops came in other droves.

In these postwar days tourists come again, and those valley dwellers who still wear the traditional costume are usually more than ready to be photographed. For any eager lens they will fetch a bright smile.

Knowing this, but not wishing to be a mere praiser of times past, I took the invading bus and was rewarded not only by the Setesdal's eternal beauty but in other unexpected ways:

Vacations by Plane

A most engaging radioman of Kristiansand's airport was my seat mate part of the way. He had been to the States as a seaman, and when he learned that I was from Boston his pleasure knew no bounds.

Across from our seat and in front of it and behind it rode a score or more of very young Danish girls, a school group on vacation with

their teacher. They were singing Danish songs, but suddenly came an interloper, "My Bonnie Lies Over the Ocean," and the words were English. They sang several verses, though I had hardly realized that there was more than one, and all the children knew all the words.

I have since found that this song, in English, is a great favorite of young and old throughout Scandinavia. I have heard it many times in cafés and in various holiday settings.

But the little Danes did not stop with "My Bonnie." They sang "My Old Kentucky Home," "Polly Wolly Doodle," "Oh, My Darling Clementine." From these they moved on to World War I songs, also in English.

Then my heart warmed mightily as I heard them strike up "America," obviously for my benefit. But the words that came from the youngsters were "God save our gracious King, Long live our noble King, God save the King."

Properly crestfallen, I suggested to a 10-year-old towhead near me, "How about singing the American words? We in America use that same tune."

"I'm afraid we don't know them, sir," she said politely in very good British.

I was put in my place, but I said I would sing them myself. I did and the girls listened with rapt attention, trying to get them. I was mollified, for those children were excitedly interested in anyone who came from America.

They crowded around me to ask the same questions that all Europe's children ask of an American. "What is New York like? What is Hollywood like? Do you have good things to eat in America?"

At Haukeligrend, north of the source lakes of the Otra River which carves out the Setesdal, one must make a decision. Due north one cannot go unless one is a mountaineer or a wild reindeer.

Norway's Principal Cities

One may go east by bus through Telemark and ultimately reach Oslo; or one may go west, curving north to Odda on a branch of the Hardanger Fjord, and so, by boat and train, to Bergen. Both ways and both goals are of equal and enormous interest.

Norway's two chief cities invite mention here of the third, Trondheim, formerly spelled Trondhjem, and in olden times called Nidaros. The three together form an isosceles triangle with Oslo and Bergen at either end of the base and Trondheim at the apex.

Although their combined population is no more than half a million, their charm, as a

group, is unmatched by that of any similar trio in Scandinavia.

Trondheim, with its unique cathedral of blue-gray soapstone, is the historic cradle of the country, the "crowning" city of Norwegian kings for over 900 years.

Bergen has been a city of world trade since the 13th century, and in the 19th it was the inspiration of Norway's cultural rebirth. It suffered terribly from the Nazis, but remains great despite its tragic hurts.

Oslo is Norway's bid for 20th-century importance. In this century (1905-1906) it took on new dignity as the capital of a kingdom with its own king. In this century (1925) it resumed its early nationalistic name in place of the Danish name Christiania, which had been used for 300 years.

Just before World War II, and now since that cataclysm, the city has assumed an up-to-dateness which is dramatized by buildings and art works of almost belligerent modernity.

The Vivacity of Oslo

Oslo is a vivacious city and at times effervescent. Every visitor coming from staid Stockholm notices instantly the livelier atmosphere of its streets and cafés.

Karl Johans Gate, the capital's main street, is a ribbon of life and even gaiety far into the night. There are some cabarets in the neighborhood, and the restaurants may have dancing any evening.

Oslo's effervescence reaches its annual peak on May 17, the national holiday (Plates I-XVI). On that day in 1814 Norway, refusing to be summarily handed over to Sweden by Denmark, adopted a democratic constitution in a mansion in the village of Eidsvoll, 35 miles northeast of Oslo. Later that year she formed a voluntary union with Sweden under the same king. This lasted until 1905, but the separate constitution of Norway remained always in force.

On May 17, in these present years, joy is unconfined, particularly among the pre-university students, boys and girls alike. The slang word *ruiz* is used to designate the year-before-university student of either sex.

Early in the morning of the great day each ruz dons a red hat, any connection with Soviet Russia being entirely fortuitous. In addition to the hat, which boasts an embryo tassel, the youngsters wear other bits of red, some symbolic of school or class, others merely red.

Many of the boys sport red bow ties and have red stripes down the sides of their trousers. The girls wear red coats or jackets, or perhaps white ones with red symbols.

In sallies and sorties and swirls and eddies



© National Geographic Society

1

Kobachrome by Ole Pihle Hæber

Oslo's Singing Children Wave Flags at the Royal Family on the Palace Balcony

Each May 17 as Norway celebrates its Constitution Day, thousands of boys and girls troop to see the King.



© National Geographic Society

11

Exhibition by Gilbert Grosvenor

All Oslo Turns Out to Watch Its Happy Children March to the Royal Palace (Right)

Long before sunrise the people began lining up for vantage places. Now Karl Johan, the main street, is crowded like a ticket window at a Sunday ball game. The overflow extends deep into the Student Grove (left).



Prank-loving High-school Seniors Glue Black Mustaches to Peach-fuzz Blond Faces. Though their final examinations approach, the row (immature) reveal no dismay.





© National Geographic Society

IV

Reproduced by Gilbert Grosvenor

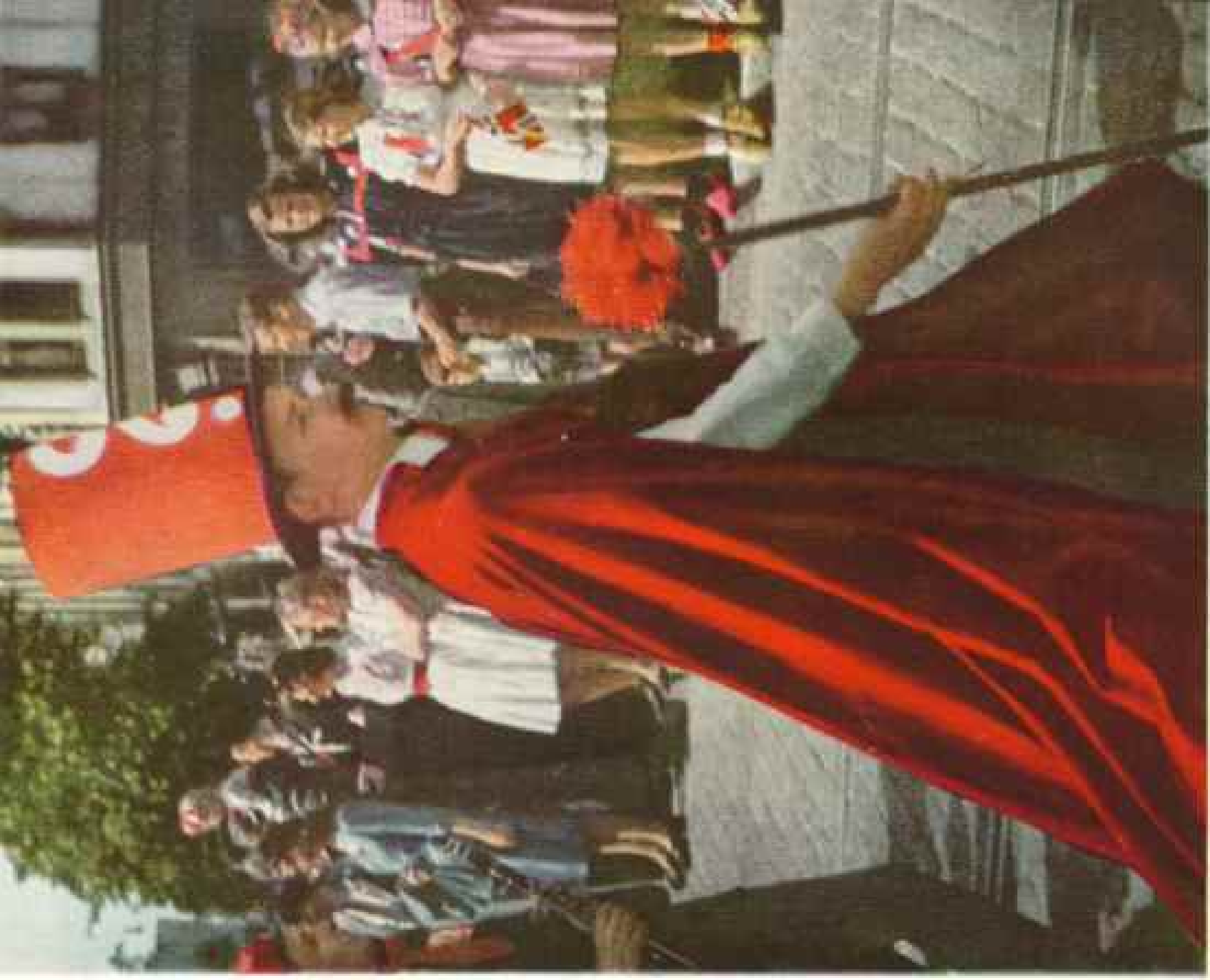
Banner Bearers of Ila School Weave a Shadowy Pattern Across Shiny Paving Blocks of Karl Johan Street



© Seymour Chwast/Artists House

Candidate for Princess Campaigns on Admirers' Shoulders

"Am I not lovely?" asks the chatted sign (right).



Koblenz by Ole Frithjof Norheim

Stovepipe Hat and False Mustache Deck a Solemn Bandmaster

A mop borrowed from Mother serves as his baton.



Their Own March Completed, Students Join Spectators Along the Parade Route



May 17 Tradition Sanctions Students' Horseplay, So One Mounts a Pasteboard Steed
 The rider wears the red cap of an undergraduate. On the right, two boys show the black caps of graduates.



© National Geographic Society

VII

Kodachrome by Ole Frithjof Norheim

In Norway on May 17; as in the United States on July 4, Noise Is Not a Crime

A sign (left) parodies Ibsen, the dramatist, who wrote: "The past is yours forever." Students, employing a play on words, say: "Eva (Eve) is yours forever."



© National Geographic Society

VIII

Reproduction by Ole Frithjof Bækset

Flags of Four Northern Nations Fly for Norwegians' Constitution Day

Signed in 1814, the Constitution dates Norway's birth as a modern nation. Denmark, Finland, Sweden, and Norway (left to right) remain friends despite varying wartime experiences.

the youngsters fool around the streets and parks of the city, raising Norwegian Ned. Daubs of red paint are splashed here and there and practical jokes are unleashed, but rarely does such sport degenerate into vandalism, though the newspapers of Oslo print numerous letters each year from viewers-with-alarm who see in such behavior fresh signs of the decline of youth.

Model T Fords are in their element on the morning of May 17. I remember one named Guinevere, in red chalk, which made a special hit. Four sweating youths with birch brooms went ahead of her sweeping the street clean, and beside the T queen, on both sides, walked a solemn red-hatted convoy.

Guinevere herself sputtered and barked in most unroyal manner until her heart and lungs gave out. Then she submitted to being pushed along, and not too gently at that.

The general fooling resolves itself into a procession, and the student lines then march past the palace, to be reviewed by the King (Plates I and II). Competitive singing by community choral societies enlivens later hours of the day (Plate XIX).

May 17 is a high and handsome moment of youth, as of the whole nation, but for the students worry lies immediately ahead, since university examinations take place during the full month following Constitution Day. A little before Midsummer Eve, which is June 23, these are concluded and the youngsters learn their fate.

Those who pass become university men and women. They burn their red hats and don black ones which have a very long cord culminating in a tassel that is draped over the shoulder (Plate IX). The black hats are their proud announcement of matriculation. Wearers will be ready to tackle their life plans, and mightily in earnest, when the fall term opens (Plates XVII and XXIV).

Norway's Part in World War II

Norway's part in World War II was a dramatic one, and Oslo was the central stage. A fireman in the capital's chief fire station told me about it from the angle of one who fought it through, in the underground.

"It was a *good* time for Norway," he said, "because it was so bad. There were no divisions then. Not more than one person in a hundred went over to Quisling. Of course, there were the *stripete* too, the striped ones who played both sides, waiting to see who would win, but those weaklings didn't count for much and were shunned by true Norwegians. We were one nation. Oslo was one city."

He reviewed, with obvious delight, the historic fumble of the Germans, coming to protect Norway from the Allies, when they tried to force the narrows in Oslo Fjord at dawn on April 9, 1940. (Versions differ slightly in detail but not in essence.)

Two veteran Krupp cannons of Oskarsborg, of the vintage of about 1905, named Moses and Aaron, fired point-blank at a naval unit led by the 10,000-ton heavy cruiser *Blücher*. One of the patriarchs made a direct hit on the *Blücher* with its first shot.

The ship caught fire and after receiving two torpedo hits from the fort she sank, taking, it is claimed, a thousand men with her. Some few, however, were able to save themselves by swimming ashore.

The unexpected action of Oskarsborg, which was supposed by the Nazis to have come into "friendly" hands, astonished the invaders and held up their whole plan, but for only a few hours. Then the Luftwaffe took over and captured Oslo from the air.

Heroic Even in Defeat

Norway was doomed to military defeat, but her resistance movement proceeded to write one of the most heroic, thrilling, and sometimes downright entertaining chapters of the entire war.* The clergy, the teachers, the Supreme Court judges, the sport organizations, the labor leaders, the farmers, even the children of Norway, were as ingenious as they were loyal and stubborn in their resistance.

Every part of the country rings with the struggle still. Every town and village, every factory and summer mountain pasture, every school and hotel has its occupation stories, always moving, often irresistibly funny despite the tragic background.

Norway had a wonderful hidden ally in her sense of humor, an ally denied to the Nazis and one which they could not even grasp. A hundred times, yes, a thousand times and many thousand, little stories with a big laugh went from valley to valley and from fjord to fjord. Some wrinkled crone had made a fool out of a Nazi officer, though the officer never knew it. Some schoolboy, risking death, had distributed an illegal patriot paper in the very presence of Gestapo agents.

A curious fact of the war is that the regular telephone service functioned throughout the occupation, even in Oslo. Never were the Nazis able to bring it under effective control.

My fireman friend told me that before each

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "White War in Norway," by Thomas R. Henry, November, 1945; and "Norway, an Active Ally," by Wilhelm Morgenstierne, March, 1943.

act of sabotage by the underground his station received a call, through the regular city switchboard, something like this: "There will be two explosions at the — warehouse in the — quarter at 4 and 4:05 tomorrow morning. Two, not one. Wait for the second and then take it easy. Don't get there too quickly." He had received many such calls.

The Nazis fumed at the "inefficiency" of the metropolitan fire department, but could do little about it.

The Town Hall's "Two Heads"

Norwegian pride of nation is symbolized by two gigantic works of modernistic architecture and of art in Oslo, the Town Hall and the Vigeland Fountain, neither fully completed as yet.

The Town Hall, of warm red brick, "raises its head," in the words of Dr. Harry Fett, a Norwegian art authority, "almost like a paradox, an abstract monumentality, a thing apart from the town" (Plate XX).

He might have said its two heads, for the Town Hall has two heads, or tower sections, of equal height. It has also two personalities blended into one, for the architects Arnstein Arneberg and Magnus Poulsson, who designed it, are as different in inspiration as a cool mountain spring and an explosion, but they were able to combine their talents and temperaments effectively.

The Vigeland Fountain, in Frogner Park west of the city, is commonly known as the Vigeland Layout (*Vigelandsanlegget*). That word in English is weak, however, for a complex of bronze and granite statuary so enormous in plan and execution that it would seem more suitable for the capital of Brobdingnag than for the capital of Norway.

From a statue-laden bridge over an artificial lagoon it ascends to a fountain bowl upheld by six colossi and thence to a plateau surmounted by an elaborately carved Monolith 57 feet high surrounded by 36 granite groups. The entire "colony" is from designs by the late Gustav Adolf Vigeland, Norway's stormy petrel of sculpture (page 190).

Oslo's civic and social climb toward the light is seen in a remarkable spirit of pioneering that has characterized the city for many decades and is maintained without abatement in these struggling years of recovery from war.

The Norwegian State has shown parallel energy in pioneering legislation, but for well over a century, since the so-called Act of 1837, it has assigned to the individual municipalities broad powers and responsibilities for the development of their own self-government and social systems.

This act first awakened general civic interest and pride at a time when the cities of many other countries were prone to leave their responsibilities to the central government or the crown. It bred a political maturity which is evident today in every Norwegian city, though most of all in Oslo.

Ole Olsen of Oslo, the John Q. Public of that capital, follows life by a path which is likely to free him from want and fear because it is intelligently planned to give him the maximum opportunity.

He was born at a cost of perhaps \$50 or less, for a compulsory National Health Insurance Plan, inaugurated in 1909 and later greatly extended, provides financial aid in all cases where medical or hospital service is needed, from the time a mother summons the obstetrician or midwife until her offspring grows to old age and is finally laid to rest.

The compulsory insurance system covers wage earners in the middle and lower brackets, but persons of more means may, and usually do, come into the plan on a voluntary basis, as provided by law some 15 years ago.

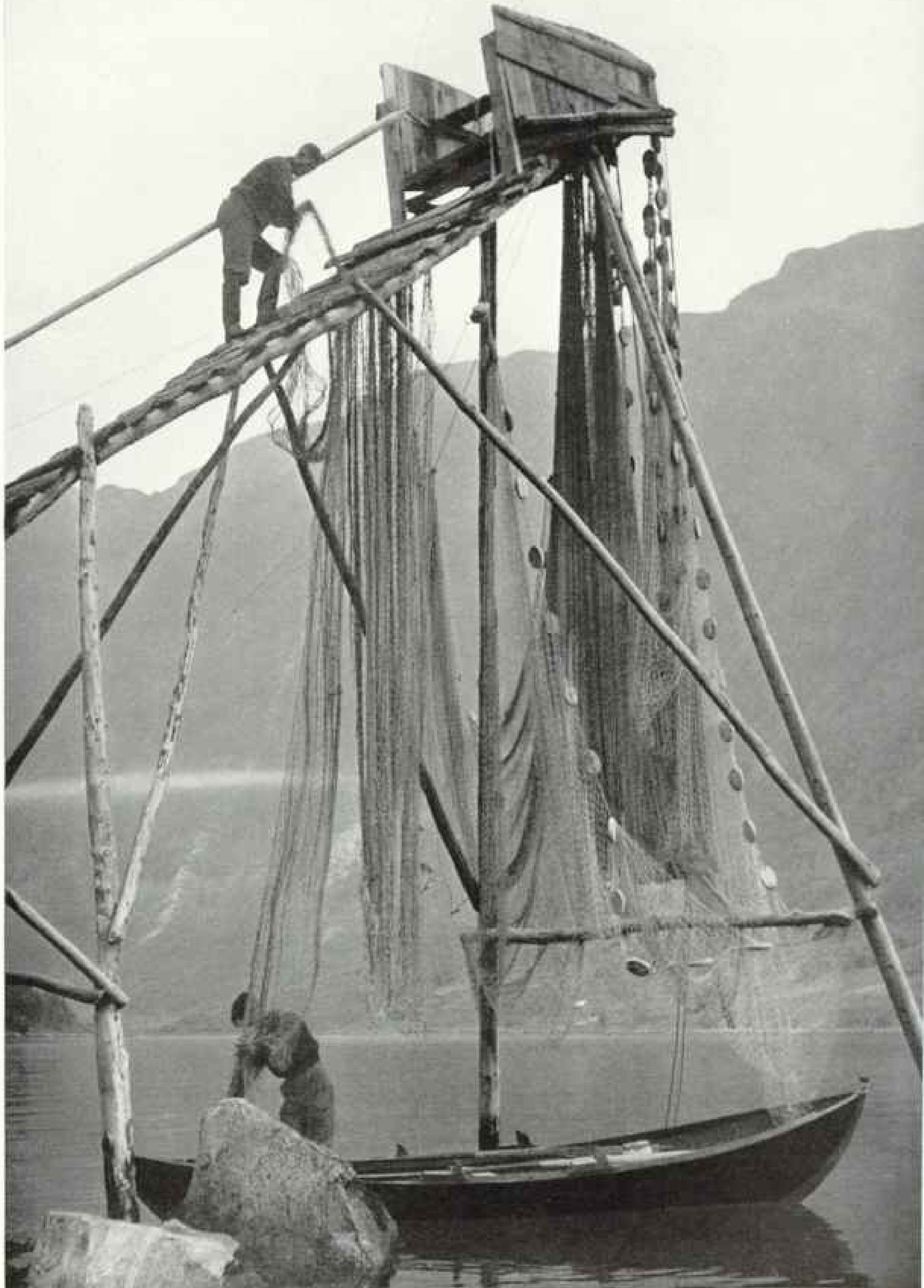
The Children's Act

If Ole Olsen's parents were destitute or even temporarily unemployed, health and maternity insurance was presumably furnished free by the city of Oslo and the State. If he had the misfortune to be born out of wedlock, that circumstance has probably not obstructed his path through life. The Children's Act of 1915 gave him the legal right to his father's surname and the right to inherit property on an equal basis with his legitimate brother.

The city of Oslo supplements this legislation with an effective system called Mothers' Pensions, which provides sufficient income to enable any separated mother, married or unmarried, to maintain her home and bring up her children. If she works to supplement her slender pension, her children are cared for at the city's expense in well-managed crèches and day homes until reaching school age.

If our hypothetical Ole, as small child or teen-age boy, faced a bleak future without either father or mother, the city became his devoted foster parent, and through the Child Welfare Council brought him up, not as a Norwegian *Oliver Twist*, but as a proud and respected youngster with as good a chance as anyone else.

When Ole was seven years old he entered an elementary school and became the beneficiary, whether he knew it or not, of one of the best and most democratic educational systems in Europe. He was assured, for at least seven years, of first-rate schooling in a



Hans Kjos

The Tower That Spotted the Salmon Now Dries the Nets That Caught Them: Sogne Fjord



Stavanger, Sardine Capital of Norway, Wears Winter's Frosty Mantle

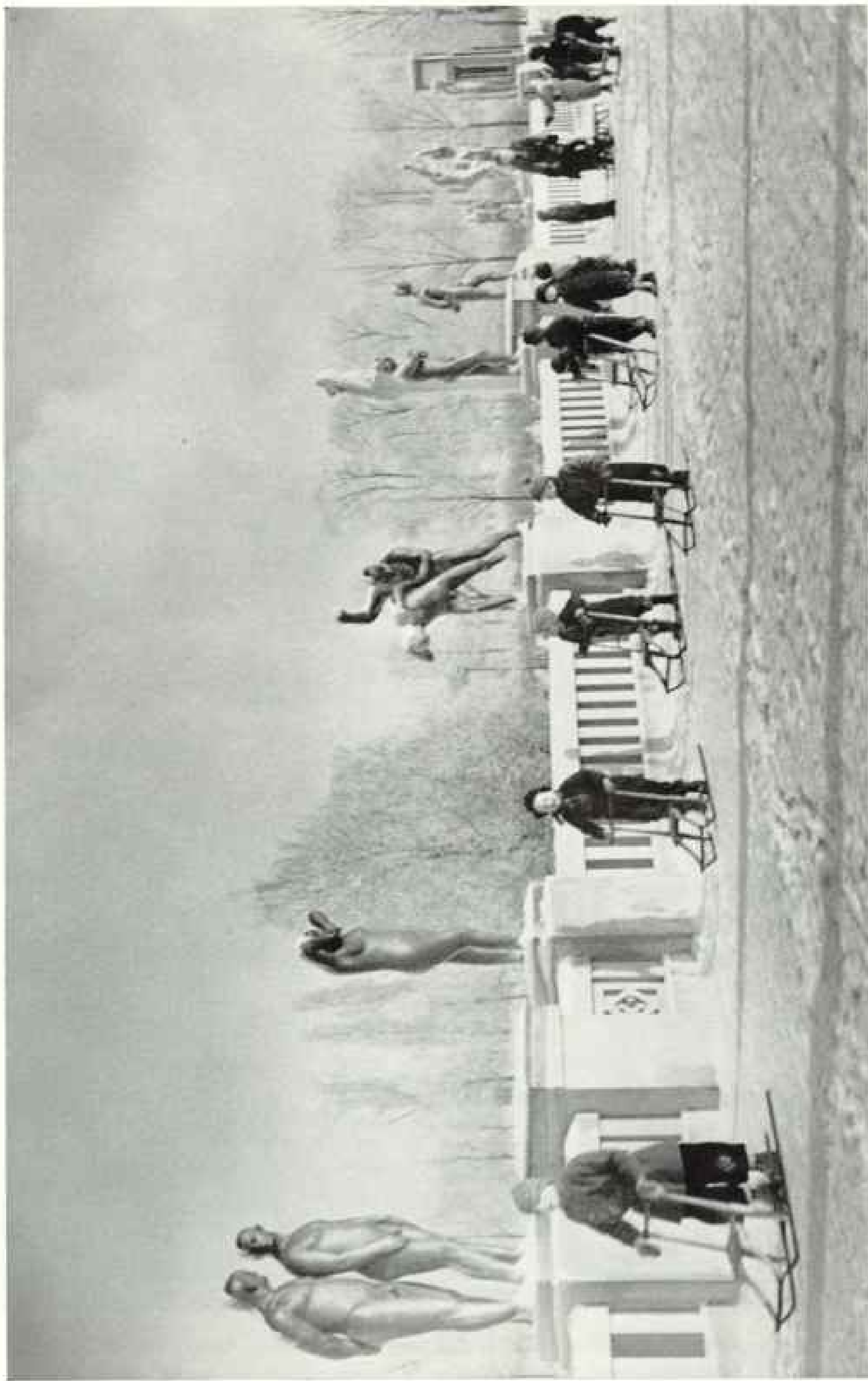
Norway's fourth city, not so long ago a village, owes its rapid rise to the once-despised sardine (brisling), which canning made valuable. Some 100 canneries here preserve about 600,000,000 fish a year (page 172).



Norwegian Official

Gloomy Days Stay Fog-free, a Boon to the New Transatlantic Air Terminal

Islands in the outer harbor support new shipyards where Norway builds large cargo carriers she used to buy abroad. Sola, Stavanger's airfield, is an \$80,000,000 "gift" from the Nazis, who developed it during their occupation (page 171).



© Elisabeth Meyer

Oslo Children, Kicking Scooter-sleds Past Gustav Vigeland's Bronzes, Get a Realistic Art Lesson

Initiated in 1906, Vigeland's monumental project is still growing, though the sculptor is dead. Proud Oslo never begrudged the millions it cost. Germany, hoping to beguile the Norwegians, let the work go on in wartime. This bridge, which crosses an artificial lagoon, leads to the Titan-borne fountain and the sculpture-laden Monolith. The latter depicts the human life cycle from embryo to senility (page 186).

land where illiteracy is virtually unknown. If he liked some special subject, he was allowed, even as a small boy, to specialize in that subject, while receiving adequate grounding in the three R's and other essentials.

He discovered, and it probably did not surprise him, that the children of the royal family were his schoolmates in public schools on a footing exactly equal to his own. Titles of nobility have been completely abolished in Norway, except for members of the royal family.

The "Oslo Breakfast"

Ole's school day started each morning with the traditional "Oslo breakfast," a school meal which has become famous throughout the educational world.

If it looks to Americans a bit grim, when put into words, it is nevertheless a model of healthful diet and, what is quite as important, is much liked by Norwegian children.

It consists of a piece of hardtack with vitaminized margarine and cheese, a piece of whole-meal bread, also with margarine and cheese, plus cod-liver paste, a tall glass of whole milk, a carrot or half an apple, and finally half an orange. Thirty minutes are customarily devoted to this meal, which is followed by 15 minutes of play outdoors.

The school day went its way for Ole, and he could look forward to a game of gardening in the afternoon.

When I first learned of this treat, I was reminded of a game my mother instilled into me when I was about Ole's age. She called it "helping mamma," and I was supposed to think it great fun.

Somehow Norwegian genius actually does make the cultivation of school gardens good fun. The youngsters plant, sow, tend, and harvest their crops with cooperative zeal, and in the autumn each child receives his share of ripe vegetables and fruit (Plate XXII).

During all of his elementary school years Ole was entitled to free medical and dental care, and when he went on into independent life, with or without the benefit of courses in Oslo's secondary schools and university, he continued to enjoy, through health insurance, wonderful freedom from fear—of doctors' bills.

If he is an average citizen of Oslo he also enjoys at least a relative freedom from want, despite the hardships brought on by war. He certainly does not live in a slum, because there are no slums in Oslo.

Perhaps he is doing well enough to live in one of the city's numerous ultramodern

apartments (Plate XX), dependent upon electricity for cooking, heating, and refrigeration, though occasionally, as in the period after the 1947 summer drought, regretting such super-electrification of his home. The "white coal" of southern Norway almost gave out on that occasion from the prolonged lack of rain.

Bergen, western base of Norway's three-city triangle, has been an important port city since King Olav Kyrre founded it around 1070. It reached a medieval peak of importance in trade in the 14th and 15th centuries when the German merchants of the Hanseatic League dominated it so utterly that even Norwegian merchants, not to mention English and Dutch, were forbidden to do business.

Norwegians liked that German occupation no better than they liked the next one, in 1940, and finally, in mounting anger, they managed to overthrow the greedy men of the League.

Forces greater than their own also threw out the recent German aggressors, but not until a terrible tragedy had occurred near the end of the war.

In 1944 a Nazi munitions ship exploded at its dock in the inner harbor with appalling results. Hundreds of Norwegians were killed.

The headquarters building of the Bergenske Steamship Company was demolished, killing 23 persons. The 15th-century banqueting hall of King Haakon Haakonson, a famous medieval relic, was wrecked, as was the Rosenkrantz Tower. The promontory of Nordnes, with its appealing Old World houses, became a shambles.

Perhaps worst of all, practically every window in the Bergen area was blown in by the concussion and many people were injured by flying glass.

Much of the Tyskebryggen was destroyed, but not the well-known Hanseatic Museum. The historic name Tyskebryggen means "German Quay," and that was joyfully wiped out on May 9, 1945, when the Nazi forces surrendered. It is now merely the Bryggen (the Quay), without the hated adjective *tyske*.

Bergen's National Stage

Most foreigners think of Bergen only as a port, but Norwegians think of it also as the hearth of their modern culture. On this hearth the fires of art were lit in the 19th century.

Ole Bull, a native Bergener, might be said to have started the conflagration, first by his personal celebrity as a violinist and later by founding in Bergen the National Stage. He also "discovered" a young fellow-Bergener

named Edvard Grieg and gave the initial impetus to his great career.

The National Stage in Bergen, "spreading" also to Oslo, won the interest of Bjørnstjerne Bjørnson and Henrik Ibsen, each of whom took a turn at directing it. They brought from obscurity the works of Ludvig Holberg, another Bergener, and raised the Norwegian theater to a distinctive level and even to European eminence, in rivalry with theater movements in all the great countries.

Too pure in its art to be popular at first, the theater failed after a few years but was later revived and won permanent success.

Bergen remained the inspiration of Norwegian drama and for decades provided Oslo and other cities with the best histrionic talent.

The western port carries on with credit to this day as a dramatic center, though now somewhat overshadowed by the capital with its greater resources.

Music gave me my earliest personal introduction to Bergen, and I still think of the city chiefly in terms of music. Going there in 1913, fresh from the campus, I was thrilled to hear a young American violinist named Albert Spalding give a concert in the modern National Theater, then newly built. I remember thinking him courageous to invade the city of Ole Bull, but Bergen took him to its heart.

The importation of such artistry as his from the United States was a decided novelty in that old stronghold of musical culture.

It is interesting to trace the paths of Bergen's chief musical celebrities. To track down the towering Grieg is easy, for his home and studio, collectively called Trollhaugen, form a conspicuous landmark in the suburb of Hop.

But Ole Bull takes a good deal of finding, and only just now have I made my way to his home, by rowboat, on the island called Lysøy, in a fjord some 12 miles south of the city.

There one may see the fantastic Moorish-Russian-East Indian mansion which the violinist built in his old age, a florid cadenza of construction but handsomely located.

Souvenirs of Ole Bull

One may examine, among many personal souvenirs, one of his violins, with a woman's head for scroll, and on the wall one may study a program of a concert given in Buffalo on November 15, 1853, when he was on one of his "farewell tours."

The program announces as a special attraction that Mr. Ole Bull has engaged the services of "Adelina Patti, the musical phenomenon," then only 10 years old. A good showman was this Bergener, as well as a great virtuoso.

The base cities of Norway's triangle, Oslo and Bergen, are tied together by a railway that was Norway's first major effort to crack her mountain shell. When opened in 1909 after 34 years of planning and labor, it was considered a world wonder, as indeed it was and still is. Latitude (north of the 60th parallel) combined forces with altitude (over 4,000 feet), and both joined in chorus with a brutal beauty called Mother Nature to say, "This line shall not be built."

A World-wonder Railroad

A great many intelligent Norwegians said, "It cannot be built." And then it *was* built. It crosses the wild and lofty plateau called Hardangervidda. (Vidda means vast plateau.) It runs above the pine line for 60 miles, above all tree growth for 30. It bores through 184 tunnels, ducks under 10 miles of snowsheds, and behind 10 miles of snow screens.

Despite such quests for shelter, it is a glutton for snow, eating through 12-foot drifts behind giant rotary snowplows, each of 1,000 horsepower. Its loftier stations look like Eskimo igloos from October to April, and Finse, its highest station, serves as a center for June skiing. (Midsummer-night skiing by daylight at midnight is a perennial thrill.)

The line is old news, as dull as a miracle. I crossed the sky by means of this miracle when it was four years old, when it was 25, and now when it is nearing 40. Its wonder never wanes.

It is the only winter connection, on land, between Norway's two chief cities, and is bound to remain so until the snowmobile becomes an accepted conveyance.

One may, as I have said, drive from Stavanger to Kirkenes, a distance of 1,900 miles, and with the exception, in hard seasons, of a stretch over the Saltfjell, in Nordland Province, and another in farthest Finnmark, one may do so in midwinter; but one may not drive from Oslo to Bergen.

Norway can crack mountains, but her engineers have not learned how to melt a billion tons of snow, and then a fresh billion. And the Gulf Stream has not learned how to send its warm breath, with full effect, nearly a mile in air.

The motor road between Oslo and Trondheim, apex city of the triangle, is kept open to traffic in winter by sustained effort, but the brief high point of this road is lower than the Hardangervidda and far less forbidding.

There are two railway routes from the capital north to Trondheim, and one of them, the Rørosbane, was being converted from narrow



A Truck Cabin Makes a Grandstand Seat. Junior's "Meersechaum" Is a Horn
 Norway's children are as healthy as they look. In lieu of winter sun, they get plenty of cod-liver oil. During the German occupation, adults sacrificed food that the younger generation might grow strong.



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IX

Illustrations by Gilbert Grosvenor

More Love than That for Country Shines in These Old Grads' Starry Eyes



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X

Illustrations by Ole Frithjof Norheim

A Solitary Cowboy Suit Stands Out among Young Vikings. It Looks Like the Gift of a Minnesota Uncle



Glowing Male Nurse and Grownup "Baby" of Doubtful Sex Burlesque Norway's Rising Birth Rate.



Sturdy Girls of Kampen School Proudly Parade Their Banner Beside the Norwegian Flag



© National Geographic Society

Illustration by Ole Folke Høster

"Town and Country" Lamppoon High-school Essay Topics



XIII

Illustration by Gilbert Grosvenor

Father's Broad Shoulders Relieve a Weary Spectator



Each Girl Waves Her Country's Flag—a Section of the 30,000 Children Marching in a 6-hour Parade

The infectious gaiety of Oslo's youngsters contrasts with the traditional taciturnity of Norwegian country/folk.



© National Geographic Society

Silver Filigree on National Costume Is a Family Heirloom



XV

Parade's Early Bird Sleepily Protests Getting Up So Soon

Contributed by Ole Frithjof Norheim



Kochiluzome by Gilbert Grosvenor

On a Day Meant for Smiles, One Girl's Gesture Says, "Oh, My Aching Feet!"

Having stood in line and marched for hours, these schoolgirls near the end of the parade.



© National Geographic Society

XVI

Kochiluzome by Otto Fritsch

Students Waste No Time Waiting for the Parade to Start; They Study

Within the next few days they will begin their examinations. Some time in June they will know whether they've passed. Notwithstanding festive canes and caps, the interval is filled with anxiety.





Leisurely Diners, on a Sunlit Terrace, Watch White Sails Skimming Across Oslo Harbor





White-capped Members of a Choral Society Meet on a Lakeside to Hail Norway's Independence with Song

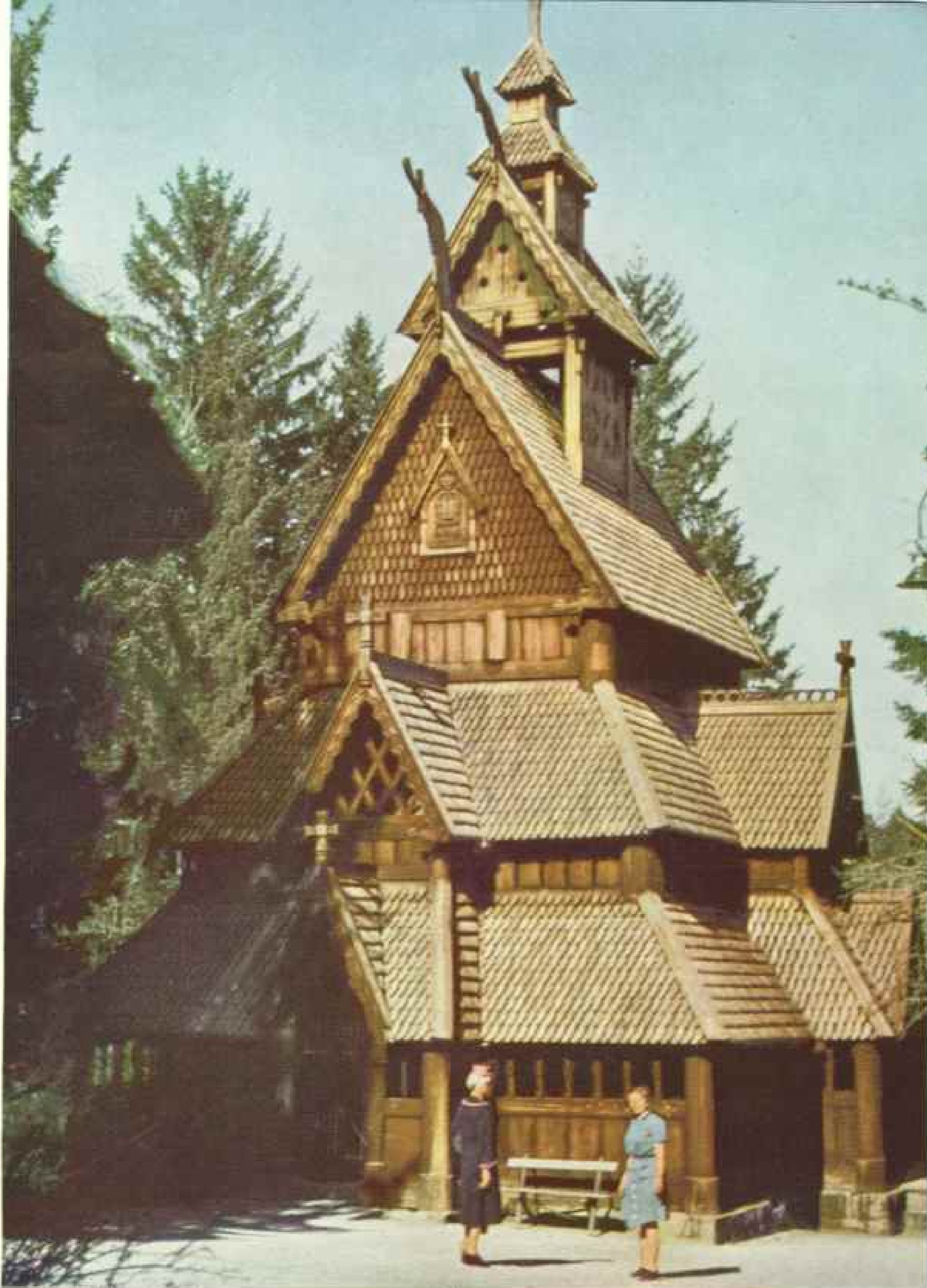


Oslo's Twin-towered Town Hall, Begun Before the War, Remains Unfinished



Balconies on Oslo's Modern Apartment Houses Express Norwegians' Love of Sunlight

When spring rolls around, winter's pale shut-ins spend long hours on their balconies. They so love the sun that they seldom draw window blinds. Rooftop sun-bathing, however, is not very popular.



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XXI

Reproduction by Gilbert Grosvenor

Norway's Early Christians Built Dragon Churches in the Form of Pagan Temples

This eight-century-old specimen, preserved in the Folk Museum of Oslo, resembles a Chinese pagoda. Dragon's head gargoyles stick out above the crosses; shingles are like dragon scales. Windows are lacking.



In Their School Gardens, Oslo Children Raise Great Quantities of Vegetables and Fruits

Every year Norway sends its school children into forested areas to replant trees. They also help gather the country's crops.



Using a String Lasso, Two "Park Aunts" Herd a Kindergarten Class to a Playground. They Carry Picnic Lunches

Oslo's parkaunter, usually trained nurses, call in the morning to relieve working parents of children below school age.



A Book-weary University Student Snatches Forty Winks Between Examinations



The American Influence: Collegians Throw Off the Tyranny of Jackets and Neckties

These medical students relax in the sun between classes. As Oslo University faces busy Karl Johan Street, they may often be seen strolling arm in arm through crowds of shoppers.

gauge to broad gauge when the war came.

The Nazis rushed through the conversion by forced labor, opening the line in the latter half of 1941. They similarly rushed to completion a short north-going spur of the Oslo-Bergen trunk line called the Flåmsbane, a line nearly completed, from Myrdal north to Flåm, on a branch of the Sogne Fjord.

This Flåm line, gateway to the classic fjord-and-highway route from Bergen to Trondheim, cries for inclusion in the mountain-cracking roster. It is another miracle and not a minor one. Again credit goes to Norwegian engineers, not German.

Celebrated Scenic Places

Devised and largely built to enhance tourist travel, it is so glorious in beauty, so incredible in its hairpin turns and circles, that in summer the chief trains now stop at special viewpoints over chasms and beside huge waterfalls while the conductor goes through the train lecturing about Nature and about construction problems.

Down this almost sheer mountain wall the traditional horse-drawn carts of Norway have carried exclamatory tourists for decades by a zigzag track. Deplorers deplore the invading rails, but at least the line is electrified. No smoke or soot hides the stupendous scenery (though numerous tunnels do), and the railway carriages—if this be treason make the most of it—are more comfortable than the jouncing carts.

From Flåm the "tourist highway"—in part fjord ferries (which take cars) but mostly mountain-scaling motor roads—works north, by a thousand convolutions, to Trondheim.

There is nothing else in the world of scenery, in this traveler's opinion, that can match this route, mile for brilliant mile. Among its celebrated scenic points are Balholm, Loen, Geiranger, and war-raided Åndalsnes in the Romsdal.

Its physical high point is a newcomer to the scenic galaxy, the peak called Dalsnibba, rising a vertical mile above the Geiranger Fjord.

A motor toll road was completed to this peak in 1939 and is only now coming into its tourist own. From the summit it presents a view which is often called the finest mountain view in Europe, though that superlative can have little meaning in Norway.

Mountaineers bemoan this new road with some bitterness. They think that no view such as that from Dalsnibba should have its peace broken by hordes of easy trippers or, indeed, that it should be seen at all unless earned by hours of climbing.

But from the mountain's crest they can see several hundred other peaks that remain unconquered by the motorcar. There are still a few undisturbed views which the strong of heart and limb may strenuously earn.

Trondheim, Norway's most northerly city of any size, is infinitely greater in significance than in its meager population of about 60,000.

Founded by the fabulous King Olav Trygvason in 997, it became the nursery of the nation when Trygvason's nephew, King Olav Haraldsson, a rugged warrior who converted the land to Christianity by the most violent methods, was suddenly deemed to be a saint.

This phenomenon took place after his death in battle in 1030. His bones became the goal of countless pilgrimages, and to house them the greatest cathedral of Scandinavia grew up in Trondheim, then called Nidaros.

The sainted bones were dispersed by Reformation vandals centuries ago, but the Cathedral still grows.

As has been stated, it is the historic crowning place of Norwegian kings. St. Olav's line was here crowned for three and a half centuries, until it became extinct in 1387.

Then came consolidation of the Scandinavian peoples and crowns. Norway had no separate king until the present one, Haakon VII, who was crowned in Trondheim's Cathedral in 1906 in a ceremony that fired national emotions.

Eras come and eras go, but the vast blue-gray Trondheim Cathedral goes its way. It has long been called the national thermometer. When times are good, a few million *kroner* are voted for repairs or enlargements or artistic refinements. When times are bad, the edifice rests, and waits.

Extensive improvements of the west front are now in slow progress. I asked a Trondheim authority, "When do you think the Cathedral will finally be finished?"

"It will be finished," he said with a disarming smile, "about the same time that New York City is finished."

To the Russian Frontier

The north Norway portion of the National Highway extends some 1,200 miles from Trondheim to Kirkenes and the Russian frontier.

This was nearly completed, except for numerous ferry stretches, just before the war, but to the occupying Germans the feasibility of using the road continuously seemed almost a matter of win or lose.

They desperately needed it to provide a land route to Narvik, strategically important as the outlet port for Swedish iron ore, and



© Elizabeth Meyer

To Toddle and Ski—a Norwegian's First Two Steps

Boy or girl, the young Viking who can't ski is as rare as the American who can't swim. Pagan Norway "wore the boards"; Christian Norway introduced the sport to the world. Here Tomm Murstad, a ski instructor, trains his 19-month-old son near Oslo.

to ice-free Arctic ports, whence they could harry sea traffic to and from Murmansk; so they rushed through various improvements, especially the by-passing of several ferry stretches.

Grim Mementos of Russia

Similarly, and for like reasons, the Germans completed the well-advanced Nordland Railway, which now leads from Trondheim through Mo, a fjord port virtually astride the Arctic Circle. They were pushing the rails still farther north across the bleak Saltfjell toward Bodø when their grip on Norway was finally loosened.

No census was taken, or ever can be taken,

of the thousands of war prisoners, chiefly Russians, whom the Germans deliberately massacred by overwork, under impossible conditions, in the Saltfjell stretch.

Russian cemeteries are pitifully numerous, especially in the Dunderlandsdal, just north of Mo, and can be seen by any traveler.

The Soviet Government has erected mass tombstones, each bearing the sign of the Hammer and Sickle.

The legacy of new rails and roads left by departing Nazis in the north has been hardly more than a challenge to Norwegian enterprise. In open stretches the rails were often laid loosely over meadows. In mountain sections they were smashed through by any means that was quick.

War-born Labor Problem

German handling of Norwegian labor has left a headache for reconstruction authorities. In their desperate haste to push through needed construction the Nazis wooed reluctant Norwegians by

various special favors and by paying, with stolen Norwegian money, fantastically high wages for every type of work, wages which cannot possibly be maintained by a solvent state.

They strove to make it clear that they were "friends" to the Nordics of Norway. It was only the "subhuman Slavs" and enemies of progress whom they killed with their severities.

This campaign of temptation and flattery was long sustained, and the money was poured out in Niagaras of kroner.

It is hard even for the present Labor Government to bring some types of labor down to everyday earth without courting cries of

"reactionary," and it is more than hard for road and railway construction to cope with labor difficulties along with those of a technical nature. Yet the mountain-cracking, fjord-skirting work goes impressively forward, as I know from being amid it as I write.

I have made my way by train and bus, not steamer, to Tromsø, which is just south of the 70th parallel of latitude, as is Kirkenes far to the east.

Beyond Tromsø the Norwegian Government for the present frowns on travel of any kind not directly connected with the reconstruction program.

The desperate plight of the far north, meaning the Provinces of Troms and Finnmark and isolated martyr towns like Bodø, completely blotted out by the Luftwaffe, Rotterdam style, in an early raid, is perhaps the most unifying element that makes progress possible. "It is a good time in the north because it is so bad."

When the Germans withdrew before the Russians in the autumn of 1944, they attempted to erase the region so the enemy could not use it.

"Within a few weeks," says a Government publication, "nearly everything created by man through the centuries was laid waste in an area some one and a half times the size of Denmark."

Rebuilding the Far North

The rebuilding of this waste is an epic of activity little mentioned in the world's press, because mere toil does not make news. It will go on for some time, and tourism, north of Trondheim, will be officially discouraged until the program is further advanced.

"Do you know what spurs me on, and many others, too?" a man in Bodø asked me, amid a din of construction noises. Then he answered himself. "It is a poem that used to be seen on living-room walls in America when I lived there as a young man. I'll show it to you." And he pulled from his pocket a poem of four verses entitled *Hvis*.

Because that word was one of the few Norwegian words lodged firmly in my vocabulary, I recognized Rudyard Kipling's *If*.

"The translation was made by Carl Joachim Hambro, formerly president of our national

Odelsting" (a division of Parliament), he continued, "and the poem is as fine in our language as in yours."

Then he shouted the whole thing in Norwegian above the inspiring cacophony. It was immensely stirring.

But for every Norwegian whom Kipling's poem has spurred, hundreds have been exalted by a poem of their own Bjørnstjerne Bjørnson, for it was he who wrote the words of their national anthem.

Sinking of the *Tirpitz*

In Tromsø Egil Lindberg recited a portion of the anthem to me. Lindberg is one of the men whose secret radio messages to the British resulted in the destruction of the battleship *Tirpitz* on November 12, 1944.

He showed me her rusted hull, a fantastic red behemoth in shallow water near Tromsø, slated soon to be salvaged for steel and valuable machinery.

"When that ship went down," he said, "it was just one more sign that Nazi Germany was finished. The *Tirpitz's* commander could probably have found a sheltered fjord where he might have saved his ship, but he didn't seem to try."

"Perhaps he was discouraged by men like you," I ventured.

"No, no," he demurred. "A happening like that is fate, God, whatever you want to call it. Our release from the Nazis was near. The idea is in our national song."

I asked him to recite it, and with some diffidence he gave me four lines. In the English translation by G. M. Gathorne-Hardy these lines are:

Norseman, whatsoe'er thy station,
Thank thy God, whose power
Willed and wrought the land's salvation
In her darkest hour.

For additional articles on Norway in the NATIONAL GEOGRAPHIC MAGAZINE, see "Nomads of Arctic Lapland," by Clyde Fisher and Jack Kuhne, November, 1939; "Norway, a Land of Stern Reality," by Alfred Pearce Dennis, July, 1930; "Norway and the Norwegians," by Maurice Francis Egan, June, 1924; "Country Life in Norway," by Axel H. Osholm, April, 1939; "Life in a Norway Valley," by Abbie L. Bosworth, May, 1935; and "Norwegian Fjords and Folkways," 20 illus. in color from natural-color photographs by Jack Kuhne, April, 1939.

INDEX FOR JANUARY-JUNE, 1948, VOLUME READY

Index for Volume XCIII (January-June, 1948) of the NATIONAL GEOGRAPHIC MAGAZINE will be mailed upon request to members who bind their copies as works of reference.



Train, Auto, and Canoe Meet at the Trip's Starting Point, near Keyser, West Virginia

The rocky, shallow North Branch is here less than two canoe lengths wide, but all hands work willingly to become water-borne. Canoes are lifted from car tops. Duffel bags, food boxes, charts, and water jugs are readied for loading. Paddles are not forgotten. A Mallet locomotive, Percheron of the B & O stables, roars by.

Down the Potomac by Canoe

BY RALPH GRAY

With Illustrations from Photographs by Walter Meayers Edwards

FAR upstream from the broad tidal reaches of the Potomac at Washington, D. C., the "national river" begins as two small trickles almost hidden in the deep folds of the Allegheny Mountains. One trickle forms the North Branch of the Potomac; the other, the South Branch.

To trace the crazy windings of the changeful river as it tumbles to tidewater, seven of us in three canoes embarked on the North Branch about five miles below Keyser, West Virginia, one hot day in July.

Before us stretched some 225 miles of paddling and portaging, shivering and sweating, camping and cooking, that ended twelve days later in the Nation's Capital (map, pages 214-215).

Canoeing Through a "Rock Garden"

We put in from the Maryland bank where the river, though less than two canoe lengths wide, seemed deeply channeled. We did not know that around the first bend we should find the water skimming over a rocky shelf that all but choked the current.

Caleb (Cay) Hathaway saw it first. "Did you ever canoe through a rock garden?" he asked.

"This is known as a riffle," I explained. "Usually the rocks are wet instead of just damp."

I stood up in the rear of *Baby Blue*, an aluminum canoe, to see if the riffle had a "slick," an opening in the rocks where most of the water pours through in a smooth V pointed downstream. It did. "Follow me," I called back too confidently.

As I sat down, Harry Swanson, the front man, paddled strongly to build up steerage-way. We swung easily into the opening and for a moment felt the thrill of a live vessel beneath us sliding silently over brawling water.

Then—*scrape!* The Potomac had scored first.

Harold and Vernon, my two brothers, were following in *J-10*, an all-red canvas canoe. They piled up behind us. But *Green Lady*, our third canoe, had seen waters like these before. Cay, her owner and steersman, successfully worked her 18-foot canvas length through a passage against the reeds on the West Virginia bank that any smart sardine would have avoided.

"You've got to learn how to read the water," he said, with a smug look on his face.

"Look out! Rock on the right!" warned Charles (Chuck) Peck, Cay's front man. *Green Lady*, with a shuddering scrape, hung hard on the submerged obstruction.

Pride Goeth Before a Ducking

Walter M. (Topsy) Edwards, the third man in *Baby Blue*, jumped into the ankle-deep water and pushed, while Harry and I poled, and we were soon afloat.

With *J-10* right behind me, I piloted my free canoe through the remaining rocks, then let her drift as she found deep, quiet water. Chuck and Cay silently paddled up beside us.

"You've got to read the rocks beneath the water too!" I chortled.

Starting 725 feet above sea level, we navigated hundreds of these miniature rapids. In the first days, many of them dropped only a foot, or even less, and often they were less than 100 yards apart.

Later, as the river burgeoned with tributaries and fought clear of mountains and Piedmont, riffles became rapids and rapids became falls. Nearly everything the Potomac had to offer we took, and the rougher it was the better we liked it.

Almost before we knew it, the shoal area ended. The river deepened, ran through a navelike arch of sycamores and maples, and broke out around a bend beneath sheer cliffs 140 feet high. Then the rock wall disappeared behind us and again we entered the main aisle of a woods cathedral. The Potomac's changed personality was revealing itself.

One thing was missing—people. In our first three days we saw only one person on the water. Part of the answer in the upper reaches was pollution, industrial and sanitary—a scourge made worse by the low-water season. Acid coal mine runoff, blending with the outflow from the Luke, Maryland, paper mill 12 miles above our starting place, combined to kill nearly all life in the water.

Spume flecked the river. Our paddles stirred up black sediment with every stroke. Where the water was three or four feet deep a kind of subterranean fermentation sent bubbles popping to the surface. The ones that struck *Baby Blue's* hull pinged metallically.

Riffles are Nature's aeration plants, restoring the water's natural clearness.



Drawn by Theobald Price and Irvin E. Allman

Taking Passage with the Fast-water Potomac, Canoers Twisted and Dropped to the Tides

Embarking on the Maryland side five miles below Keyser, West Virginia, the expedition followed the river through a dozen ranges of the Alleghenies and Blue Ridge. In their fragile craft the paddlers skimmed rocks, shot riffles, and lurched over rapids and falls. In between, they drifted with the current along natural tree-draped pools and stroked laboriously through the slack water behind dams. Altogether, the tumbling river dropped them 725 feet in 225 miles of paddling.

We made our first camp in a narrow pasture bracketed between river and railroad tracks. Baltimore & Ohio and Western Maryland trains were out of sight over a slight crest, but not out of hearing. Each locomotive whistled at least four or five times as it passed.

Hamburger and Coffee Time

Cay built a fire and got coffee going while Vernon and I made hamburgers—three parts top ground round and one part onion. Chuck peeled potatoes and put them on to boil. Harry and Tippy pitched the two tents.

Vernon, war surplus-conscious, had bought a jungle hammock which came complete with everything except two trees the right distance apart. "I bought that hammock for research," he said. "I want to find out how long a body can go without sleep."

After eating, we washed the dishes in darkness. The sun had gone down behind Dans Mountain, and now the moon was silhouetting Knobly Mountain (Plate V). Our fire flicked misshapen shadows on the nearest trees. Tired out by an unaccustomed 14-hour day, we turned in.

Next morning I noticed Vernon was standing slightly doubled over. "How did you sleep?" I ribbed him.

"Fine," he said. "From 5:30 to 6!"

In short order we breakfasted, broke camp, and shoved off. Except for the railroads and bridges, we still had the river to ourselves. The Keyser-Cumberland highway, a mile or so to our left, was just out of sight.

"There may be no traffic *on* the river," said Harold, "but its valley is a real transportation artery."

"Once the river itself carried commerce," I reminded him.

Hard as it was for us to believe, the "Patowmack Company," whose prime mover was George Washington,* announced in 1802 that the river was navigable from near Western Port, six miles above Keyser, to tidewater. "Navigable" meant dry-season channels deep enough to allow passage of boats carrying 50 barrels of flour.

"What did they haul on the river then?" asked Cay.

"Flour and farm produce, tobacco, whisky, and livestock. Often farmers poled makeshift rafts down to Georgetown, marketed their surplus crops, sold their rafts for lumber, and walked home."

After hours of expectant paddling, we reached the Celanese Corporation of America dam. A rough line of rocks diverted water into the huge plant. The first of our nine portages was simple.

We Push into Cumberland

Below the dam, white, soapy-looking foam poured from the plant into the river. A few yards farther on, a stream heavy with residue blackened the North Branch.

As we neared Cumberland, the fast-water

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Potomac, River of Destiny," by Albert W. Atwood July, 1945.



Potomac's second city, we entered the backwater of another dam which bottled up the pollution and ruined the otherwise pretty and extensive water front. The city now turns its back on the river to which it owes its origin.*

We paddled in silence and possibly unseen across the basin to the center of town. At the point where Wills Creek joins the main stream we landed and climbed a grass-grown bank into Riverside Park.

While the others walked uptown to telegraph home, I strolled about on this point of

land, perhaps the most historic spot of the upper Potomac. Many an early-day great man came this way.

Indian Will, Cumberland's first settler, gave his name to the creek and to the mountain through which it cuts to make a route to the West. Thomas Cresap, Indian trader and gifted Maryland frontiersman, built a road

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "A Maryland Pilgrimage," by Gilbert Grosvenor, February, 1927; and "Maryland Presents —," by W. Robert Moore, April, 1941.

through the wilderness to the Ohio tributary waters near Fort Duquesne (Pittsburgh). George Washington and Gen. Edward Braddock used the path during their French and Indian campaign.

Afterward, a "national road" to connect the mountain-bound East with the great West of that day was built. The National Old Trails Road (U. S. 40) still follows substantially Cresap's 18th-century blaze.

Cresap was Lord Baltimore's one-man outpost; for years he was Maryland's westernmost settler.

Across Wills Creek I saw two large water gates framed in a familiar type of stonework. The sturdy, time-worn masonry was unmistakably the work of the Chesapeake and Ohio Canal builders.

We paddled to the gates and climbed on top. Sure enough, this was the western terminus of the canal, that grand relic conceived with magnificent vision but outmoded by the railroad the day construction began. Here water was let into the completed man-made artery in 1850, to flow on the Maryland bank of the Potomac 184.5 miles to tidewater.

Uphill Portage Takes All Hands

At the lip of the dam just below the C and O water gates we debarked in scummy water and began the portage. Forming a chain, we tossed duffel bags and individual items from man to man to the towpath, 20 feet above river level. Then four or five hands grasped the canoes in turn and worked them through trees and up the steep, rocky bank.

Below the dam a concrete incline extending to the water's edge protects the bank against floods. We had to carry and slide our canoes and duffel down the 45-degree grade.

As we pushed away, twenty or so boys ran downstream along the towpath, undoubtedly to watch us capsize in the Cumberland rapids. Here the full volume of the North Branch and Wills Creek is funneled into one narrow, twisting, turbulent channel.

In single file we edged our canoes into the swiftly falling current. They responded like spurred chargers. It was a good run—our first really sporty white water.

We camped on a sandy beach near a highway bridge. Except for the bridge and its cars, we might have been on a jungle stream. A festering, vegetation-choked slough area spread behind us at the edge of the beach, completely walling us off from landward penetration and continually orienting us toward the river, our sole means of escape.

But next morning we knew we were in civilization.

"Look!" Chuck called, pointing ahead to an evil-looking conduit mouth from which gushed a great volume of black liquid. We paddled in reluctant silence. This was Cumberland's trunk sewer, dumping its raw contents into the river—"the biggest tributary thus far," as Vernon said.

With a steady current and adequately deep water we stroked off the miles (Plate IV) and reached Oldtown at 4 p. m. Beneath a broiling sun we walked a quarter-mile from the low-level toll bridge to the center of the village.

Oldtown was old before Thomas Cresap, its first white settler, moved in and built a stockaded home for his family in the early 1740's. A group of Shawnees under Chief Opessa had settled here more or less permanently 30 years before.*

We found no trace of Cresap's home; he is all but forgotten today, even in Oldtown. But on the main street stands the still-inhabited Cresap House, a large two-story stone dwelling built about 1765 by Michael, the frontiersman's youngest son. I was told the basement had once been used as a jail during the Indian wars.

For the unfortunate Braddock, Oldtown was a rendezvous point on his wilderness march toward Fort Duquesne.

Washington, when 16, slept in Colonel Cresap's log home five nights, detained by floods.† His journal relates that a party of thirty-odd Indians returning from the warpath also were at Cresap's. Their "dauncing" amused the young surveyor, but not the local road, "y. worst Road that ever was trod by Man or Beast."

Under threatening skies we reached one of the trip's milestones at dusk. In the middle of a broad, placid stretch the South Branch of the Potomac, flowing from the clean farms and forested mountains of West Virginia, joins the North Branch (Plate VI).

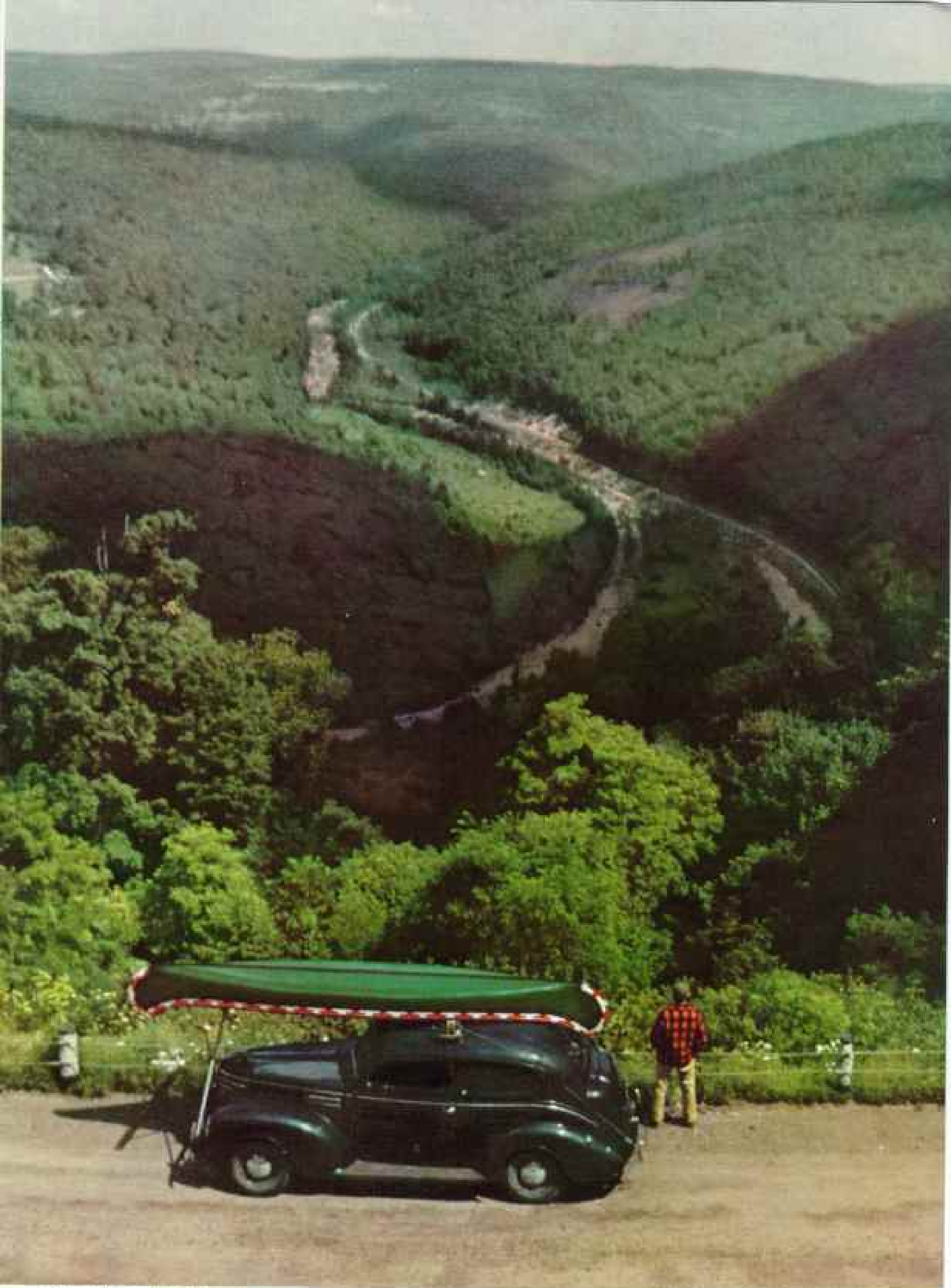
Here begins the Potomac proper. A diagonal line marks the meeting of the waters.

Overnight Camp in a Clover Patch

Looking for a camping place before rain or night fell, we spotted Isaac Long stepping through a cleft in the almost solid green wall of the river bank. "You boys can camp in my clover patch across the river," he said, jumping into his flatboat. "It's about to start coming down! Come on, I'll show you the way."

* See "America's First Settlers, the Indians," by Matthew W. Stirling, NATIONAL GEOGRAPHIC MAGAZINE, November, 1937.

† See "Travels of George Washington," by William Joseph Showalter, NATIONAL GEOGRAPHIC MAGAZINE, January, 1932.



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Endochrome by Walter Meyers Edwards

Ambitious Canoeists in Search of a Starting Point Scout the Potomac's Headwaters

Near Kitzmiller, Maryland, seven members of the expedition found the river's North Branch too shallow, so they took to the water 30 miles below this point. In 12 days they paddled and portaged 225 miles to Washington, D. C.



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11

Kodakprints by Wallace Staupjes Edwards

The Voyage's Advance Guards Laze on a Flower-carpeted Hillside and Contemplate the Beauties of a Potomac Meadow

Seneca Rocks (center), a West Virginia outcrop, stand 900 feet above a fork of the South Branch, which lies hidden in the valley.

White Water Thrills the Canoeists . . . and a White Stone Gives the Author a Glimpse into Colonial America

On the right, "Fix" identifies Fairfax Stone, first planted two centuries ago at the uttermost source of the North Branch of the Potomac (back-ground) has scarred the landscape and actually moved the Patomac's source. The headwater, formerly flowing from a spring near the stone's base, now seeps from a man-made trench. Left: the canoe *Green Lady* shoots a South Branch riffle.

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Illustration by Walter Meisters Edwards





Running Out of a Sudden Rain, the Flotilla Pauses below Cumberland, Maryland, to Dry Bedrolls and Bail Cances.

Pale Backs Say that the Expedition Is Still Young

The river was here before the mountains. As the Appalachian ranges slowly rose in its path, the stream wore gaps down to its own level.

Wherever the Potomac crosses a range, its bottom is strewn with lines of bubbly boulders or solid, rocky ribs.

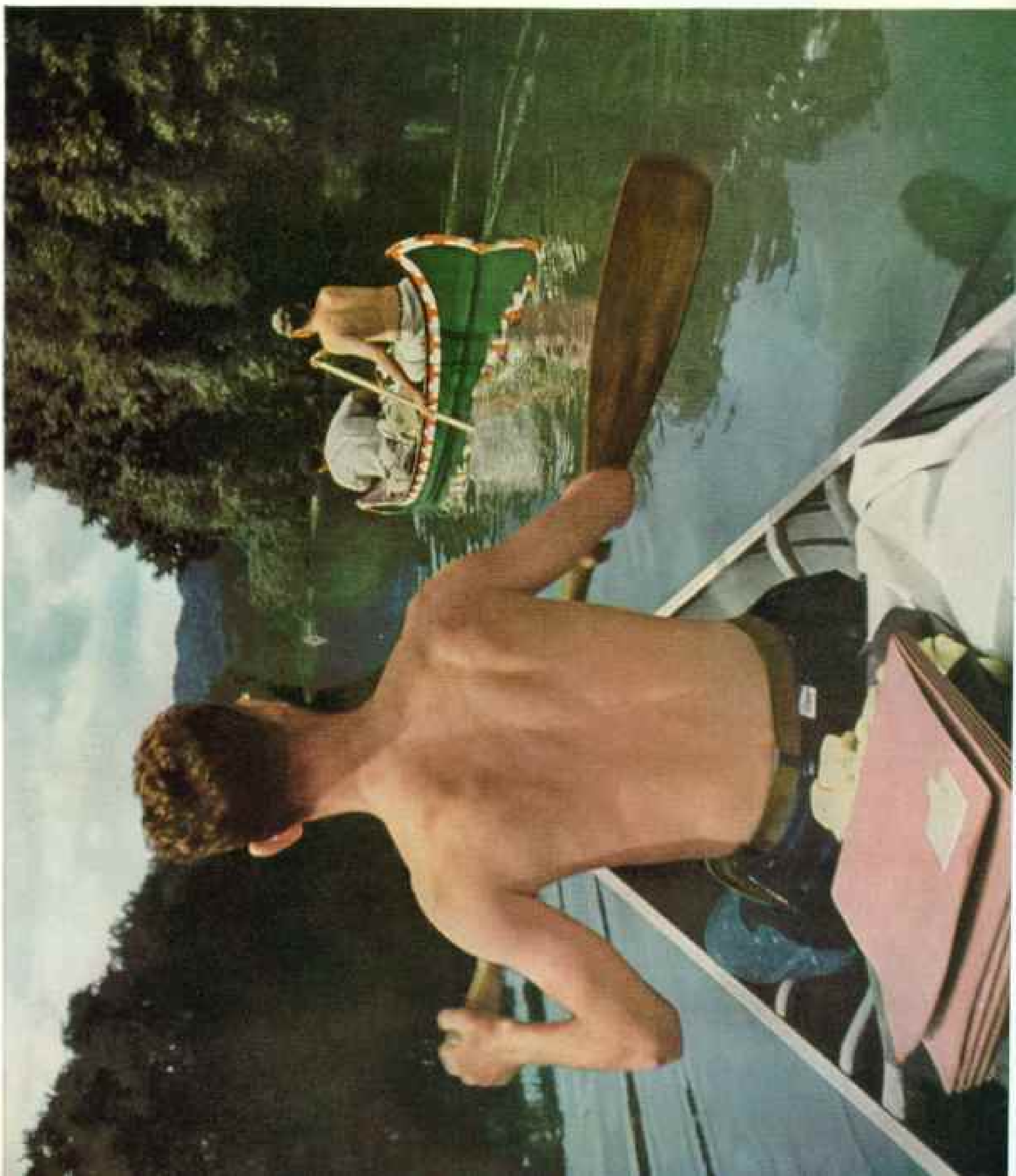
White water, rushing through traps in the rocks, forms the Potomac's innumerable riffles, rapids, and falls. To canoeists these hazards offer thrills and spills.

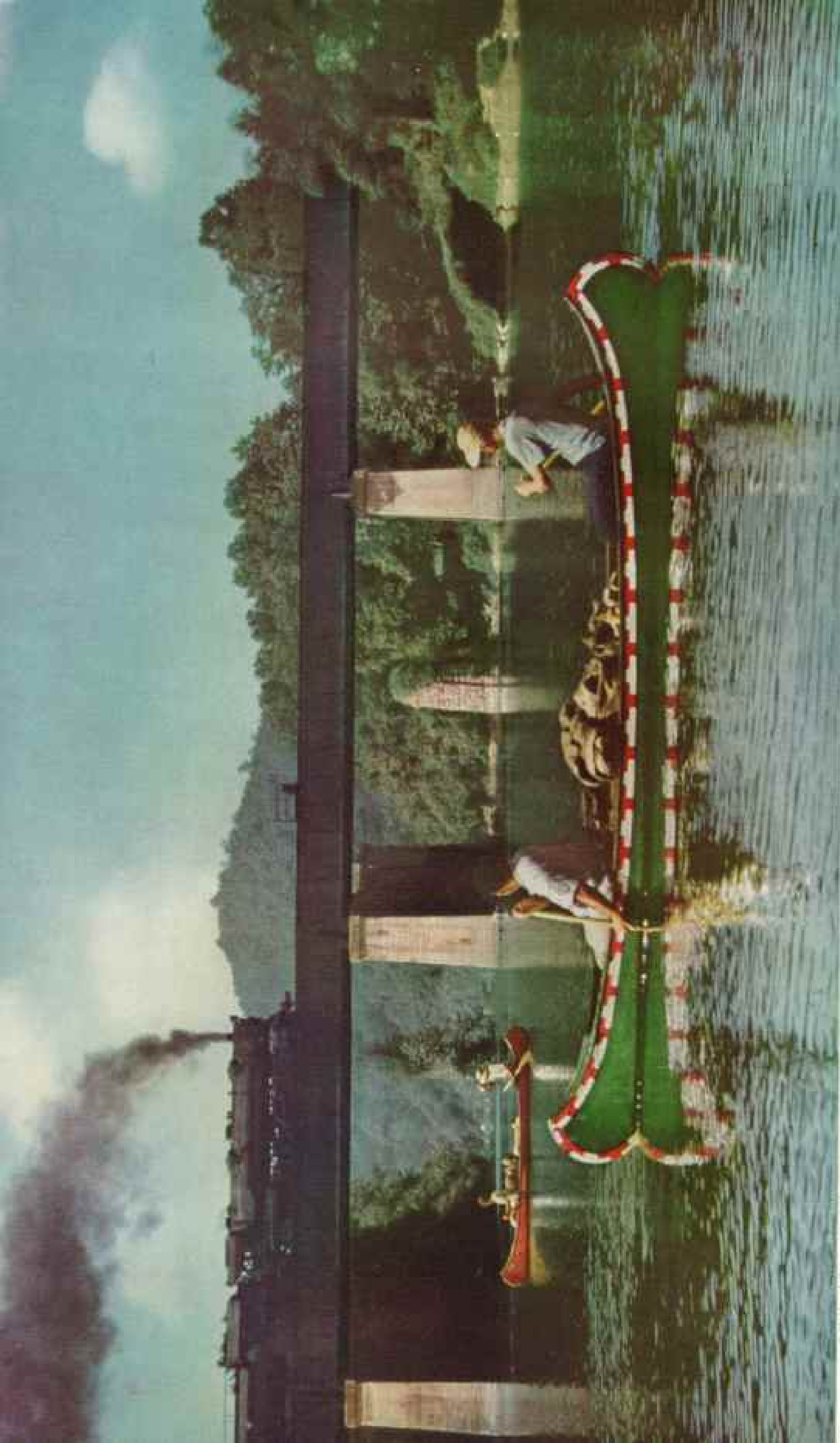
During the first two days of the trip, low water created long shoal areas over which the canoes had to be dragged and pushed. Here, above Cumberland, the paddlers enjoy one of the North Branch's few rock-free stretches.

In the distance rises serrated Knobly Mountain (center), which bends the eastward-flowing stream northward. For miles river and mountain fight a running battle, the water finally surrendering the range at Cumberland.

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Illustration by Walter Mearns Edwards





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VI

Main-line B. & O. Trains Thunder over This Bridge. Here North and South Branches Merge, Forming the Potomac

In 1936 floodwaters swelled at rail level; houses and barns floating down the South Branch smashed against the span.

Kodakprints by Walter Muesers Edwards

A Canoe on the Upper Potomac? This Farmer, Driving a Manure Spreader, "Never Saw One Before"

Everywhere down to Chain Bridge, District of Columbia, residents were surprised by sight of the flotilla. Tom Long (right) pauses to tell about the fishing and swimming he knew as a boy. Long ago industrial pollution and sewage ended his good times on the river in this area below Oldtown. Cultivating both Maryland (right) and West Virginia banks, he uses this shallow point as a ford.

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VII

Photographs by Walter Meador Johnson





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VII

Grassy Patterns Trace the Foundations of Vanished Buildings in Old Fort Frederick, Maryland

Here settlers fled tomahawk raiders in French and Indian wars, but the fort itself saw no action until the Civil War.

Kobalrome for Walter Maurer Hibbins

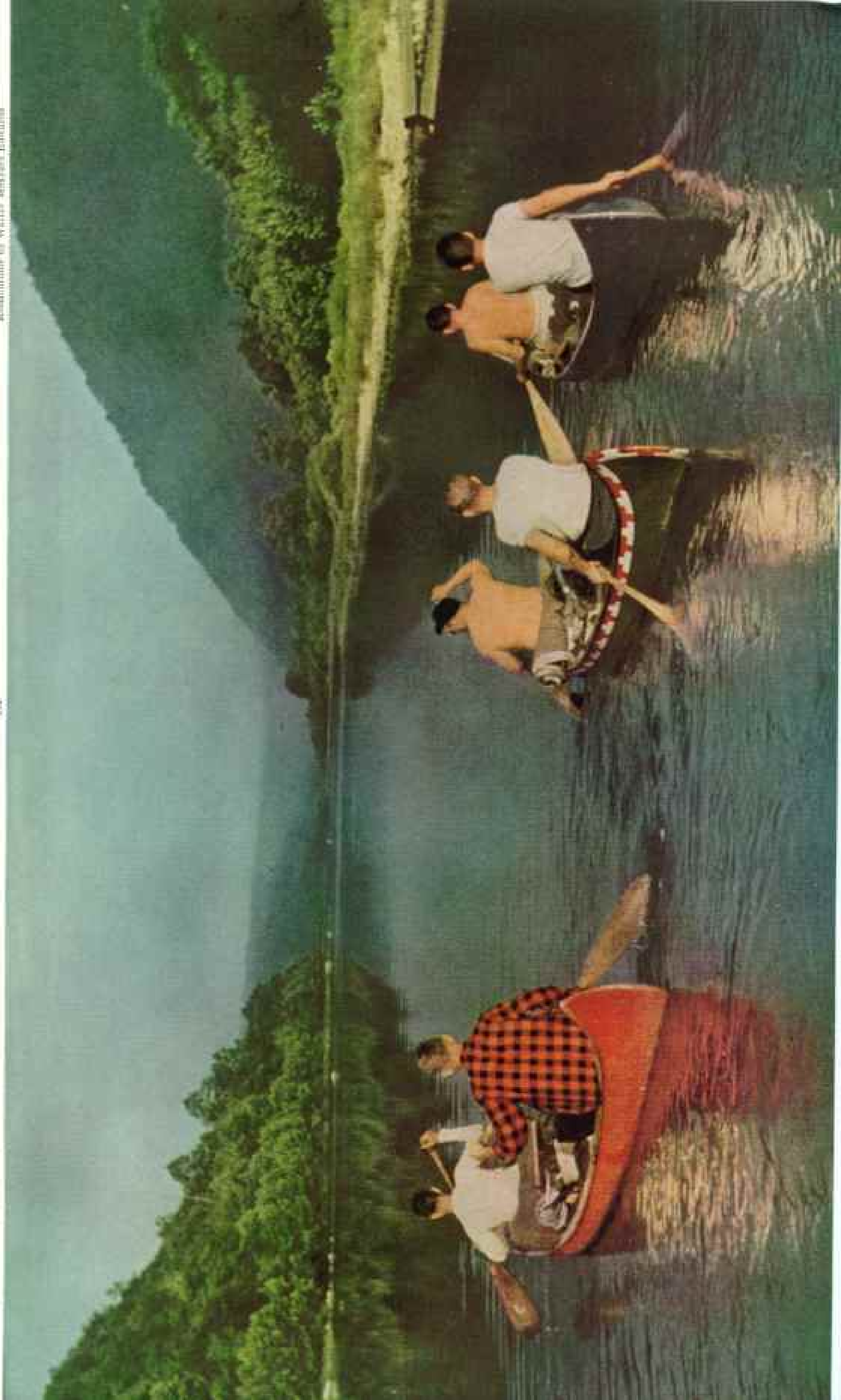
J-10. Green Lady, and Baby Blue, Abreast in Calm Water, Pass West Virginia's Sidelong Hill (Right).

For mile after mile the B. & O. follows the Potomac. Often the smoke of its trains is the only sign of civilization.

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IX

Excerpt from by Walter Murray Edwards





© National Geographic Society

X

Recreation by Walter Moore's Journal

In Indian Church, a Cave in This West Virginia Cliff, Savages Held Heathen Conventions

Folklore, surviving in these hills, vividly describes the Delawares' manners of isolated pioneers in the middle 1700's. Residents told the cannibals how one Mr. Jack, after witnessing his son's death by torture, escaped the Indians by leaping from the 100-foot cliff.

Flatboatmen Fish the Middle Potomac's "TVA." Here Dam No. 4 Creates a 13-mile Slack Water

Nothing is more typical of the Potomac than its homemade flatboats. They usually stay in one placid stretch, but a practiced hand can pole them up or down a riffle. These fishermen referred to the expedition's craft as "canoe boats." Anchors at each end keep their boat abreast the waning current. In this section the Potomac is considerably less polluted than it is farther upstream.

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XI

Reproduction by Walter Meunier Edwards





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**♣Morning's Camp Smoke Spells "Breakfast":
Near Shepherdstown, West Virginia**

After a 10-hour paddle, evening's campfire felt comfortable even in July. When cook called, "Food for the troops," there were no slacker appetites. Though trains rumbled a lullaby, sleep came quickly.

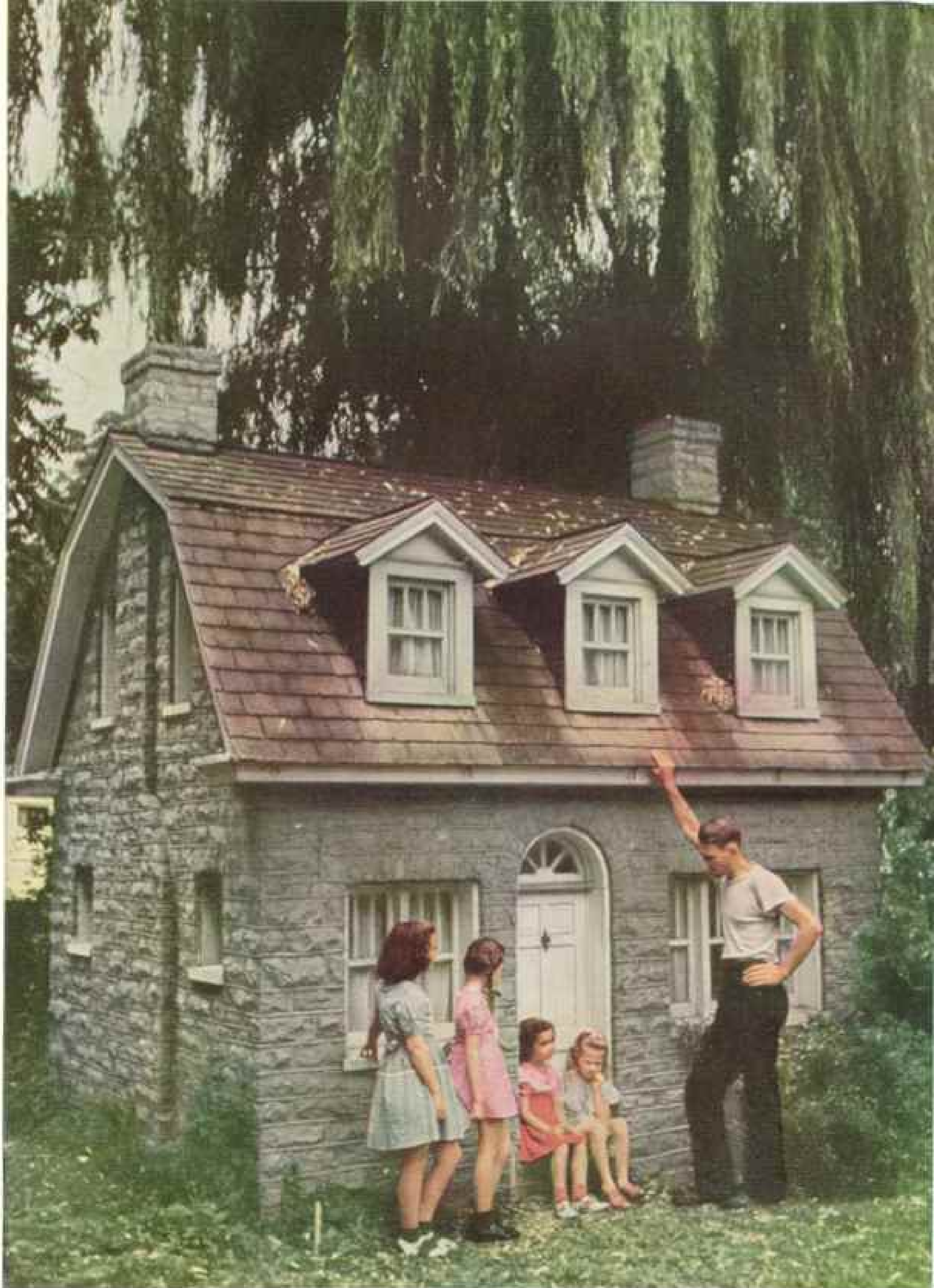
XII

Illustrations by Walter Myers Edwards

**Toughest of Nine Portages Was the Tangled
Trail Around Dam No. 4**

The Potomac's numbered dams, built by the Chesapeake and Ohio Company to divert water into its canal, now serve small electric plants. Brambles and tumbled masonry cover this faint path.





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XIII

Kulichovna by Walter Moscovy Edwards

An Adult Towers as Gulliver in a Lilliputian World: "Kiddies Kottage," Shepherdstown: Shepherd College built this house to attract youngsters to summer demonstration courses. Bedrooms, stairs, kitchen—everything is in miniature. Even books in a tiny bookcase are toylike.



Paddlers Steer Clear of a Maryland Lorelei Perching on a Rock Like the Siren of the Rhine

Ahead of them, Monteracy Aqueduct stands sturdy despite the weight of its 115 years. Until two decades ago it carried the C and O Canal 20 feet above the stream. Now its dry bed bears trees and weeds. Here the Monocacy, a main tributary, is about to join the Potomac.

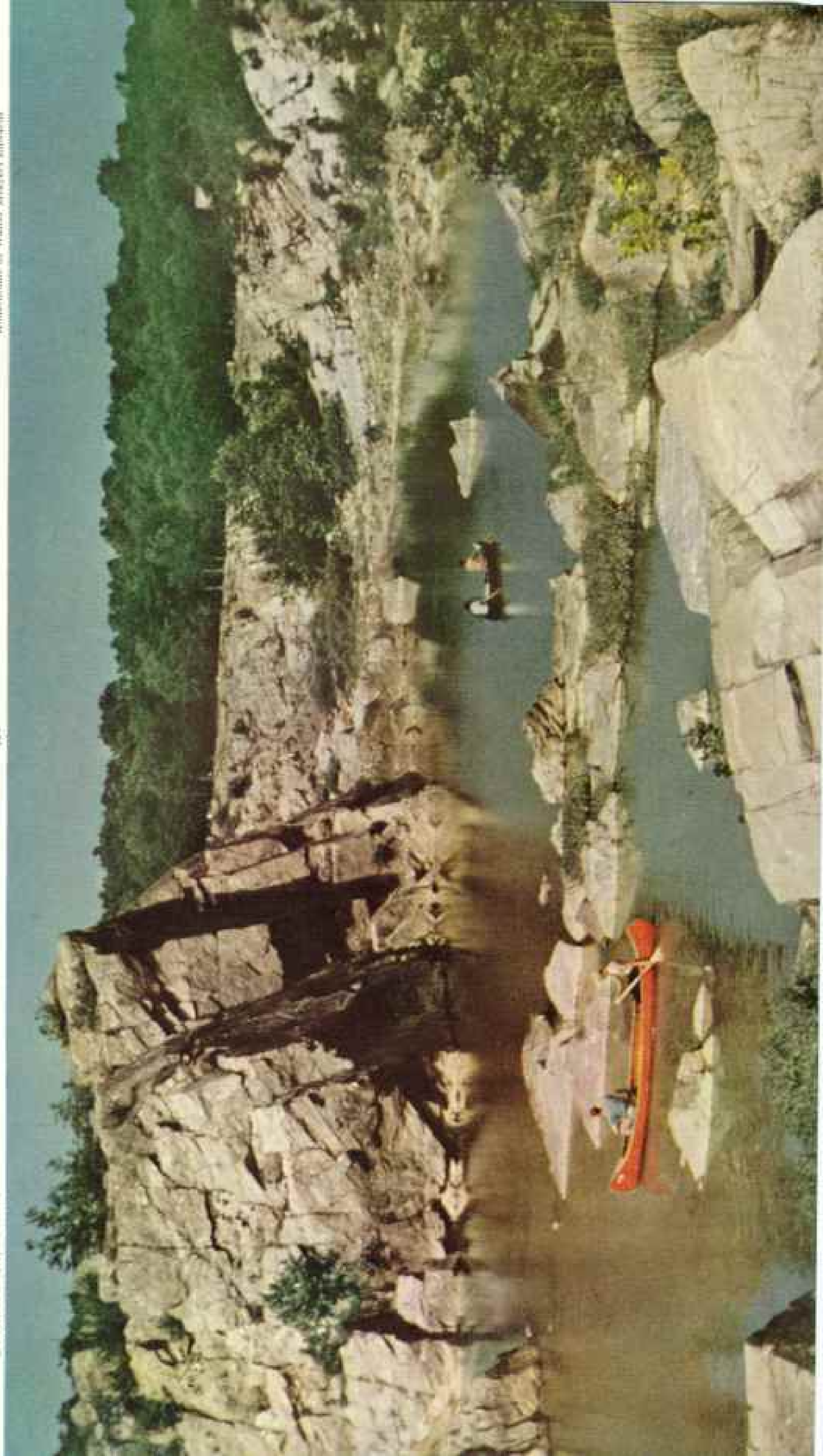
A Glassy Backwater Saves the Canoeists a Backbreaking Walk Across Great Falls's Jagged Granite

Trying to shoot Great Falls is equivalent to committing suicide. Water cascading down 10-foot drops is sure to swamp the most skillfully handled canoe. A half-mile portage is necessary. In this primeval wilderness the paddlers are only 10 miles from the Nation's Capital. The final leg of the voyage—through narrow gorges and heaving rapids—will carry them past some of the Potomac's grandest scenery.

© National Geographic Society

XV

Endpapers by Walter Myers Hixson





In the Potomac Gorge, *J-10's* Bow Leaps Out of Water; the Front Man Paddles Air

Riding the gorge is like riding a bucking bronco. When the bobbing canoe slaps the water, the shock resembles the impact of saddle leather. To find the safest course, the steersman (rear) deliberately aims at the swiftest water.

With our duffel strewn from the riverbank to the clover patch and the tents halfway up, the deluge started. We threw everything under canvas or rubber. Harold, in swim trunks, "ditched" the tents to sluice water around them.

When the storm slackened, our host walked down from his house with a gallon thermos of hot coffee.

Two weeks before our present trip, Toppy, Cay, and I had explored the South Branch (Plates II and III). Beginning at the Old Fields bridge, we spent a leisurely day paddling through the Trough, that curious defile described by George Washington as two "Ledges of Mountain Impassable running side and side together for above 7 or 8 Miles and ye River down between them."

The South Branch has a greater annual volume and a bigger watershed, and is considerably longer than the North Branch. It also rises farther west.

Early settlers did not know this. To them the North Branch was more important, because it cut through the Appalachians and gave them the best route to the West between New York's Mohawk Valley and Kentucky's Cumberland Gap.*

Had the pioneers known more Potomac geography, the boundary between Maryland and West Virginia might follow the South Branch, giving the former a great triangle of territory. Maryland's charter stated that the colony should extend west to the "first fountain of the river of Pattowmack" and a line drawn north from there to Pennsylvania.

Lord Fairfax Surveys His "Estate"

Lord Fairfax, heir to grants including all the lands between the Potomac and the Rappahannock (to the south), sent out surveyors to mark his 5,000,000-acre estate.

Assuming that the North Branch flowed from the westernmost source of the Potomac, the party traveled up to the source of that stream and placed the Fairfax Stone in 1746 (Plate III). Maryland did not accept this stone as the "first fountain" of the Potomac until 1911, after a United States Supreme Court decision.

Strangely enough, however, Maryland misses by a mile reaching to Fairfax Stone. This is because the Infant river starts out flowing west before looping back to the east. Where it crosses the line drawn north from Fairfax Stone, there is another stone, Marker No. 1, designating Maryland's southwesternmost point (page 234).

Next morning, after drying duffel in a blazing morning sun, we all pushed ahead on the

main stream, now clear and 200 yards wide.

We stopped at Paw Paw, West Virginia, to buy provisions, and soon after entered the "Goosenecks." In this wild, seldom-seen section the river lashes out madly at its jailer mountains. It is literally "beside itself" as it writhes through three great loops and 12 bends in a straight-line distance of nine miles.

We Explore a Forgotten Canal Tunnel

Between Paw Paw and the vicinity of Little Orleans, Maryland, the Western Maryland Railway bridges the river six times and tunnels three intervening mountain necks. The B & O crosses twice and has four tunnels. The C and O Canal Company, exasperated by the interminable winding, finished its own tunnel in 1850 to cut off 5½ miles on the big loop nearest Paw Paw.

We climbed the steep Maryland bank to see this forgotten work of man. In an almost suffocating welter of vegetation we found the towpath. Beside it the canal was a light-green avenue of scum-covered water that cleared as it disappeared into the ghostly tunnel mouth.

On close inspection we found every stone of the masonry façade tightly in place. The towpath was in good condition. With flashlights we edged inside the cool entrance, alert for snakes. The other end was a tiny spot of light more than half a mile away.

We spent 12 minutes walking through. The earth on the towpath was powder-dry. On the unrotted wooden rails between towpath and canal we saw the long grooves worn decades ago by ropes sliding behind white-eyed, shying mules.

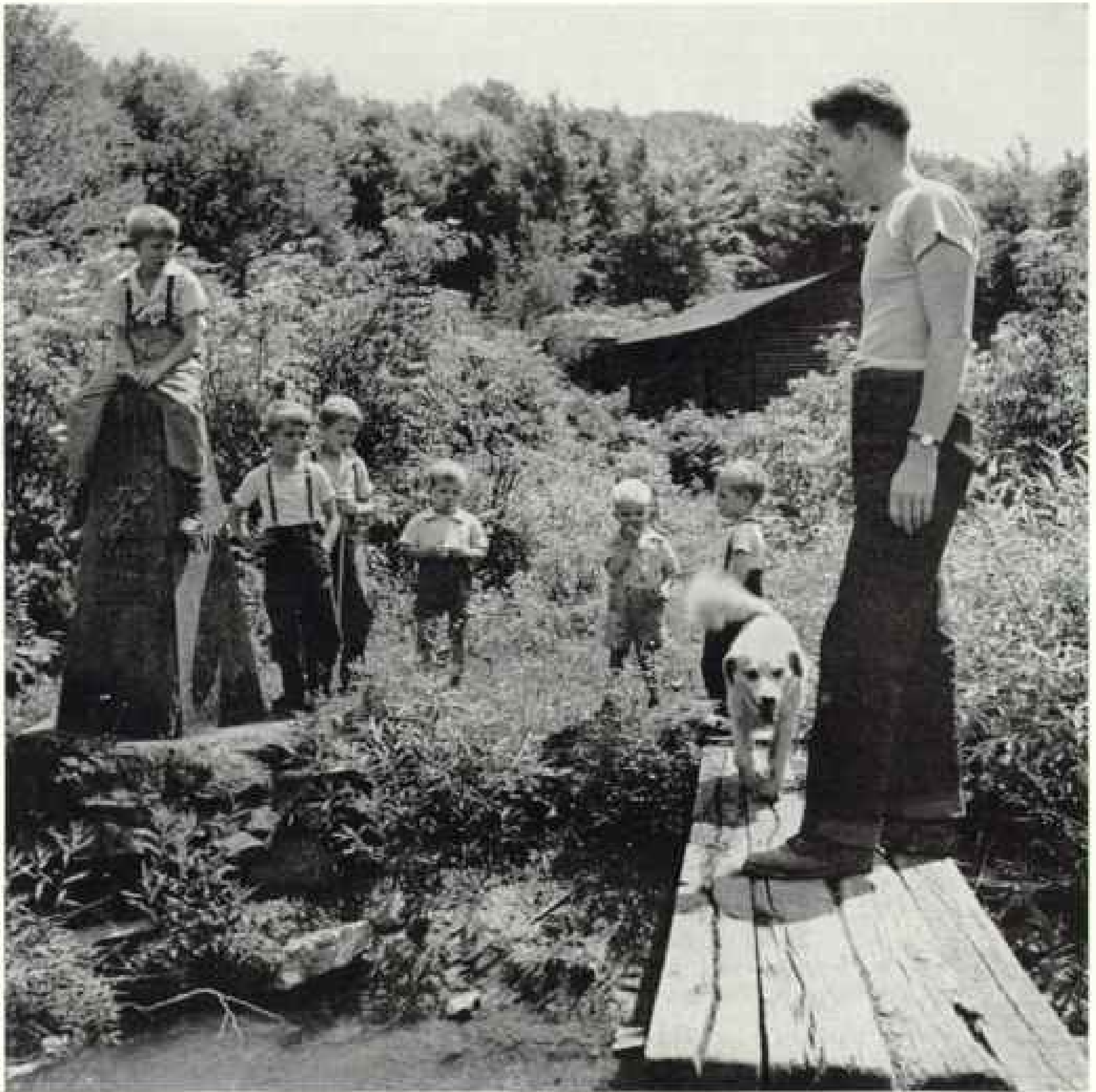
In this sequestered spot we tried to imagine the crowded scene nearly 100 years ago, when the harried canal company, in a final spurt to reach Cumberland, put four gangs to work here.

One group bored from each end and two from shafts sunk from the mountaintop.

In earlier years, gang rivalries, insubordination, strikes, and discontentment at tardy wages led to violence and resulted one night in one group rowdily shooting up innocent Oldtown in Wild West style. A century ago men were ready to die over this obscure hole in the ground.

A 200-foot-deep cut through solid rock, an engineering marvel in itself, carried the canal northeast toward the river. The towpath,

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Drums to Dynamos on the Mohawk," by Frederick G. Vosburgh, July, 1947; and "Home Folk Around Historic Cumberland Gap," December, 1943, and "Kentucky, Boone's Great Meadow," July, 1942, both by Leo A. Borah.



Mountain Boys Point Out Marker No. 1, Where North Branch Enters Maryland

A far cry from proud tidewater Potomac, four 10-foot planks span the trickling stream a mile below its headspring (page 233). From here on, the right (south) bank is the Old Line State's southern boundary. Close by is Kempton, a coal-company town whose inhabitants live, work, vote, and pay taxes in Maryland; yet letters addressed to them go to Kempton, West Virginia. Their post office is across the State line.

crushed by rockslides and all but overgrown, tempted Chuck and me.

We suggested walking through the chasm while the others canoed around the bend. I did not realize that the canoers would paddle seven miles while we walked but one.

Canalboat Days Recalled

Chuck and I explored an abandoned lock house, gave a scurrying copperhead plenty of leeway, and picked a hatful of blackberries, but we reached the river far ahead of the others, who did not arrive until after dark.

Again under unified command, the party

groped its way to the West Virginia side to make a late camp beneath some willows that Chuck and I had spotted before night fell.

Next morning we needed water, and someone wondered if Potomac water here was potable. Cay burst into the strains of an old folk song to prove that it was not:

I'm a-goin' where the water tastes like wine,
I'm a-goin' where the water tastes like wine,
Potomac water tastes like turpentine!
I ain't a-gonna be treated this-a-way!

We paddled seven miles through the "Goose-necks" before seeing a sign of habitation. That sign was a flatboat with a path leading from it.

Seeking water, we followed the path around a cornfield to a farmhouse near the dry canal bed. There we met Grandmother Higgins (page 238).

As we pumped water from her kitchen-door cistern, I asked the spry old lady if she remembered the operating days of the canal.

"I should think I do," she said, pertly. "When I was a girl I was cook on a canalboat. Cooked for my father."

"You must be about the only C and O cook left."

"Reckon maybe I am. All that wasn't yesterday! My father owned his own boat. Lived on it most all summer. Boatmen took their families with them sometimes. The womenfolks put curtains in the cabin windows and hung their washing out on deck."

At Little Orleans the one general store, a midget post office (page 237), and a couple of lonely houses made the place look more isolated than it would have seemed without them. A man leaning against the counter in the store learned with open-mouthed disbelief that we had canoed from Keyser.

"That's the durndest thing I ever heard of," he marveled, unflatteringly. "I always thought those geologicalists climbing up that railroad cut for pieces of rock were the limit. But you fellows have got them beat!"

We Leave the "Goosenecks"

Two bends below Little Orleans we left the "Goosenecks" and entered a long straight stretch. The river slices through 2,000-foot-high Sideling Hill, making a water gap similar to the one at Harpers Ferry, but deeper (Plate IX).

For the first time we had company on the river. "What are you catching?" we asked one of several flatboat fishermen.

"Nothing much. Some sunfish and cat. A few bass."

That was the story all the way to Great Falls. At one time fishing was better. A man standing on shore at Lineburg told us President Cleveland used to come up here for small-mouthed bass.

Dam No. 6 at Great Cacapon once sent water into the canal. Torn by floods, it now lets the full current of the Potomac through a center breach. Below it the water drops swiftly through a sharp S curve.

We camped at the foot of Cacapon Mountain. After breakfast next morning it started raining. We passed the mouth of Sir Johns Run in a downpour. "Look out for steamboats," I joked.

A hundred and sixty-four years ago this warning would have been more apropos.

James Rumsey, pioneer experimenter with mechanically driven vessels, chose this remote spot for secret trials of a model boat in 1784.

George Washington, an enthusiastic on-looker, afterwards backed Rumsey's inventions (page 240).

We reached Hancock, at the north bend of the Potomac, soaked and chilled. Through rank weeds twice our height we slithered up to the old highway town and ate a hot restaurant lunch.

Green Lady, leaking steadily as the result of some forgotten encounter with a rock, had to be bailed out about every two hours. *I-10* had also suffered some hard knocks and was taking on a small bit of water every day.

The rain stopped as we left Hancock. We paddled steadily to Fort Frederick State Park, our sixth camp. Here a spring and a stone fireplace made life easy. Nubbins of field corn featured our dinner.

Early next morning we walked up to the restored French and Indian War fort (Plate VIII). Its limestone walls gleamed brightly on the brow of a green hill. Four sharply pointed corner bastions looked like battleship prows. A massive gate on the river side was the single entrance.

A short distance below Fort Frederick a switchback reminiscent of the "Goosenecks" carried us out of the mountains into the broad pastures of Shenandoah Valley. Long lines of limestone outcroppings, like wild horses, galloped to the water's edge and sloped down as if to drink.

At Little Georgetown some well-kept summer cottages, the first we saw, line the West Virginia bank. Gradually we realized we had entered a lake, the slack water behind Dam No. 5. The virtually unknown "TVA of the Potomac"—three successive artificial lakes—stretched ahead of us.

Corkonians vs. Longfords

We prepared lunch on a grassy bank overlooking the pastoral charm of the Four Locks bend, then "mushed on" to Dam No. 5. Not a drop was falling over the 18-foot brink; the Potomac Edison power plant took all the current. I got out on the concrete cap and looked at the rockwork below.

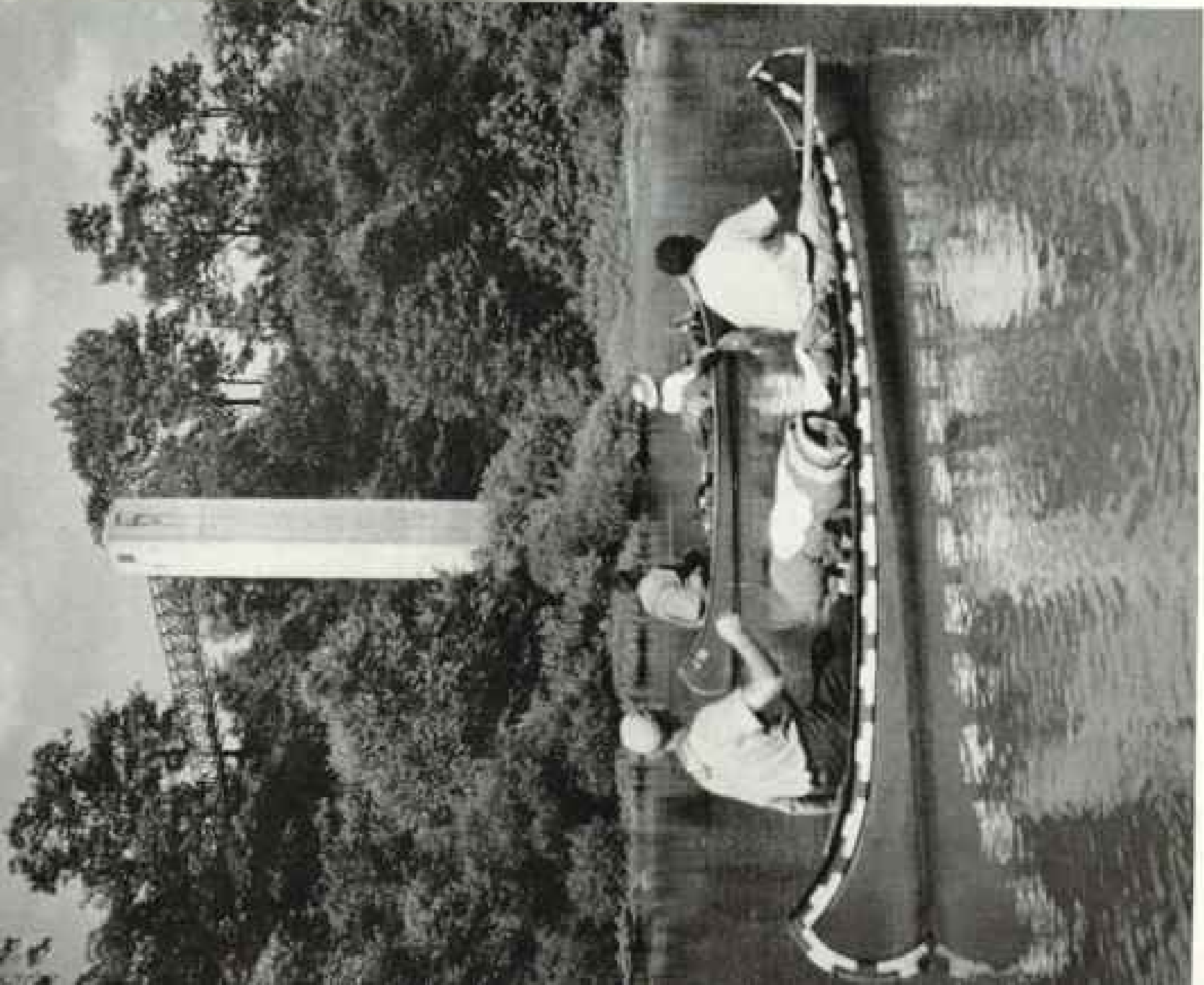
This was original C and O masonry, laid in the 1860's, mostly by Irish workmen who lived with their families in temporary shanty towns.

Thirty years before, the canal company had built a brush and rubble dam here and at Dam No. 4, below Williamsport. Intense rivalry developed between the Corkonians, working on No. 5, and the Longfords of No. 4.



Rivers, Mountains, Railroads, Highways, Canals, and Three States Converge at Harpers Ferry, Climax of Potomac Splendor

The new bridge in the foreground connects Maryland (right) and Virginia, while the point on which the town stands is in West Virginia. The Shenandoah (left) joins the Potomac here and adds its volume to the rocky rapids where one of the expedition's canoes was smashed (page 240).



A 61-foot Gauge Graphs the Potomac's Ups and Downs

Just below the top of the tower, opposite Paw Paw, West Virginia (page 233), a line marks the river's all-time high-water mark, 54 feet on March 18, 1936.



Not a Dollhouse, but Little Orleans's Bandbox Post Office

It serves 600 customers, mostly rural. Here the postmaster receives a card from Harold Gray, who reassures his family with "Haven't drowned yet!"



With Cool Water, Grandma Higgins Gives Gay and the Author a Warm Welcome

At her century-old home she spins stories of her own busy years. As a girl, Mrs. Higgins cooked for her father on his C and O canalboat. She still lives on the abandoned waterway, now bone-dry in this stretch above Little Orleans, Maryland. "I look a sight," she objected when asked to pose. "Been raming" (page 235).

Gang anger brought about an armed clash in January, 1834. All-night patrols guarded the camps. Outlying shanties went up in flames.

Finally, six or seven hundred Longfords crossed the Conococheague and charged 300 Corkonians on a hilltop near Dam No. 5, killing an untold number. From Fort McHenry came two companies of United States troops to restore order.

We portaged through the grounds of the power plant. Quick water below the dam was a treat after the smooth lake.

Rifle after rifle brought us speedily to Indian Church, a towering white cliff of weathered limestone (Plate X).

Pleasant homes and a waterside park line the Maryland shore near Williamsport. We camped on the tree-covered towpath below town. It was just wide enough for my big tent. Gushing into the river beneath us, a large musical spring quickly sang us to sleep.

Our eighth day on the river was mostly a struggle against the seemingly endless slack water (Plate XI) behind Dam No. 4, which stands 23 feet high and backs up water for 13 miles.

A half-inch film was pouring over when we reached it in midafternoon (page 241).

We portaged on the Maryland side, over a



Lonely Tim Long Protects a Pet Duck as He Feeds His Hungry Cats

The canoeists, camping near his lock house home, were like men from another world to him. His darting eyes and fitting hands studied with wonder every item of camp equipment. Long before Tim's time, lock keepers wore a path from his door to the C and O lock, 20 feet away and two miles from Oldtown, Maryland.

backbreaking, trackless, rock-strewn route of at least 250 yards (Plate XII). We had to cut a path through locust saplings.

Artificial Riffles Boon to Fishermen

Before pushing off, we bought supplies at the town at Dam No. 4, an angler's rendezvous. Below the barrier, fisher-men and -women were thick in the artificial-looking riffles.

The riffles were often V-shaped, with their one opening at the point of the V. The current poured through the breach.

Fishermen explained. "Those are fishpots. They were built years ago by river people to bottle up fish and make them easier to catch.

When the Government found out about them, an opening was blasted in each to let the water and fish through.

"You fellows will see the most peculiar riffle on the whole Potomac about three miles below here. They call it the Horsebacks. The rocks run *with* the river instead of across it."

At a gentle bend we reached the rigidly straight lines of parallel outcroppings. They were so regular they reminded me of curbstones with avenues of water between them. But the water did not flow down the avenues. The river bend made it flow first transversely across the rock lines in one direction, then cut back the other way. It was a hard fight,

against the broadside thrust of the current, to keep our canoes off the rocks.

At the lower end of the Horsebacks a grassy slope extending to the water's edge provided our roomiest and least Amazonian campsite (Plate XII).

Lying around the fire after dinner, we had our first casualty. As Harold started to roll over, he gave a sharp gasp. "My back!" he groaned through clenched teeth.

"I guess I had a little too much portage this afternoon," he joked, weakly.

Next morning we propped him up in the center of *J-10* and paddled on to Shepherdstown, West Virginia's oldest continuously inhabited place.

My eyes swept the 100-foot bluffs on which the town lies. Here a single-columned monument to James Rumsey pierces the skyline.

On these bluffs in 1787, twenty years before Robert Fulton's *Clermont* chugged up the Hudson, stood throngs of people watching the first public demonstration of the local inventor's steamboat.*

Rumsey employed the jet principle to propel his craft; it expelled water from the stern faster than it took it in at the bow. It attained an upstream speed of four miles an hour.

Below Shepherdstown the river widens majestically and swooshes through a series of mighty riffles. Here was Pack Horse Ford, which German settlers crossed in 1730, and probably earlier, to found Mecklenburg (Shepherdstown). After the Battle of Antietam five Confederate divisions forded the Potomac here.

Where Antietam Creek enters the Potomac, we ate a late lunch beneath the three-arch canal aqueduct, then paddled without stopping to the dam above Harpers Ferry.

One Canoe Demands Bailing Hourly

We hailed *Green Lady* about every hour now. With relief we stopped on the brink of the brush and rubble dam and looked down the gently sloping Shenandoah Falls into the Hole, that deep cleft cut by the river through the Blue Ridge at Harpers Ferry (p. 236).

An old dam at this point sends water down a mile-long canal to a small hydroelectric plant. We took the canal and set up camp beside the power plant, just a few rods away from the site of the arsenal firehouse where John Brown made his last stand during the raid on Harpers Ferry in 1859.

Next morning a grocer warned us about the rapids below town. "Stay on the Virginia side. The main current is on the Maryland side. It's too much for a canoe."

Everyone was for disregarding his sober

advice and taking the Maryland side. We drifted past the green Shenandoah influx toward the first white line of tossing, angry rapids.

My canoe submarined the biggest swell, shipping a quarter-hold. *Baby Blue* took on so much water that Vernon and Toppy eased it sluggishly ashore to empty it. Several layers of canvas and rubber around the cameras kept them dry.

Next came two more drops, even sportier than the first. The tremendous volume of heaving, white-breasted water, tossing our canoes about almost uncontrollably, lent the zest of danger that had been missing in the shallow-water riffles.

Cay decided to increase the thrill by angling between two large rocks. Harry, in front, peered ahead and saw a small rock just below the surface between two big ones.

"Look out!" he yelled, as he started to back-paddle. This sudden tactic threw *Green Lady* broadside and she smashed against one of the large rocks. The rest of us heard the rending crash above the noise of the water. I looked back in time to see Harry's 200 pounds splash into the river. Luckily the current did not drag him over any rocks.

Green Lady and Her Crew Give Up

Green Lady was through. Three ribs were broken. "Well, that does it," said Cay philosophically. "I'm going home."

"I'll go with you," Harry volunteered. "I've had enough paddling in nine days to last me the rest of the year."

They completed the trip by automobile. The five survivors, one with a lame back, pushed on.

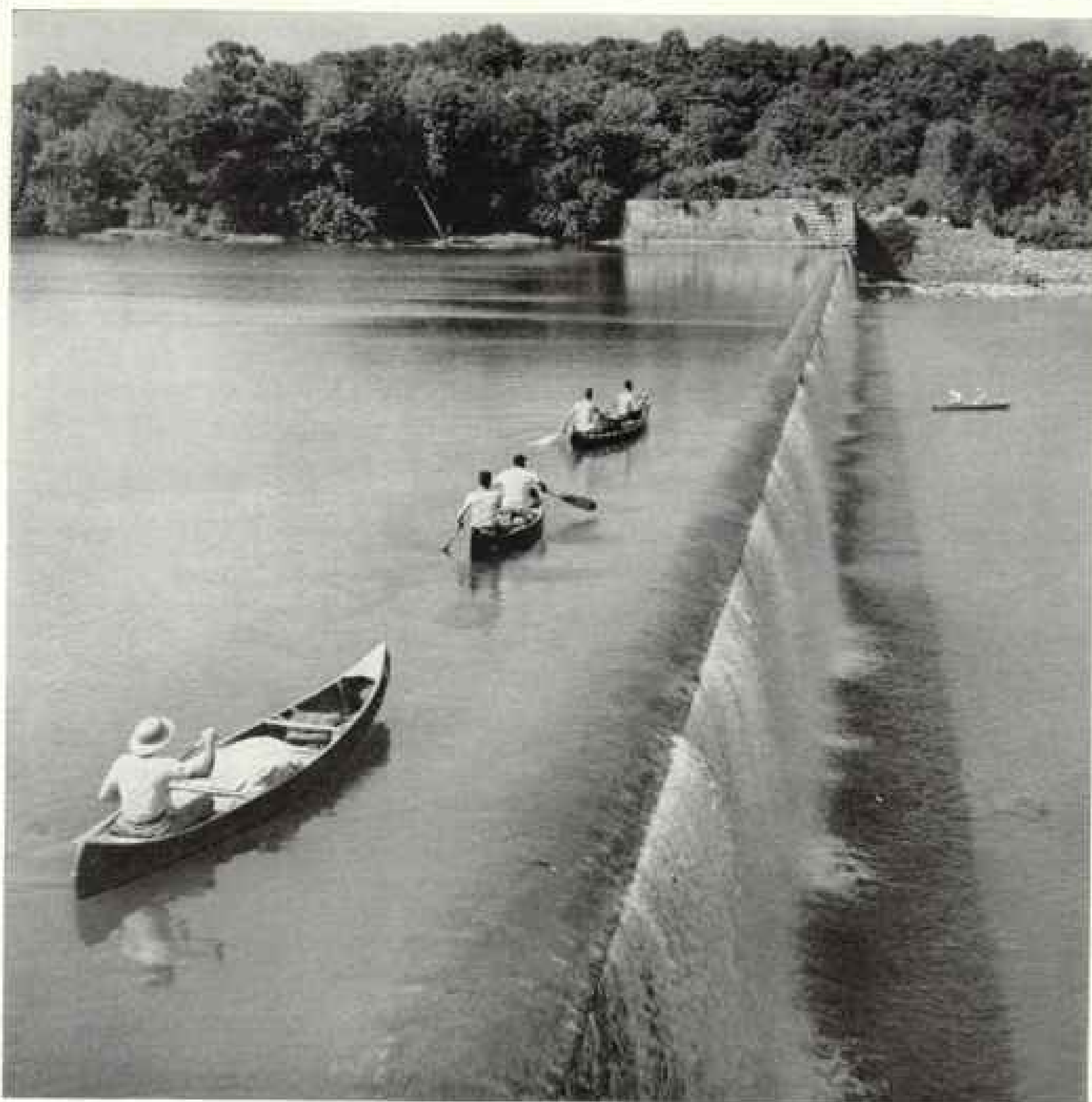
I glanced back at the Harpers Ferry water gap. The volume and force of the river made it easy to understand how the Potomac, an antecedent stream, had sawed away at the mountains as they rose up beneath it, imbedding itself 1,200 feet and more in the Blue Ridge.

Ahead of us reared a similar gap where South Mountain (the Maryland name for the Blue Ridge) crosses.

At Point of Rocks the river saddled its last mountain range—Catoctin. Here we said good-bye to swift water until Seneca, 27 miles downstream, but were glad to see there was still a strong current.

The Piedmont Plateau, longest bridgeless and townless section of the fresh-water Potomac, stretched before us.

* See "West Virginia: Treasure Chest of Industry," by Enrique C. Canova, NATIONAL GEOGRAPHIC MAGAZINE, August, 1940.



Tightroping along the Brink Looks Dangerous, but at Low Water It's Armchair-safe

Since only a half-inch crest is flowing over Potomac's Dam No. 4, the paddlers would have to push hard to make the canoes go over. A few weeks later, when the river rose a foot, it would have been a different story. Then if they got this close, the boats would have been drawn over the 23-foot spillway despite the frantic paddling of the canocists. Fishermen below the dam seek bass and catfish (page 238).

At the mouth of the Monocacy we canoed into the tributary river and gazed upon the sun-soaked beauty of Monocacy Aqueduct (Plate XIV). The arches were jumping from shore to shore on their own reflections. Directly over the span the green backdrop of symmetrical Sugarloaf Mountain rose into view, climaxing the scene. We camped almost underneath the span.

Next morning Harold's back was better. Holding himself rigid, he took front paddle in my canoe. Not able to put much "back" into his stroke, he was little help, but he said the exercise was beneficial.

We passed Whites Ferry, again in operation after a wartime lapse. This sole remaining public boat crossing on the Potomac was a popular Civil War fording place.

On Virginia's Side—in Maryland Waters

A distance downstream, Harrison Island splits the Potomac. We followed the narrower channel, on the Virginia side, but still in Maryland waters. A peculiarity of the Potomac is that the boundary follows the south shore, not the center. The entire river is in Maryland, except for a bit in the District of Columbia.

In the long, slow pull through the lakelike expanse above Seneca Falls we spotted two young herons standing on shore.

We drifted silently toward them, watching their long curved necks twist this way and that in mild alarm. Suddenly they took flight, winged downstream, and waited for us. They kept up this game for miles. Finally they flew inland to a tall tree from which they watched us pass.

Motorboats churned the half-mile width of the river at Seneca, where the canal company built its Dam No. 2. Little is left now except a natural barrier of jumbled rocks.

Here begins the 19-mile stairway which lowers the Potomac 190 feet from the Piedmont to the coastal plain. The steps are called falls—Seneca, Great, Difficult, Yellow, Stubblefield, and Little; but with the exception of the second, they might more correctly be described as sharp rapids.

Seneca Falls needed an inch more water to be at its best. But below the main drop we entered a sporty section of riffles and entrancing passageways between islands. The banks were wild with vegetation and uninhabited. It was easy to imagine that man had never been here; yet only 20 miles away lay a city of a million people!

As we neared the dam above Great Falls, hundreds of swallows flitted between us and the setting sun, making silver splashes as they continually dipped at the water. We grounded our canoes at the Maryland end of the dam, where Washington drains its water supply.

Below and beyond us the river thundered into nothingness. So far as we knew, the roaring chasm of the falls proper had never been navigated by anyone—nor even attempted. And we were not going to be the first to try!

We found a camping place near Lock 19. The canal here sang with running water, let in by the National Capital Parks for the benefit of visitors to Great Falls.

Wonderland of Great Falls

Our last day dawned bright and clear. We carried our canoes along the towpath to Lock 17, then down a sandy path to a lagoon.

We paddled west 150 yards on this backwater through the strange moonlike landscape of upended rock slabs found only in the wonderland immediately below Great Falls (Plate XV).^{*}

We eased our canoes into the mad river, carefully holding the painters, then hopped in for the wildest two minutes of the trip.

Smack! Down went the bow into a five-

foot trough as water flew up and drenched us. We paddled furiously to keep control (Plate XVI). We were flung up and down on a dizzy aquatic seesaw, shipping water at every plunge.

Suddenly the dangerous run was over and we nosed into a swift, smooth current.

At the lower end of the straight-walled Potomac gorge cut through ancient crystalline rocks, we reached the fascinating Sherwin Island (Cupids Bower) bend. This begins with Difficult Falls, the uncomplicated but often dangerous drop where, with Cay, I learned a few years ago to shoot rapids.

We Ride the Rapids

We took island-dispersed Yellow Falls far on the Maryland side where a long bend stretched out its drop. Then, drifting casually toward Stubblefield Falls, we suddenly awoke to reality at the head of the rapids. For fully 100 yards the entire yellow torrent of the Potomac roared angrily through one narrow channel, swelling and dropping spasmodically.

Like rodeo riders on unsaddled mustangs, we turned ourselves loose on the back of the bucking rapids. Pistol-like reports rang out as the canoe bows cracked time after time into the hollows between whitecaps. At the end of the run we were still mounted!

From the Little Falls Dam (No. 1 of the C and O) a feeder canal drains water into the canal proper. We followed these artificial waterways around Little Falls, thus avoiding that death trap of overweening canoeists, and across the District of Columbia line.

When opposite the head of tidewater we portaged down the long bank into the river. On the final two miles we saw scores of people in canoes, rowboats, outboards, launches, and yachts.

In our battered canoes we felt immensely superior to the hands-trailing-in-water school of paddling we saw around us. But we were too tired, now that we had reached our tide-water goal, for anything more than silent envy.[†]

^{*} See "Great Falls of the Potomac," by Gilbert Grosvenor, NATIONAL GEOGRAPHIC MAGAZINE, March, 1928.

[†] See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Approaching Washington by Tidewater Potomac," by Paul Wilstach, March, 1930; "Roads from Washington," July, 1938; "Washington Through the Years," by Gilbert Grosvenor, November, 1931; "Sources of Washington's Charm," by J. R. Hildebrand, June, 1923; "Washington: Home City and Show Place," by Leo A. Botah, June, 1937; "Wonders of the New Washington," by Frederick G. Vosburgh, April, 1935; and, both by Albert W. Atwood, "Washington—Storehouse of Knowledge," March, 1942, and "Tidewater Virginia, Where History Lives," May, 1947.

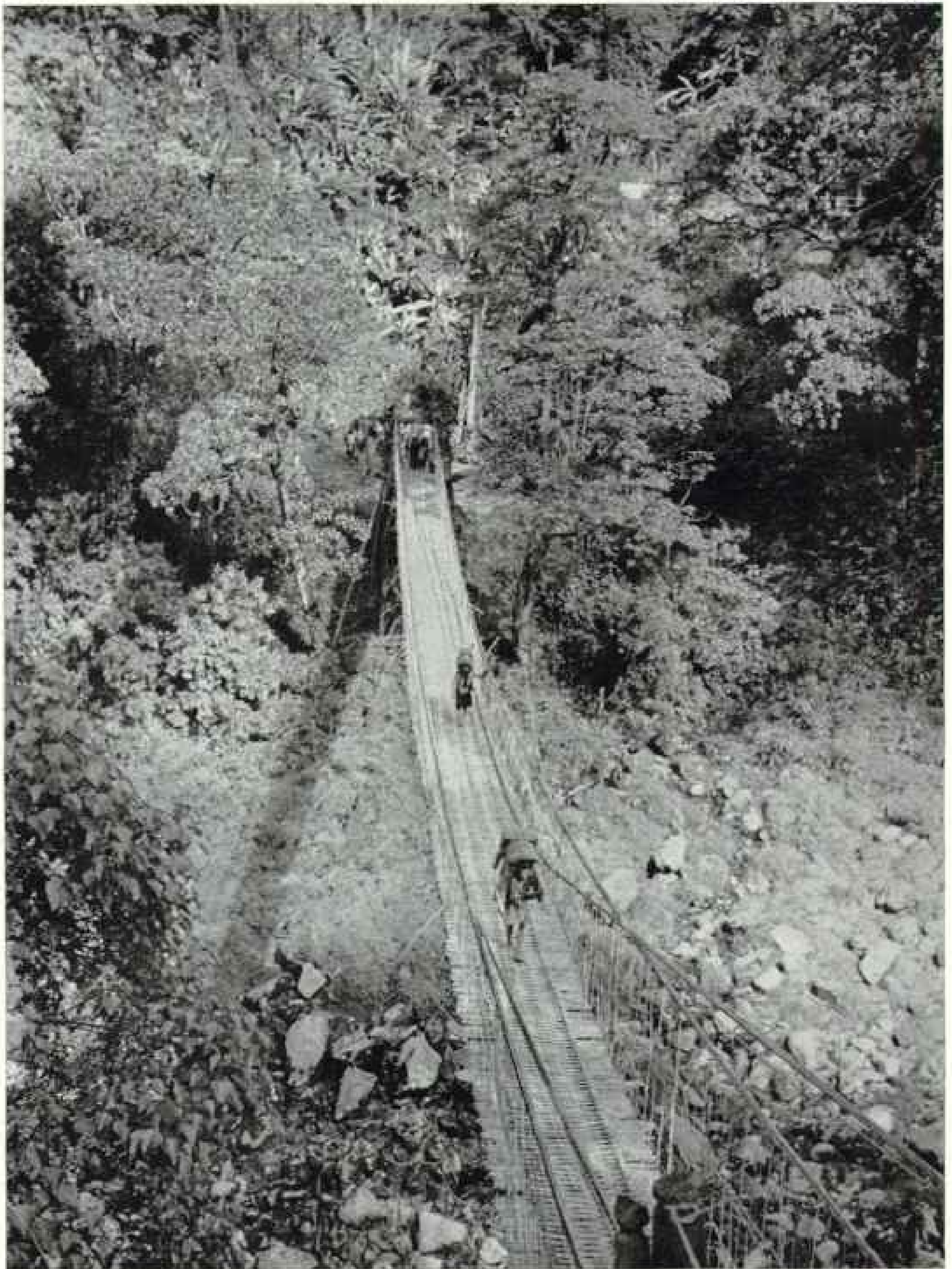
Cane Bridges of Asia



Paul Papper from European

Travelers in These Gorges Must Build Bridges or Turn Back

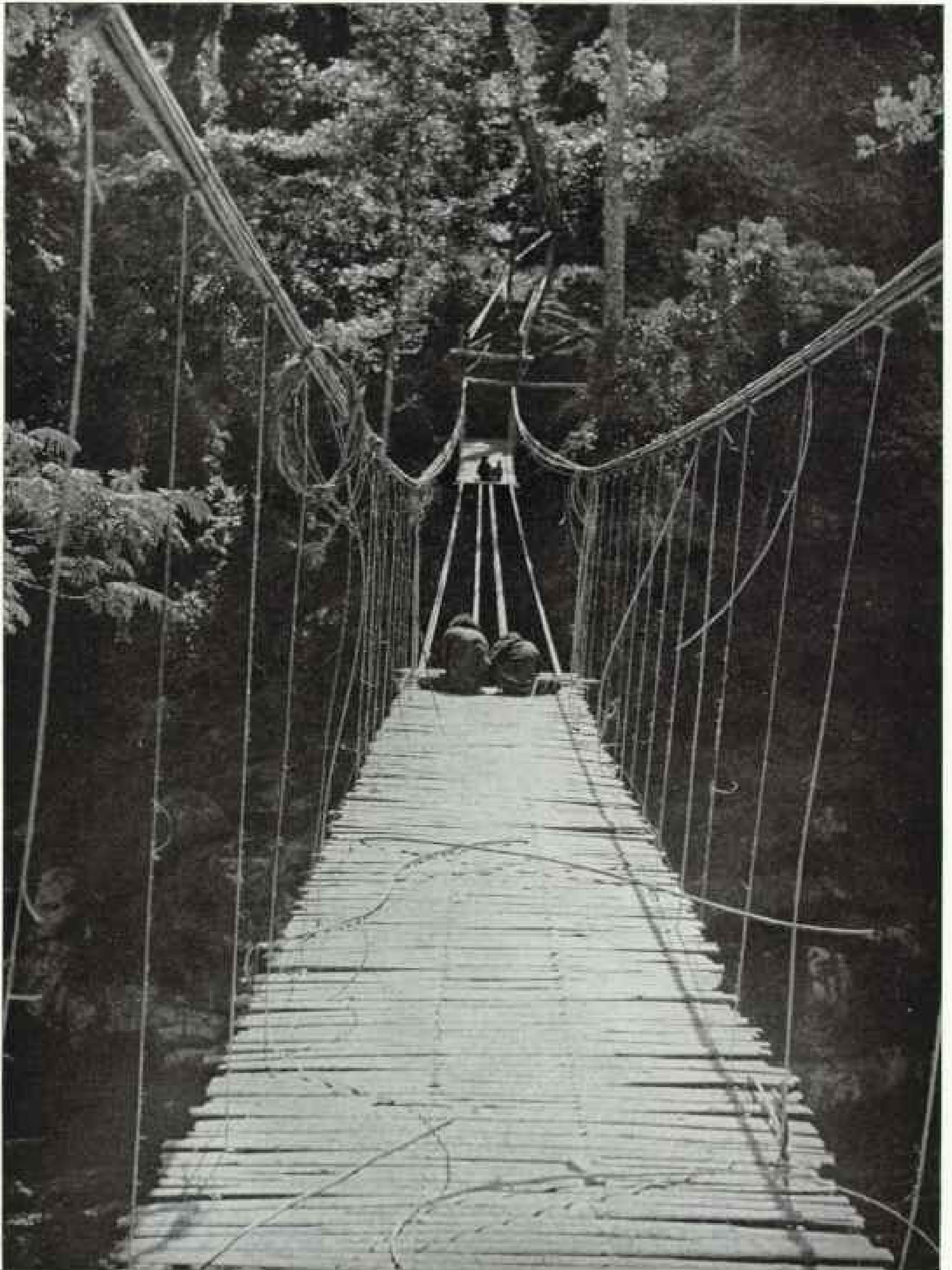
Here in the wilderness, 300 miles east of Lhasa, Tibetans contrive a gallery to get around unscalable cliffs against which the Yigrong River beats in fury. The structure skirts the bank, first by the fallen-log method, and then by the hanging vine, forerunner of modern suspension bridges. Around the outjutting rock a strong swimmer first carried the cane cables on which the bamboo floor is laid.



Paul Duval from European

With Cane Cables North Burma Nungs Build Suspension Bridges for Mule Trains

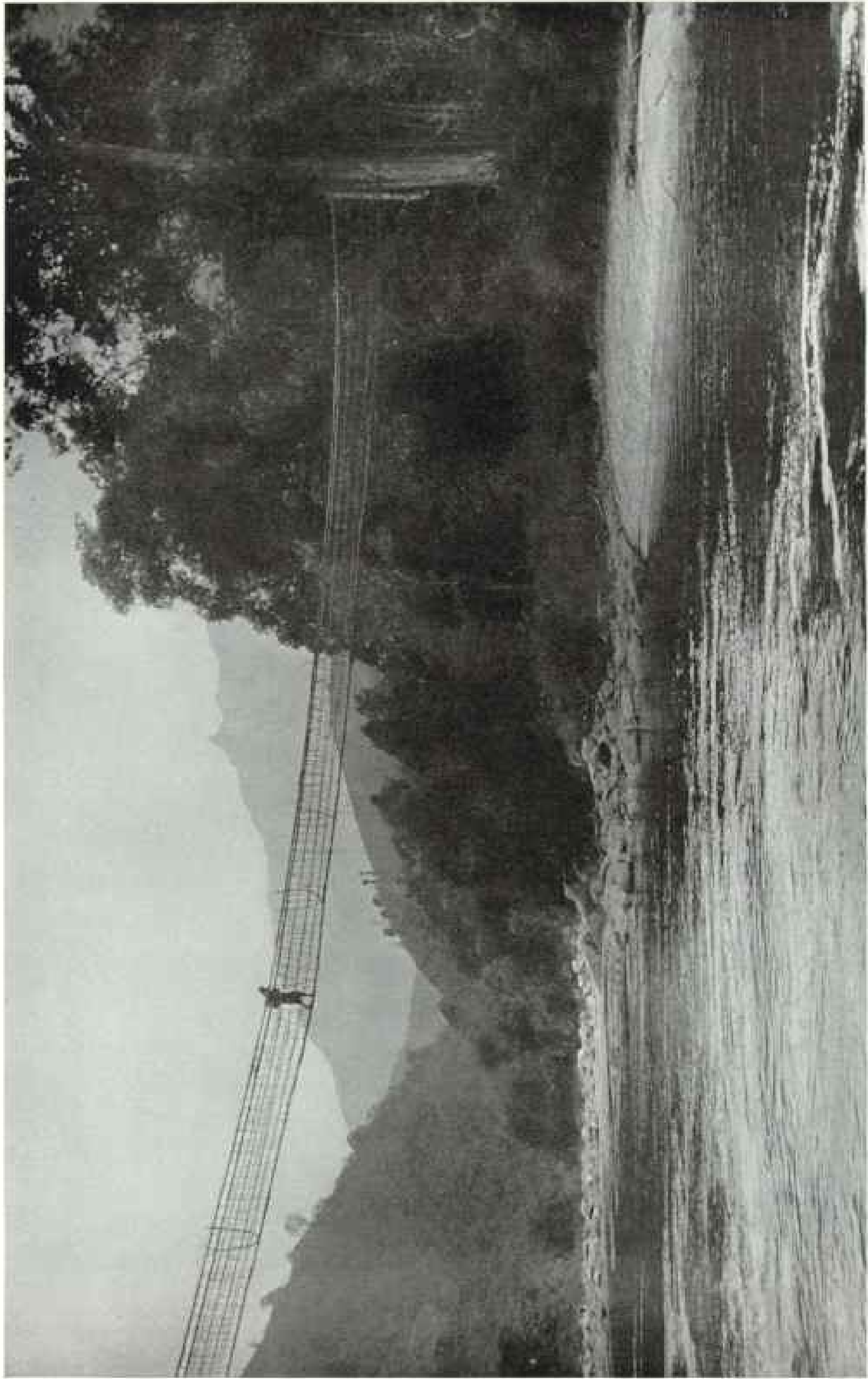
The engineering principle used in this span strung across the Tamai 50 miles from Fort Hertz (Putao) is the same as that followed in bridging with steel the Hudson River and the Golden Gate. Ends of the hammocklike structure are securely spliced to trees or stout scaffolding on either side of the stream.



Paul Popper from European

Strips Laid Across the Cane Cables and Tied Securely Form the Floor

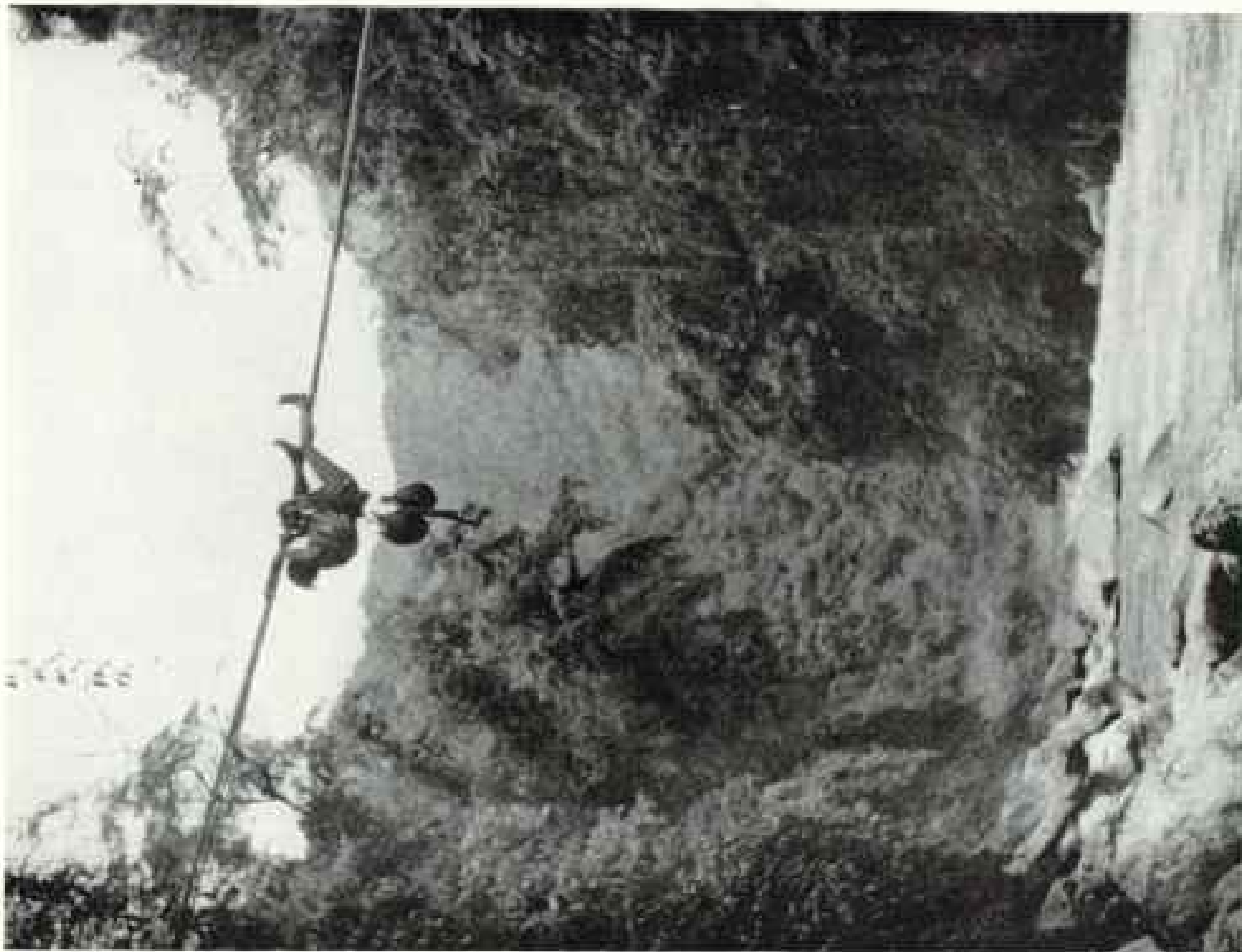
To insure against accidents, Nungs bind together strands of vegetable rope to make each supporting cable. The fiber stretches in time so that the bridge sags in the middle and swings like a hammock in the wind. Natives sometimes take up the slack by pulling back and reanchoring the ends, but more often replace the whole framework.



Prof. Peiser from Formosa

Less Elaborate than the Mule Bridge but on the Same Principle Is a Footbridge Across the Ngawehang

The main supporting cables of rattan or twisted bamboo strands are secured to big trees on either bank of this stream in north Burma, and cane loops connecting the strands form a framework like a ship's rigging. For the narrow floor, strips of bamboo are laid lengthwise along the bottom of the V-shaped contraption. There are three other types of these suspension bridges: the single cable, page 247; the wide-floored, pages 244, 245; and the tubular, pages 249, 250.



Simplest of All Is the Single-rope Bridge

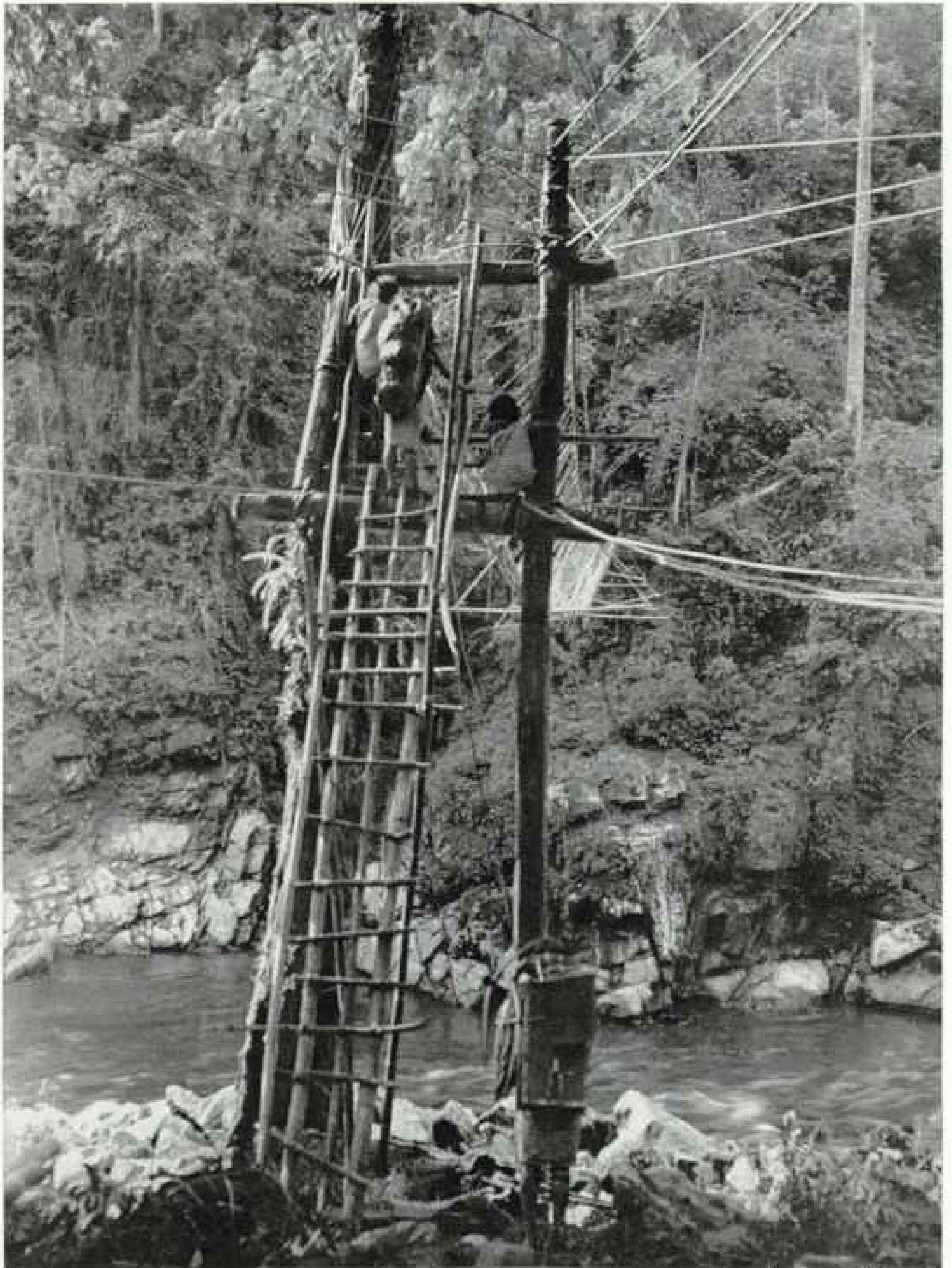
Nungs dwelling near the source of the Irrawaddy in northernmost Burma cross the Tamal on a sloping cable composed of two or three strands of cane. For a car to support the passenger a wooden hoop is used. Ropes must be renewed three times a year where animals are taken across on slings.



Field Paper from Himpeta

If the Cable Stretches Too Much, the Traveler Is Dunked

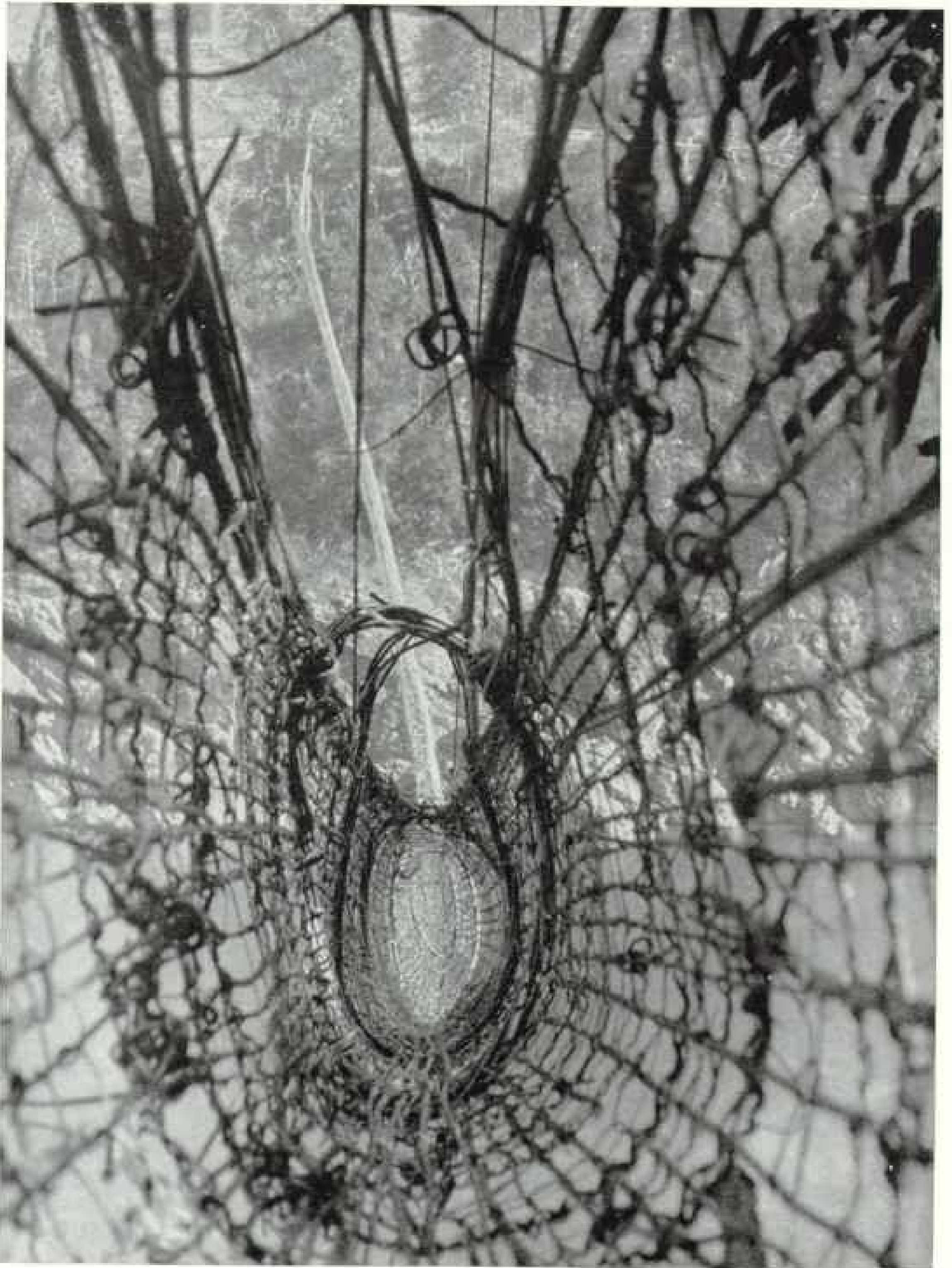
This Nung tribesman is reasonably safe from a wetting, however, for he is 40 feet above the stream and rocks. A slender hoop, which slides on the cane ropes, supports his weight as he propels himself with hands and feet. Often the cable is greased to make the hoop slide easily.



Paul Pappet from Esopus

To Cross This Bridge, One Must Climb a 20-foot Bamboo Ladder

Suspension spans supported by vegetable cable sag with use, and for that reason they are usually hung high in trees on the river banks or from wooden towers which are guyed by strands leading to forest giants. This bridge built by the Nungs crosses the Tamai 50 miles from Fort Hertz in northernmost Burma.



Paul Poppel from European

Six Hundred Feet Long and 50 Feet above the River Sways the Abor Tubular Cane Bridge

It is well that the spider's web is constructed like a tunnel, for gales blowing through the gorge may swing it 30 feet. This precarious bridge built by the Abor tribe is 100 miles upstream from Dibrugarh, the last important town on the Brahmaputra River between the plains of Assam and the plateau of Tibet.



Paul Dupret from European

Hoops Forming a Tunnel Help Crossers of This Footbridge in the Assam Himalayas

No suitable trees being available, stout wooden supports have been erected to anchor the ends. The span hangs over one of the headwaters of the Kameng, 50 miles north of the Brahmaputra at Terpur. For making the cables, the natives cut canes which sometimes attain a length of 200 feet.

Keeping House for a Biologist in Colombia

BY NANCY BELL FAIRCHILD BATES

With Illustrations from Photographs by Marston Bates

OUR decision to go to South America was made in mid-ocean in June, 1940, when we were fleeing home from Egypt where the war had made my husband's work impossible.

Both Marston and I had been brought up in the semitropical region of south Florida. He and my brother Sandy had caught butterflies along the dim trails of the Royal Palm State Park and hunted tree snails in the hammocks of the Everglades. If very good, I was sometimes allowed to trail along behind.

With the years, Marston's interest in the processes of living things had led him through Central America, Haiti, Cuba, and finally over to a laboratory in Albania where he spent four years with the Rockefeller Foundation studying the mosquitoes that transmit malaria.*

Although primarily interested in music, I had become so steeped in the ways of scientists that it was certain I should marry someone of that calling. So my astonishment over our wedding was due only to the fact that my husband had been growing up right under my nose, the one person I had always taken for granted as Sandy's great friend.

The Lure of a Laboratory

In Albania my latent love of primitive and far-off places began to come out. In Egypt where we spent ten months among the millions that crowd the Nile Valley,† this love became a longing for solitude. Here, too, a laboratory became less a place where I tried hard not to show my ignorance and more a world in itself where the most fascinating things went on.

In his laboratory the curiosity of the Boss had full scope, and his experiments resulted in a number of important discoveries about the private lives of mosquitoes. I learned to speak casually of larval ecology, species distribution, and similar "profound" matters, while he got used to having me nose about and often gave me little jobs to do.

Thus equipped, it was almost a foregone conclusion that we would choose the Tropics when it came to a discussion of where we should go next.

"I should like to try Villavicencio," said the Boss.

"Where's that?" I wondered.

"In Colombia," he said, "just southeast of Panama. The capital is Bogotá."

"Oh," I said, waiting to see what followed.

"Villavicencio is in the hot-country Tropics, and Dr. Lewis Hackett, who was there, says it is swell, with lots of animals and jungle."

And so it was that we asked for, and in due course received, our transfer to Villavicencio.

Bogotá, and a Baby

October found us in Bogotá installed in a small rented house awaiting the arrival of our first baby. While waiting there was plenty to do and learn, and all of it in Spanish.

The Boss made periodic trips down to see about a house, to look over the laboratory and the country. But he is not very observant of the details that a woman wants, so I got little inkling of the place where we were to live for so many years.

In the cold, damp atmosphere of Bogotá, where the mean temperature is 57° F. and the altitude 8,660 feet, it was hard to realize that we were only a few degrees north of the Equator.‡

It was harder still to realize that only a few hours by car down the mountainside it was hot and golden, truly "tropical" in the romantic sense of the word. I would sit by the open fire, curtains drawn against a wet, gray afternoon, and dream of the day when we should set off for the land of warmth and light.

That day did come finally, six weeks after little Marian was born, and it dawned bright and clear. A pile of bags, boxes, and brown-paper parcels accumulated in the hall. The truck came by to take on a last load; the cook packed us a few sandwiches—"just in case, Señora, for you never can tell"; the nurse heated a bottle for Marian; we took a last look around. Finally we packed ourselves into the car and were off for Villavicencio.

Sure enough, after we had climbed the pass and started down, it began to get warmer. Every hour or so we would shed another wrap as the road zigzagged lower and lower. And

* See, in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1944, "Life Story of the Mosquito," by Graham Fairchild, and "Saboteur Mosquitoes," by Harry H. Stage.

† See "By Felucca Down the Nile," by Willard Price, NATIONAL GEOGRAPHIC MAGAZINE, April, 1940.

‡ See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Hail Colombia!" by Luis Marden, October, 1940, and "Round About Bogotá," by Wilson Popeme, February, 1926.



Walter Henslike Thayer

Vaqueros Lend a Wild West Touch to Villavicencio's Streets

This Colombian cowboy wears leather chaps, as does his Texas counterpart, and a *ruana*, a woolen square draped over his shoulders. From his saddle hangs a rawhide lasso. On small, wiry horses such men roam the Llanos, or plains, tending the cattle which form the region's chief industry. For their favorite fiesta, that of San Pedro in late June, vaqueros swarm into Villavicencio. Some ride their horses in and out of cafés,

as we went along, I asked again about this place we were going to (map, page 254).

"Villavicencio is a fair-sized town," said the Boss in reply to my questions. "Six thousand inhabitants, I think, with streets and houses and things."

"But won't I see monkeys?"

"Sure you will; there are lots of them at the lab. You may see them in the bush; but you won't run into many or see wild coatis or have to climb trees to get away from peccaries."

Llanos—Wide and Wild

"Oh," and one little illusion was folded away. "What do the people live by?"

"Cattle and rice mostly. The town is the business center for the greater part of the Llanos."

By now I had read enough to know that Llanos was the name of the vast plains region stretching away from the eastern Andes (Cordillera Oriental) towards Brazil and Venezuela. I had read of their vastness, their mystery, their wildness in all the books we had been able to get on South America.

I had almost mastered the proper liquid pronunciation of the double l. But I had yet to know by experience just how wide and wild these plains are, how like a great sea whose ports are at the mountains' edge.*

As we drove, it began to seem as if we were on a magic road that would keep us forever twisting and turning, shut in by mountains.

* See "Cruising Colombia's 'Ol' Man River,'" by Amos Burg, NATIONAL GEOGRAPHIC MAGAZINE, May, 1947.



Sukey, a Pet Coati, Spends Evenings on Her Mistress's Lap

Intelligence, cleanly habits, and skill at hunting cockroaches make this South American animal a favorite in the Bates household. Coatis, allied to the North American raccoon, have long, rubbery noses, doglike paws, and slender ringed tails. Sukey hides her nose between her paws as she sleeps.

We had been driving for more than four hours, virtually without stopping; Bogotá, Chipaque, Caqueza, and the sandwiches were only pleasant memories.

We were stiff from bracing ourselves against the turns when suddenly we rounded a curve and stopped short, on the edge of nothing. It is true that the road went on, but for a moment we saw nothing but space, oceans of it full of clouds and haze, no more mountains, no walls of rock, just the wide sky.

After a moment of surprise we discovered that there was land there, far below, a great flat land that stretched away to be lost in the sky—the Llanos at last. A broad river meandered out from the foothills, patches of darker color showed us where the forest came and went, and the cluster of white dots half hidden behind a low hill was Villavicencio (page 258).

We got out of the car and sat for a long time on a low retaining wall, dangling our feet over the abyss. Then we got in for another half-hour of twisting and turning. The afternoon sun was slanting across the fields and the foothills were in shadow as we came out into the long run down to the town.

We bumped up an incline, turned a corner, and stopped in front of a house that was distinguished from its neighbors only in having grilles on the windows. People came to their doors to stare at us.

Remote from Current History

Thus began our eight years in this small Colombian town in the shadow of the eastern Andes. Shut off from the populous highlands by the precipitous slopes behind us, we face toward the vast empty plains of interior South



Drawn by Theodore Pyle and Julia E. Allen

Three Towering Andean Ranges Form Colombia's Backbone

Most of the Republic's 10,000,000 people live in the mountainous west. Eastward are the Llanos, watered by tributaries of Orinoco and Amazon. These plains comprise more than half the national territory, but support only 120,000 persons. Villaviciencio is the site of the Rockefeller Foundation's laboratory, directed by Dr. Marston Bates, the author's husband.

America, remote from the world of current history. And we have loved it more with every passing month.

In many ways Villaviciencio is like some frontier town of the old Wild West. Of the few foreigners who have lived here, many have had the one idea of getting away as soon as possible. No doubt it is because of our common background of south Florida and our common interest in natural history that we have found life here so much to our liking.

One hot Sunday not long after our arrival, the Boss said, "Come on, let's go out and explore."

He gathered together a couple of butterfly

nets, a cyanide jar, some empty mason jars, a small sieve, a machete, the plant press, notebook and pencil, camera, and a few other items, and we set out along the road to Puerto López.

We drove past open pastures and thatched huts till we came to the forest that borders the Ocoa River, some four miles away.

Here we left the car, and incidentally most of the equipment. Stepping off the road along a dim path, we entered the woods. It was dark, green, dank, and lovely in there, full of things that rustled but were not seen, that fluttered but were mute, that smelled but did not move.

The trail was narrow, muddy even in the dry season, with pools of water where a horse had left his print, and we were shut in on both sides by bushes.

Enchanted, I followed the Boss, suddenly transported back some fifteen years to the days we used to wander along the trails of the Royal Palm Park in Florida. But no, that rustle overhead

was nothing that lived in Florida.

Monkeys—at Last!

We stopped to crane our necks. It came again, and far up a small monkey jumped away to another tree and made off into the forest. Monkeys were all around for a minute and then were gone, leaving me completely thrilled. I tried to look up and walk along at the same time, but after a few tries had to do one thing or the other.

Our progress that day was by fits and starts. In a place where the sun poured on to the trail there came flapping toward us the great blue-winged *Morpha* butterfly, slow, digni-

fied, beautiful, and completely uncatchable, for at my swing he slipped gracefully to one side and was off to the treetops.

The trail was so overhung with branches that they brushed us as we passed.

We came to a little stream, and there in all directions darted hosts of tiny fish, some silver with red stripes, some iridescent, some with spots on their tails, some almost transparent; and I knew then what all the mason jars were for. But we had left them in the car and so put off fishing until another day.

I was content this first day to sit on the bank—even though I knew the red bugs would later have their field day—dabbling my feet in the water and looking up to where the trees opened to the sky.

Strange notes came out of the forest—the sound a stone makes dropping into a pool, the sound as of a cork pulled suddenly from a bottle, and a curious sort of yapping. This cheetering, the only noise I recognized, came from parrots.

Small flies buzzed about our heads, butterflies gathered around damp spots on the trail, and little minnows came to nibble at our legs.

"This Was What We Came For"

This, then, was what we had come for, and all the isolation—for I was as yet the only foreign woman in town—and all the fears that newness carries were as a feather in the balance.

The sun was slanting now through the trees. Overhead a toucan flew, a pair of parrots quarreled somewhere near, the butterflies drifted away, and the air was getting cool. A huge palm leaf fell crashing down somewhere back in the forest and we came to with



Nancy Bell Fairchild Bates

A Scientist Looks at a Ring-tailed "Dead End Kid"

Roberta, a mischievous cebus, or capuchin monkey, was the scourge of the animal house at Villavicencio. Her favorite sport was throwing missiles at rhesus monkeys in a neighboring cage. Here, in a rare quiet moment, Roberta perches on the arm of Dr. Marston Bates (page 272).

a start, to collect our things and go home.

Since then we have continued a series of sorties into the surrounding country that have never failed to delight us. The servants now are used to the Doctor y Señora coming back barefooted and covered with mud, the back of the car awash with dirty water, plants, and dead butterflies, and they no longer shut the garage door hastily behind us for fear the neighbors might see our condition.

When Daddy and Mother were here for several months, they spent days working along the roadsides and in the forested places and brought home carloads of plants.

Many of the plants Daddy collected are now growing in the Fairchild Tropical Garden

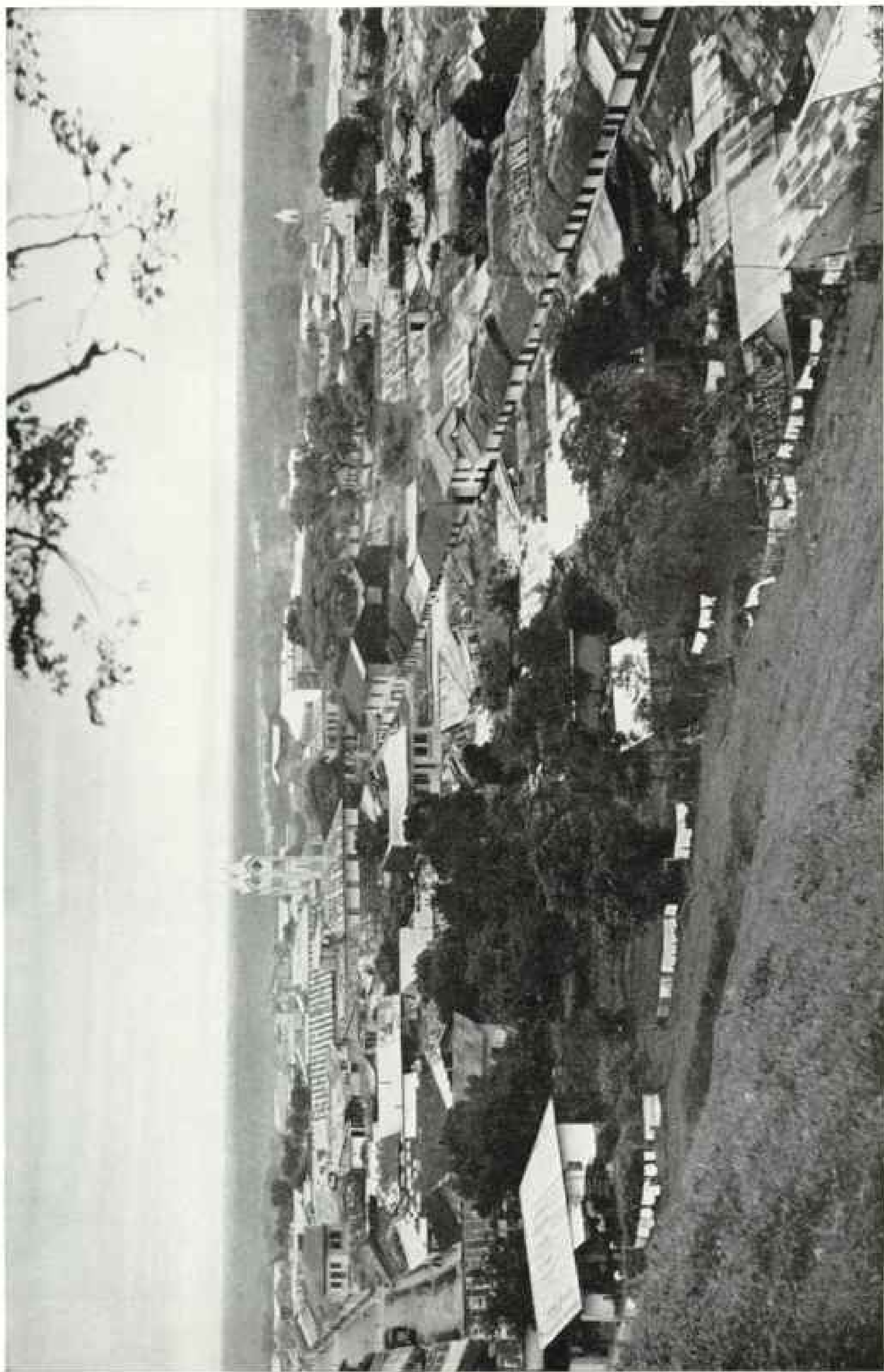


Near Bogotá, the Eastern Andean Range Sprawls Like a Prostrate Giant



Colombia's Broad, Grassy Llanos Stretch Away Toward Brazil and Venezuela.

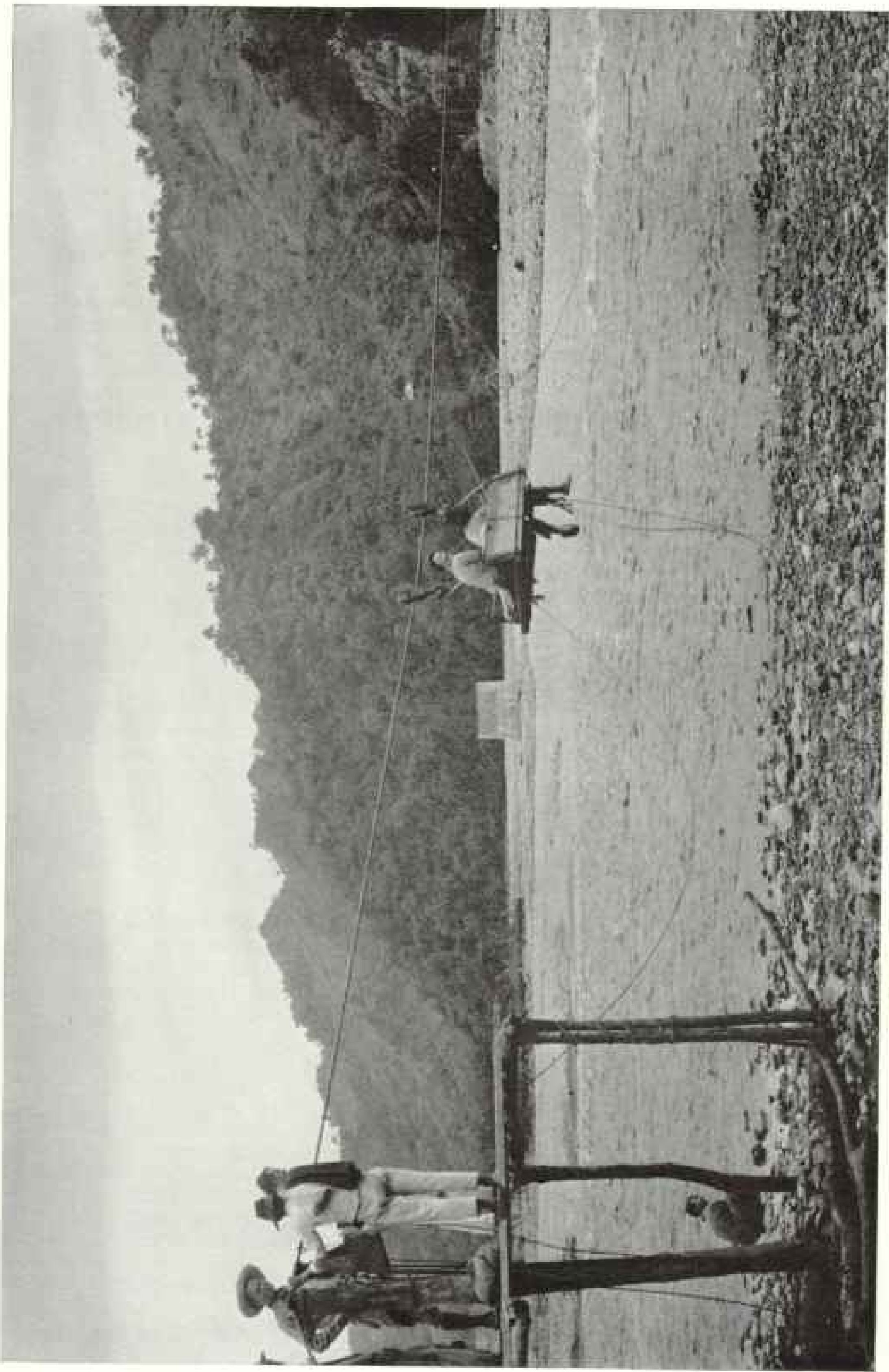
© Beatta



Walter Hentrich Hoelge

Villavicencio, Busy Gateway to the Llanos, Lies in the Shadow of the Eastern Andes

Here the author has lived for eight years, helping her husband in yellow-fever research for the Rockefeller Foundation. The mosquito-borne disease is endemic in the jungle region surrounding the town, about 50 miles southeast of Bogotá (page 253).



In a Miniature Cable Car the Author and a Companion Swing Across Colombia's Guatiquia River

Since the picture was made, a bridge has been built across this tributary of the Meta. In dry season, when the water is low, black flies breed under the moist stones. Here Dr. Bates conducted insect-repellent experiments, aided by volunteers who lined up along the shore with legs bared as bait (page 260).

in Coconut Grove, Florida; and still, after eight years, our friends ask about "Don David" who drew interested crowds wherever he went and conversed with everyone in a mixture of Spanish, Italian, and French.

Everywhere, towering above the forest canopy or standing in groves along the streams, the palms spread their great shining leaves. For Colombia is a land of palms, with more species than any other country in the world except Brazil.

The palms are one of the few groups that have distinctive local names. If you ask anyone along the road what that yellow-flowered tree is, he invariably answers, "Flor amarilla," or yellow flower. The hibiscus are all known as "rojo" or red, whether they be deep red or salmon pink. Practically any white, sweet-smelling flower is either a "jasmín" or an "azucena."

But the palms have lovely names: "moriche," "güichire," "unamo," or "chuapo."

Ladders to a Treetop World

One of our favorite patches of foothill forest was called "Forzosa," five miles southwest of Villavicencio. Here for several years the Boss had ladders up as high as 80 feet in the trees, with platforms jutting out at different levels where you might join the monkeys and birds in their treetop world.

These ladders were built when it was discovered that the mosquitoes *Haemagogus spegazzinii* var. *falco*, which carry yellow fever, live in the treetops (page 267).

They are numerous enough at ground level to make a walk in the forest dangerous for anyone not vaccinated, but they appear in swarms whenever the forest is disturbed by cutting. Thus jungle yellow fever is an "occupational disease of woodcutters," as the Boss puts it.

To learn more about the "ecology," or natural history, of these mosquitoes, the most sensible thing was to go where they were commonest. This resulted not only in a host of interesting observations on the life of the forest canopy, but also in a very neat explanation of how the virus may be kept going in the forest without the presence of man.

The *Haemagogus* is a day-flying mosquito that likes the high temperatures of the treetops. The saimiri, or squirrel monkey, which transmits the virus readily, is also an inhabitant of the forest canopy, and is also most active during the daytime (page 272).* Both are common species over a wide range of forest, and their distribution coincides with that of the known cases of yellow fever.

In the regions where saimiri do not occur,

there is another monkey, with the marvelous name of douroucoulí, that is also both highly susceptible to the disease and an inhabitant of the treetops (page 272).

"What more could one want in the way of proof?" I was inclined to ask. But of course a scientist will never commit himself completely; so the papers which have been written about the Forzosa studies are well peppered with "it would seem" and "in all probability."

Marston had a small piece of the Forzosa forest completely mapped out with every tree, every bush, practically every rock, numbered. The mosquitoes were caught in man-hour lots—so many mosquitoes per man per hour. There were thermographs, hydrographs, evaporation pans, and other equipment for observing and recording the forest world at different levels.

Whoever has the courage to climb 80 feet straight up is well rewarded. Sitting on the platform at the top with the tree trunk as a back rest, one is in a new green world. The sunshine dapples everything with flecks of gold, butterflies and wasps are busy in the flowers of a neighboring tree, the fronds of a palm a bit down the slope rustle crisply in the breeze, and out through the branches is a view of the Llanos all hazy in the heat.

Perhaps a monkey will wander by or a bird come to perch almost above the platform. Everything is bathed in a clear green light, and for a moment it seems the easiest thing in the world just to step off the edge and fly away.

But when I am going down from the platform, the feeling of height suddenly overcomes me and I have to look up steadily and think hastily of other things.

Human Legs as Insect Bait

Beside the Guatiquia River the Boss ran his experiments on insect repellents. His staff, his wife, and any chance visitors were lined up along the bank with their legs exposed as bait. One leg of each pair was treated, the other left as a control, and the black flies had to be allowed to bite before they could be counted (page 259).

For an hour the rather tense silence was broken only by slaps and a count of "one on the untreated leg," or "one on the treated leg." He tried a number of different kinds of repellents, all of them smelly and many of them messy. Some had to be put on hours in advance to test their durability, and all afternoon we would go about leaving greasy marks on the furniture.

* See "Monkey Folk," by William M. Mann, NATIONAL GEOGRAPHIC MAGAZINE, May, 1938.



Winged Carriers of a Tropical Disease Live in These Tiny Glass Houses

In the Rockefeller Foundation laboratory at Villavicencio, Technician Luis Rodriguez charts the history of mosquitoes infected with yellow fever. The insects lay their eggs on cotton pads in the bottom of the vials. Their food is sugar water, supplied through cotton pellets placed in the screened tops.

In the end one of the best repellents turned out to be soap, any old soap, lathered on and left to dry.

Meantime, the Army has got out a much better repellent that is neither smelly nor messy, called di-methyl-phthalate, which, while hard to "thpell," is very efficient.

The Boss also tried to work out an "attractivity ratio" on the basis of skin color, but it came to little more than a possibility that darker skins are more alluring to the black flies.

The Lure of Night Collecting

When Dr. and Mrs. E. R. Dunn came to Villavicencio, they introduced me to night collecting. It is a fascinating sport, for one sees so many things that go unnoticed in daylight—spiders, whose eyes shine like tiny diamonds; great green, slow-moving frogs with eyes like rubies; or the fluffy underparts of sleeping birds as the light runs up a tree.

The stealthy creep up to where it seemed that sound came from, the motionless wait until it comes again, a snatch, and the frog is caught.

The night I caught four frogs all on my own I approached a noisy pond with the

usual stealthy tread. The Dunns were away off somewhere else, but it wasn't until two glowing coals popped up out of the water that I suddenly realized that I was all alone and that this was a caiman, cousin to an alligator, staring at me. Standing there, one foot on the bank, one in the pond, I was engulfed by a cold wave of unreasoning panic.

"Easy now," I said almost aloud. "That caiman can't be much longer than a foot or two or he wouldn't be in this small pond. Just remember what the Boss always says: that animals are more afraid of you than you of them."

The glowing coals burned unwaveringly and were reflected in the water; they even moved a little closer. I removed my foot from the water and said "Boo!" in a loud voice. The coals disappeared with a slight ripple, and just at that moment over the hill came the headlights of the Dunns.

As we went back to the road together, something exploded right under my feet and dashed bouncing off across the meadow. And now I know what it's like to be scared literally stiff. I don't think I could possibly have moved a muscle until Dixie Dunn said, "Oh! An armadillo."



Named Bell Fairchild Bates

Three Feet of Mischief Is "Barbie the Bicho"

Captured as a baby, this weasel-like tayra was a Bates family pet until misdeeds caused its banishment. A trick was sneaking under chairs and nipping visitors' ankles. Its name comes from the zoological label, *Tayra barbara*, and the Spanish equivalent of "varmint."

The frog hunters caught a mess of stuff in our country, many of them new species. We saw them off on the plane with their bottles and bags and milk cans full. But even so they left a number of boots, twirps, hic-cups, and wahoos still unidentified.

Birds and Butterflies

Ornithologists are easiest of all to satisfy, for they can be made happy almost anywhere, there being birds even in the bamboo behind the lab. I have always regretted taking our two friends from the American Museum out on the road to Apiay (La Palmita) one night, for they shot my old friend the goat-sucker. He used always to sit on a certain fence post and greet us with his shining eyes as we came home after dinner with friends out at the airport.

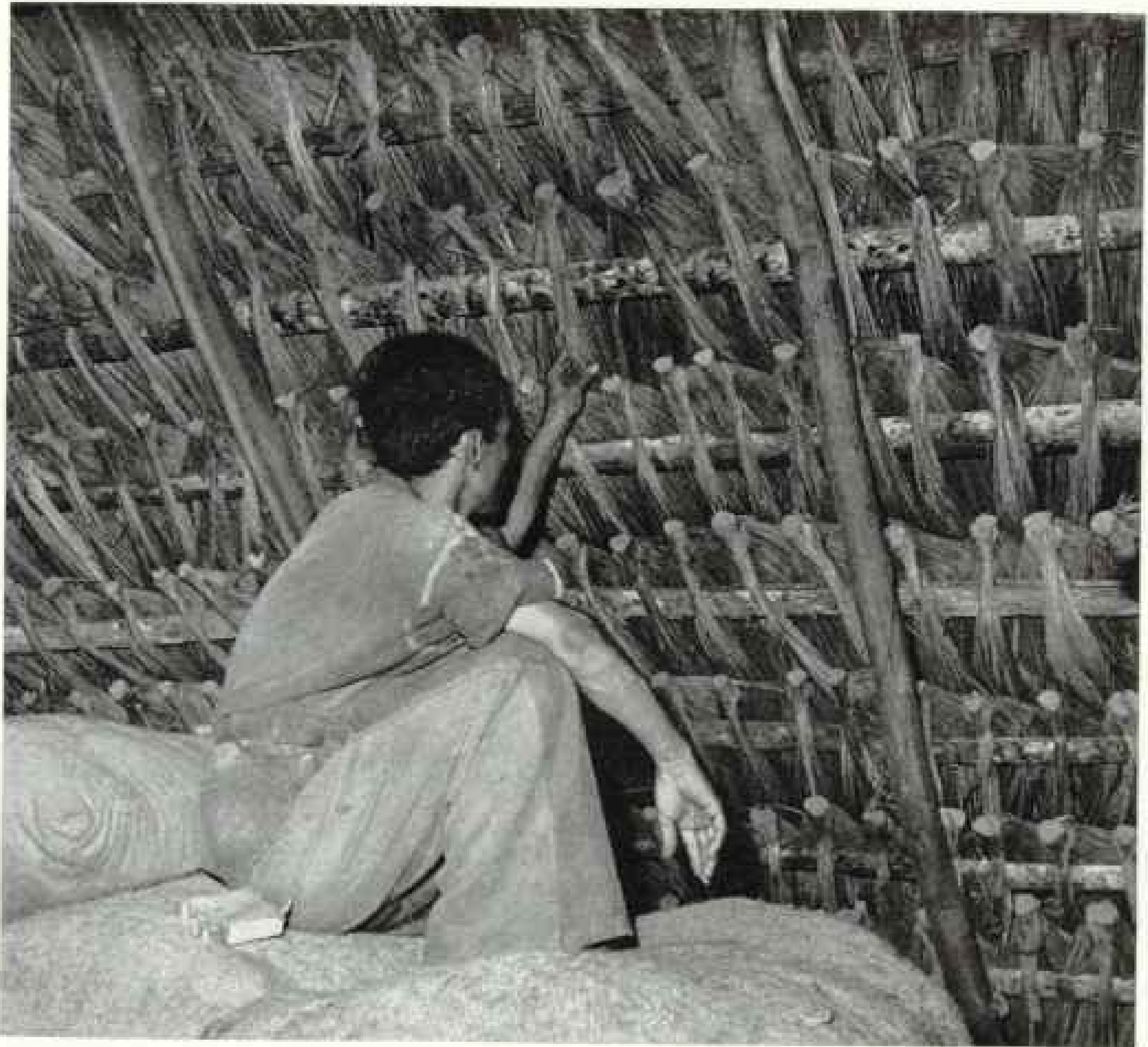
The butterflies are everywhere, swarming in damp spots on the sunny roads under our horses' very hoofs, along the aisles of the forest paths, in all the clearings, even on the flowers in our own patio.

Once, after a particularly trying day catching butterflies, a friend sent over a huge fish from the Meta. We ate what we could, but we don't have much icebox space, and I knew the rest would spoil.

As I was lamenting this, it occurred to me that butterflies are often caught with bait, the more rotten the better. And so it was that one of the boys and I started off one morning for the Ocoa bush with a box full of very dead fish which had been ripening in the full sun for five days. This we put out on a log.

It didn't get me many butterflies, however; for the smell attracted a couple of buzzards, and rain soon washed away what the buzzards left.

We have here about anything you could wish for if you are of a naturalist turn of mind. It is in fact true that this region, cut over, burnt back as it may be,



Palm Leaves, Fastened to a Sapling Framework, Make a Watertight Jungle Shelter

Even the heaviest tropic downpour will not penetrate such a roof, which may last for ten years. Many Colombian families live in similar houses. Members of the Rockefeller Foundation laboratory staff built this one as a retreat from rain in a forest area. The crevices between the leaves provide refuge for bats.

is still one of the richest spots in the world from a natural-history point of view. Small wonder, then, that even I, with no training whatsoever, have caught butterflies, tried skinning birds, kept fish, hunted frogs, and been black fly bait. Alas, I have never done any of them properly; there are too many stools to fall between.

Lab Is Home, Too

When visitors come, I often act as guide among the viruses, the mosquitoes, and the animals, thereby showing off a commendable number of technical terms and an understanding of some quite complicated relationships. In short, the lab is as much a part of both our lives as is our house.

To be sure, there were, and still are, great gaps in my attendance here, for my nose has

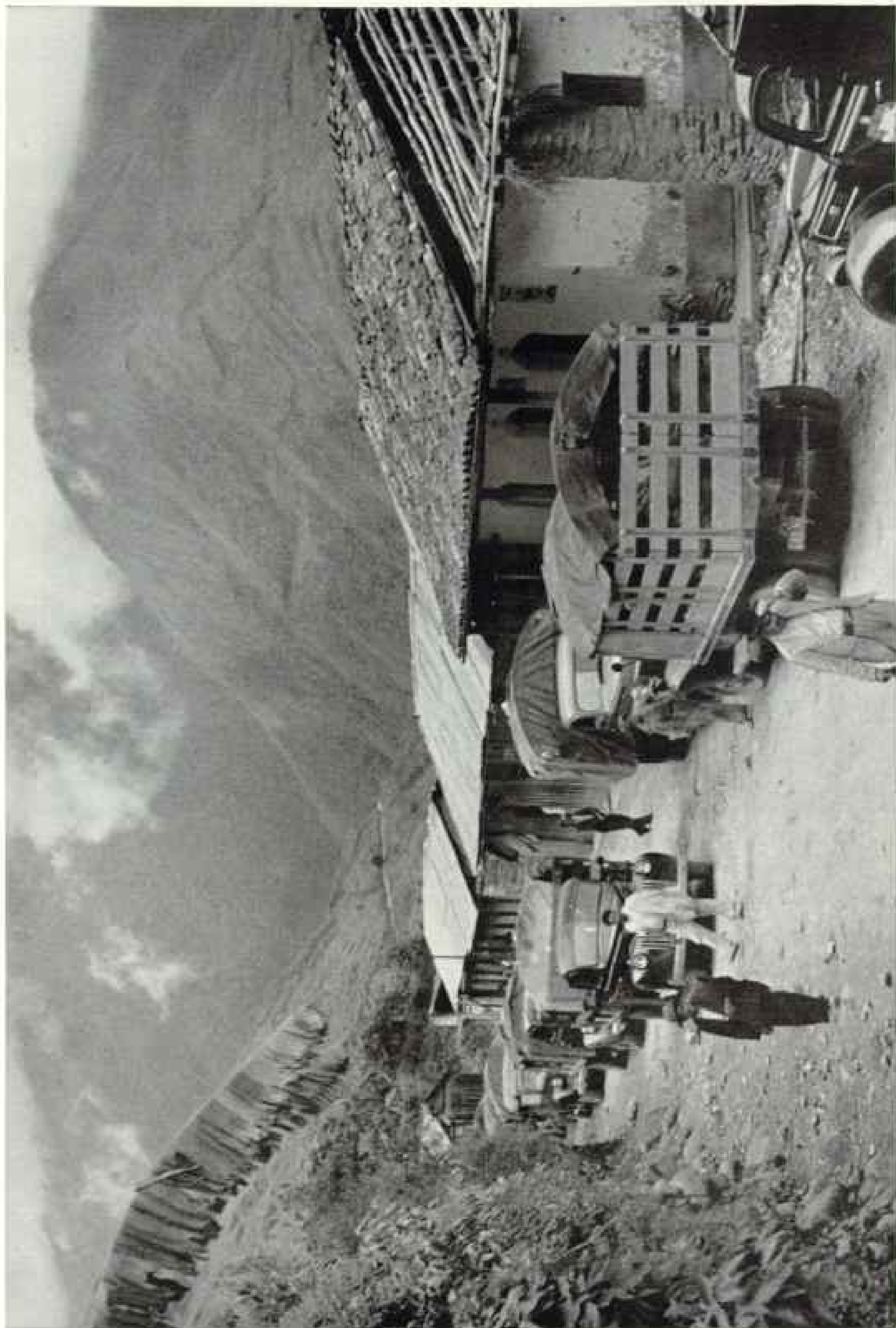
long since extended its territory to the town, the hospital, and our neighbors in general. There were also the children to consider. But we solved that neatly by building a playground for them right here at the lab.

Any morning you will find three or more small things, dressed only in pants, sliding, swinging, digging, or splashing, for we find the more the merrier.

The pool that was built years ago for a tapir became a great place for bathing. The lab staff are now trained to look out at the first yell and to distinguish the cries of anguish from those of anger.

"This place," Marston remarked one morning, "is one-third legitimate laboratory, one-third zoo, and one-third kindergarten."

Sitting here in my corner just outside his office, I get all the angles at once: the Boss



Amos Bara

Trucks Await Their Turn on a One-way Mountain Stretch of the Bogotá-Villavicencio Road



Weather Knowledge Helps Science Fight Malaria and Yellow Fever

Into the histories of disease-bearing mosquitoes go detailed reports on weather in the areas where they thrive. Rockefeller Foundation researchers set up observation posts to collect data. Here a laboratory worker checks a thermometer, which keeps a continuous record of air temperature on the forest floor.



Mosquitoes, Too, Like Air Conditioning

Scientists rigged this device to keep their captives happy on dry, hot days. From a perforated pipe water flows down a burlap screen. The electric fan blows moist air through the cloth into a room where laboratory "skeeters" live in cages. Some like it hot; others prefer it cool and damp (page 268).



Vine-hung Forest Pools Harbor Larvae of the Malaria-bearing *Anopheles*

Unlike the high-flying *Haemagogus*, which carries yellow fever, the *Anopheles* mosquito frequents low, damp places where vegetation is heavy. Here a Rockefeller Foundation employee skims the water with a shallow pan, collecting larvae for the laboratory. He carries a machete for hacking through underbrush and vine draperies.

hard at work discussing organization or dictating to Helen Booth, his secretary; Sally fighting with Eduardito, the superintendent's child out front; and, beyond, the spider monkeys swinging back and forth, back and forth across their cage.

The spider monkeys have not been used for any experiments. They merely eat and swing, though the Boss doesn't approve of having animals around that aren't used!

So also the butterfly collection, the cabinet of prepared bird and animal skins, and the jar full of various snakes and other reptiles are of course a very good example of the Boss's contention that one can follow only one line of investigation at once!

Having started to tell about the lab, I find myself entangled with the Boss. This is perhaps because the lab is his second self and is as changing as he is. If I don't get over there for a week, there is no knowing what I shall find—new cages in the animal house, a new storeroom behind the carpentry, or a beautiful leather case for the Graflex camera.

Mating of the Mosquitoes

One surprise was a small room within a room, a magnified closet painted white, with a wet sand floor in which were buzzing about some bewildered *Haemagogus* mosquitoes, the hope being that proximity, one to the other, and the lack of other distractions would cause them to mate in captivity.

Why extreme boredom should cause them to mate, I don't know; but then, you never can tell about mosquitoes.

The Boss goes in there and sits with his pets, trying, as he says, to get "their point of view." Not only that, but he goes in there to feed them, for the female mosquito before she can produce eggs must have a blood meal. Fortunately in many cases a rabbit or guinea pig will do as well, but there are some which definitely prefer man.

Since the Boss does not believe in asking his boys to do anything he would not do, he goes in with the rest and passes the time pleasantly, shirt off and legs bared, teaching the others English.

Over at the insectary where the larvae live are rows and rows of enamel pans, each carefully tagged and numbered, and each with its population of larvae in different stages of growth. Some seem



They Also Serve Who Sit and Get Bitten

If these Colombian laboratory men were working, their legs would be bared as bait for jungle mosquitoes. Alfredo, on the platform, would be catching more than Moreno, even though only 15 feet higher. When mosquitoes alight on the skin, they are trapped in small vials. Vaccination protects the men from yellow fever; others have had the disease.



"What's Holding Up That Roast Pig?" Asks the Author, at Left

All the fixings are ready, and only the main course is needed to begin a picnic in a bamboo grove behind the Rockefeller Foundation's laboratory at Villavieja. With the meat go salads, baked potatoes and plantains, and mounds of highly seasoned rice. Wives, children, and friends of the research staff are ready to fall to. Banana leaves serve as a tablecloth.

to be happiest in river water, some in the muddy water of puddles. Still others prefer an infusion of leaves or hay, and they are fed a variety of diets, from bread crumbs to powdered yeast.

This wide variety of needs requires a vast amount of equipment and the keeping of many records. Two lab boys are kept busy counting or feeding larvae, putting the pupae from the larvae pans into cages so that when they hatch out as adult mosquitoes they won't fly away, and catering to a bewildering number of different tastes and requirements.

Study of Jungle Yellow Fever

The *Haemagogus* like it hot and dry, which means a special constant temperature chamber complete with fans and thermostats.

The *Anopheles* like it cool and damp, which means a cellar, also with fans and thermostats. Even the size of the cage has its influence on

growth and mating. And the mosquitoes are only one side of the problem of disease transmission.

The laboratory was built in 1938 for the study of jungle yellow fever, which is endemic in this whole region. There are four buildings in all—the animal house, the laboratory proper, the shops (garage, light plant, carpentry, and storage room), and the insectary.

In front of the animal house and to one side are the slide, sandbox, and swing that make up the playground.

I believe the Boss is plotting to get this all shoved back a bit more out of sight near the wading pool, feeling that the sound and fury of five to ten small kids in various stages of undress do not enhance the dignity of a research institution.

Many people, never having seen a laboratory, probably would visualize it as in the pharmaceutical ads: a place full of micro-



A Tasty *Lechona* Tops the Menu at a Colombian Outdoor Banquet

Doña Enriqueta, who made the stuffing, and Moreno, in charge of the cooking, prepare to carve a roast suckling pig for a feast at the Villavicencio laboratory. With such picnics, people of the plains country honor visitors and celebrate christenings, birthdays, marriages, and completion of new buildings. When Dr. and Mrs. Bates bought a ranch, the former owner entertained them at an outdoor dinner after final papers were signed.

scopes, odd-shaped glassware, and people in white coats. Well, we have the microscopes and the glassware, and a lot of other things, too (page 261). But the Boss is likely to be in trousers and nothing else, the boys generally wear overalls, while the only time one ever sees Dr. Roca in a white coat is when he is vaccinating.

Even so, there is a feeling of order and industry about the whole place, a neatness about the white walls and green woodwork, and the rooms are carefully screened off from one another. It is a cheerful place where people whistle as they work, stopping for a cup of *tinto* (black coffee) in the middle of the morning, and a cup of tea in the afternoon.

Mystery of a Virus

I think I understand the meaning behind the activities up to now, although let no

one expect me to distinguish one mosquito from another or be able to follow the intricacies of titrating virus; I have tried and failed.

Very generally speaking, the scientists have been trying to find out by what mechanism the yellow fever virus in the jungle can and does exist irrespective of man. The yellow fever that devastated the cities of the Tropics many years ago is pretty well known. It went from man to mosquito, then back to man. But in the jungle you have a different mosquito, and apparently no need of man to carry on the cycle; so all the animals of the forest were immediately suspect.

Since you can't see a virus, except with an electron microscope, its presence can be inferred only from its effect. With malaria, you can take a drop of blood, smear it on a slide, stain it, peer at it through a microscope, and see the bugs in the blood cells.

With yellow fever, you have to take the

drop of blood, inject it into the brain of a mouse, and wait a week or two to see what happens to the mouse.

If the blood had the virus of yellow fever in it, the virus will grow in the mouse's brain and presently the mouse will get sick, showing, in the language of the learned, "characteristic symptoms"—ruffled fur, paralysis of the hind legs, and death in 24 hours or so after the onset of paralysis.

The virus can be kept going endlessly by grinding up the brain of such a sick mouse and injecting it into new mice *ad infinitum*. The mice are the "microscope" used to check on the yellow fever virus, and for this purpose thousands must be bred.

"Virus Manipulation"

I find it extremely difficult to reduce the complicated techniques of "virus manipulation" to simple terms, but roughly the idea is this.

A man or monkey sick with yellow fever has large amounts of virus circulating in the blood stream. In Nature, certain kinds of mosquitoes become infected if they bite when the man or monkey is in this stage. They pick up the virus along with the blood, but the virus has to go through some sort of development in the mosquito, since this mosquito won't infect a new animal by biting until two weeks or so after it has picked up the virus.

By this time the virus has grown in the mosquito and reached the salivary glands, to be injected when the mosquito is probing for blood on its next victim. The disease is probably kept going in Nature by these endless transfers among men, monkeys, and mosquitoes. The virus may kill the man or the monkey, but it seems not to have any harmful effect on the mosquito.

Curiously, the virus doesn't have any effect on white mice, either, unless it is introduced directly into the nervous system; and it grows only in nerve tissue, such as the brain. Once started in the brain tissue, it leads almost inevitably to the death of the animal.

In monkeys and man the virus shows a definite cycle. It appears in great quantities in the blood four or five days after infection; then a few days later, if the animal doesn't die, it disappears completely. Such an animal becomes immune and can never be infected with yellow fever again.

The Boss had to learn all the techniques connected with this virus manipulation, and so Señor Calderón from the Bogotá laboratory came down to teach him. The Boss learned to grind up the brains of sick mice with mortar

and pestle, to make a suspension of this for injecting into the brains of healthy mice, and with increasing dexterity he learned to bleed a number of animals from the veins or the heart.

White mice are the basic laboratory animals in yellow fever work, and large quantities of them must be on hand at all times. In Villavicencio they have raised as many as 5,000 a week.

Five thousand squealing, rustling, nibbling mice kept in screened metal boxes half full of dry rice hulls! Their diet is more carefully planned and controlled than that of our own children! Their wheat germ and cod liver oil and calcium are imported in vast bulk, and two boys are kept busy just washing and disinfecting their cages.

When a mother mouse gives birth to her first litter, she is given a mark on one shoulder, a little dab of color stain. Each succeeding litter she gets another dab until in no time at all she is mottled a delicate shade of mauve or yellow or whatever color they happen to be using.

The monkeys and other animals used in the experiments must also be fed and cared for: even the virus when not in use must be completely dehydrated and kept in a refrigerator.

Mishaps in the Laboratory

Having nothing better to do in those early days and not wanting to miss the show, I spent many afternoons over at the lab, plugging test tubes with cotton, wrapping syringes, bottles, pipettes, etc., in brown paper for sterilizing, or stamping the date on those already done, chatting meanwhile with Don Eduardo, the supervisor of all this routine.

One day I tried my hand at anesthetizing the mice they were to use for injection. It looks very simple and reads like a recipe: Put a little ether in a big glass jar, remove six small mice from their box with pincers and place them in the jar, stir well, and remove each mouse as he goes to sleep.

Well, the long pincers kept missing the mice's tails as they scurried in fright around the box. Then, once they were in the jar, the pincers got caught in a wire netting at the bottom so that mice, netting, ether, and all were inextricably mixed. Several animals had to be resuscitated by blowing our own breath up their noses (artificial respiration?) because they had been in too long.

It was a humiliating experience, almost as bad as the day I broke a test tube, a syringe, and a sterilized beaker, all in fifteen minutes.

In the early days of jungle yellow fever

study, a great deal of time was spent chasing the virus itself.

In likely spots all over the country viscerotomy posts were set up. Anyone dying of a fever within ten days of its onset was pounced upon by the viscerotomist who, with a neat little instrument, cut a slice out of the liver, for certain changes in the liver tissues are characteristic of the disease.

I believe a considerable amount of subterfuge was necessary at first. But now it is a matter of routine and no one is buried in Villavicencio without a signed permission from the laboratory. The liver sections are sent to Bogotá for diagnosis.

Up until a few years ago a positive liver from almost any accessible spot was enough to set up feverish preparations. "Accessible" is a relative word, so that in many cases a regular expedition was necessary. Mice, monkeys, and endless equipment went on muleback over terrific roads deep into nowhere to set up a miniature laboratory right on the spot.

Often weeks were spent trapping and bleeding the local animals and catching mosquitoes to feed on the monkeys; as often as not, the result was negative. But the few times the virus was recovered were enough to compensate for all the effort.

With malaria it is ever so much easier to catch the "villain"; you just go and round up a bunch of school children, prick their fingers, and from the blood of any dozen you are sure to get something.

Parallel to all this, the laboratory has been running, and will continue to run, weekly vaccinations against yellow fever. This is our main claim to local fame and our most obvious reason for being.



An Animated Ball of Yarn Is the Woolly Monkey

Monkeys are valuable in yellow fever research, since their reactions to the mosquito-borne disease are similar to man's. Many, like the one peering at the author, were brought from the Colombian jungle to serve science, but became household pets (page 272).

The people come in from all over the region. They sit around on the front lawn or cluster about the spider monkeys' cage; all sorts of people of all ages. Those from the country sit quietly waiting, a little awed, while those from the town feel more as if it were an outing. Some have even come back for a second shot just for the fun of it, even though one inoculation is supposed to make you immune forever.

"The Horriddest Monkeys of All"

Time was when the lab was full of Indian rhesus monkeys, which in my opinion are the horriddest monkeys of all, always ready to jump at the bars or snatch at you if you



Mosquito Bar Converts a Hammock into a Tiny, Boxlike Room

Easily carried and quickly slung, the hammock is the universal bed of Colombia's Llanos country. In areas where ticks prevail, the mosquito netting is tucked under the occupant; otherwise, it is allowed to trail. Instead of beds, some country inns merely provide wall hooks for hammocks.

get too near. They were the only animals besides the white mice, rats, and guinea pigs that were not of local origin.

The cebus (also called capuchins, ring-tailed monkeys), so common here, are known as *maizeros*, or "corn stealers." Anyone who has followed a hurdy-gurdy a few blocks knows what they look like. One of the cebus, Roberta, took an intense dislike to the rhesus monkeys, and when chained near their cage spent her whole time throwing stones, banana peels, and anything else handy at them, along with her insults (page 255).

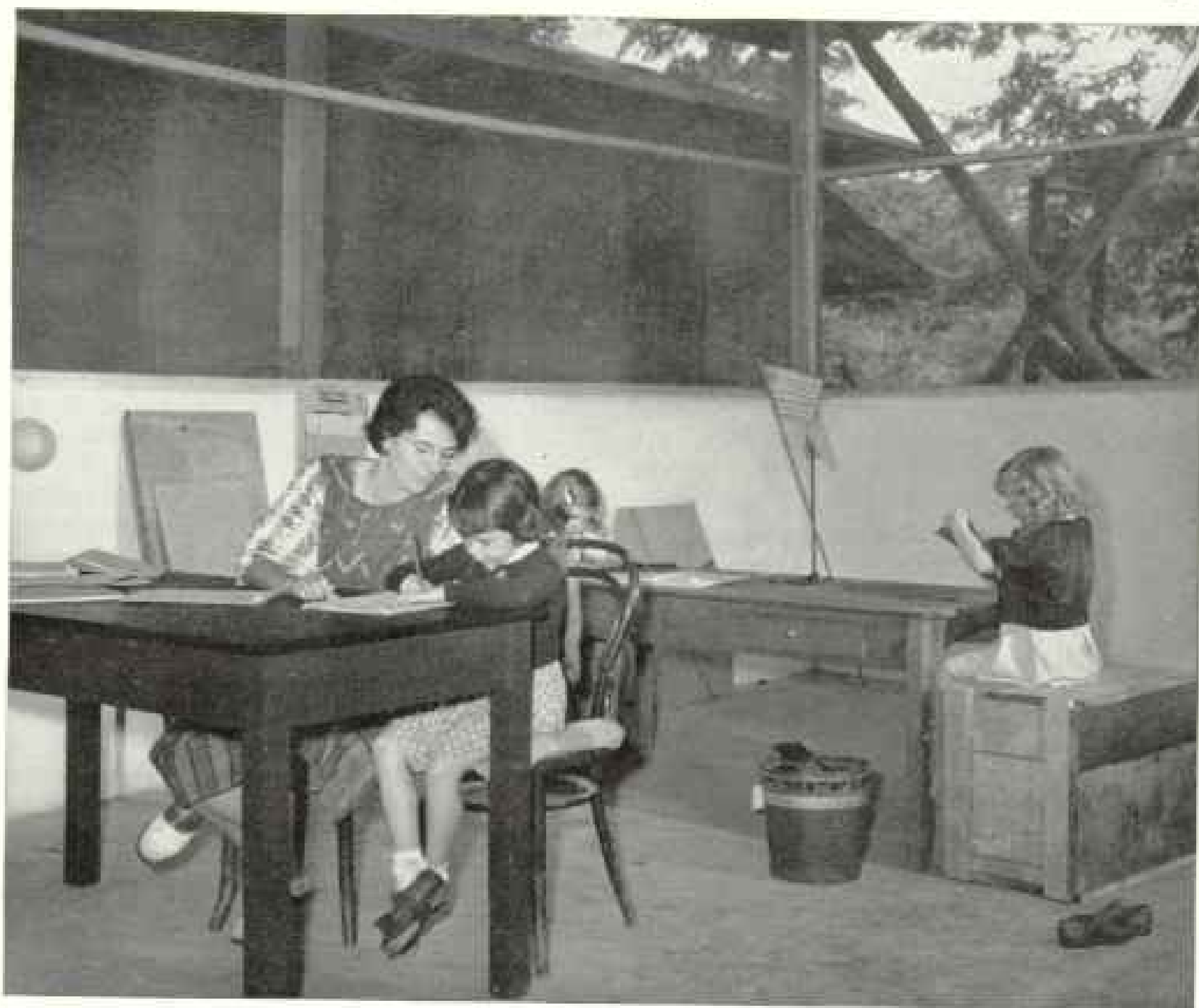
We have had a good many saimiri monkeys because they turned out to be good experimental subjects—*i.e.*, highly susceptible to yellow fever—and they make lovely pets. They are dainty little things, and the local name of *titi* just seems to suit them. They have bulbous heads, flaring ears, and tiny faces with muzzles that look as if they had been dipped in ink.

The other end of them is black, too, the long tail that hangs down as if weighted by the tuft of hair at the end. In between they are the color of pepper, salt, and mustard mixed together. I frequently watch them nimbly catching flies to eat or scratching each others' backs.

The woolly monkey makes a nice pet, too, although he is rather stupid. He makes me think of a clipped round ball of black yarn, lightly dusted with powdered sugar. Mournful eyes gaze out of a wrinkled black face so appealing that I often pick him up and carry him about like a baby, his tail wrapped around my arm. It seems to be the one thing he really enjoys (page 271).

"Little Widows," with Folding Legs

Then there are the *douroucoulis*, nocturnal monkeys with big staring eyes that have earned them the common name of owl monkeys. Like the saimiri, they make good



In the Animal House, Bates Youngsters Learn the Three R's, with Natural History at Recess

Here in a screened corner of the Villavicencio laboratory, the author teaches, with a correspondence course, her three daughters, all born in Colombia. She also sings, writes, keeps house, and assists her husband in yellow fever and malaria research.

laboratory animals, for they are even more susceptible to yellow fever. They have very silky soft fur, tails that are not prehensile, and almost no voice at all.

At first glance you would not take them for monkeys. Their faces are almost completely furred, therefore rather expressionless; and their hands are like paws.

But they are monkeys—all the scientists say so—and they make gentle, even affectionate pets.

Not so the socay (*Callicebus ornatus*), aptly called *viuditas*, or "little widows," from the wide band across the forehead. Heavily furred, with scared eyes and short front legs which fold upon their breasts, they look extremely mournful. They sit huddled tight together in a row, every head moving in unison at the slightest noise, and will have nothing to do with anyone.

Personally, if a monkey isn't going to be friends, I'd rather he'd be completely defiant

like the marmosets which come from farther south. Only about three to five inches long and with teeth so small they can't even pierce the skin on your finger, they still are afraid of nothing and will fly at you in a fury.

Marmoset Curiously Marked

By far the most spectacular of the monkeys we have had here are the slightly larger marmoset, *Edipomidas edipus*, from the Magdalena, not on account of their size, for they could curl up comfortably in your hand, but because of their curious markings.

The coat is red brown, white underneath, but from just above the eyes, over the head, and down to the shoulders runs a long narrow mane of straight white hairs like the plumes of a Greek warrior's helmet. It gives an almost regal dignity to the tiny figure, while sparse white hairs on the black face add a look of great age.

In the animal house at the time I first

started messing about in it, there were soft little wild rats and a host of even softer woolly opossums. One there was named Carlota, a gentle, downy, popeyed creature who rode about on a lab boy's head, her tail curled around his ear. To get her off, he had to unclench each tiny paw, which had a death grip on his hair.

This perhaps explains why baby opossums can crawl all over their mothers without falling off.

When it was decided to send the rhesus up to Bogotá, the lab boys presented a verbal petition that the two rhesus babies born here should not go with the rest. "Born in the Llanos, they should die in the Llanos."

That is what the oldest one promptly did. But the youngest with his mother frisked for many months about his cage, and her cry grew more and more mournful in the late afternoon, so far from home and alone among strangers.

Her maternal activities were an interesting contrast to those of the mother saimiri, of which we had several.

The rhesus mother kept her baby constantly within reach and would clutch it to her bosom at the slightest disturbance.

The saimiri mother paid almost no attention to the baby that crawled all over her, except to dump it off impatiently from time to time. I don't think she knew how to pick it up, for we never saw a captive saimiri pick up its young. They would go alongside, butt it with their heads, and lower a shoulder for it to climb up on.

When I have nothing better to do, I can always sit and watch what goes on in the cages, see who picks on whom, what hand they seem to eat with most, etc.

These observations I should never dare to write up seriously, having read too much about "anecdotal natural history"; so until I master the true style of complete objectivity, *i.e.*, "the animal oriented itself with respect to the banana and took a bite," science must wait.

The Antics of Rusty

Along with the saimiri babies, we weighed Rusty, a howler, Negrito, a woolly, and Anastasio, a cebus. I am sure that they recognized and liked us. Rusty would jump up and down, shake his head, growl, turn over, and make a general fuss until we came to pay some attention to him.

We did not pick him up, however, but merely put in a hand to play with him and tickle him. For anyone who has read about

howler monkeys will know they are highly emotional and that one of their methods of "attack," shall we say, is to release all they've got "with reference to the observer." With or without reference to anything, they are about the "releasingest" animals I ever had anything to do with, and we always left Rusty until last in the measuring and did it as quickly as possible.

I heard of a lady in Panama who solved the baby howler problem by keeping hers in diapers. Negrito, the woolly monkey, on the other hand, he who loved to be carried about like a baby, was never known to release anything.

Many of the animals that went into the inoculation room did not die there, and when they were recovered they were given away, set free, or kept as part of our zoo. There are still about four saimiri living in the bamboo grove behind the lab.

Other animals were bought in weak moments by the Boss or his predecessor just because they were particularly appealing or rare, on the strength of the fact they might prove useful some day.

These all constituted the zoo department, and if we did not give the animals names, the lab boys did. Oddly enough, they never named the baby rhesus they were so set on keeping.

The very fact that no one knows very much about the habits of the South American monkeys has been an incentive to me, for in treading strange paths it's much nicer to have no one else about to see you make a fool of yourself. So I blithely note that saimiri monkeys prefer to roost at night as high as possible, or that they reach for their food rather indiscriminately with either hand, or that bananas given too often seem to give them diarrhea.

I gravely measure them each week, sometimes getting more, sometimes less than the week before, in the great faith that somehow, in the long run, these rather haphazard measurements and observations will mean something to somebody.

How nice to be quoted, even derisively, by some great naturalist: "Mrs. Bates observed that . . . although, of course, all her data must be considered as 'anecdotal.'" I really don't aim very high. And it's an awful lot of fun!

This article contains excerpts from the author's book, "East of the Andes and West of Nowhere," published by Charles Scribner's Sons, copyright 1947.

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LEFT TO RIGHT: **LESTER**—19 jewels, 14K gold-filled case: \$71.50; **PIRINE ROCK**—17 jewels, 14K gold case: \$200; **EMC**—17 jewels, 14K gold-filled case: \$60.50; **GLORY**—17 jewels, 10K natural or white gold-filled case and chain bracelet: \$57.75; **A-4**—17 jewels, 4 diamonds set in 14K natural or white gold case: \$150 (other distinctive diamond-set watches in gold and platinum); **EMERALD**—17 jewels, 14K natural or white gold case: \$71.50. At better jewelers everywhere. Prices incl. Fed. Tax. Hamilton's reputation making railroad watches assures greatest accuracy in every grade. Send for FREE folder and revealing booklet, "What Makes a Fine Watch Fine?" Hamilton Watch Company, Dept. C-3, Lancaster, Penna.

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THE WATCH OF AMERICAN HISTORY



NEW ELECTRICAL MARVEL ELIMINATES ALL GARBAGE

• General Electric Disposall® Shreds All Food Waste, Washes It Down Kitchen Drain!

Meet one happy housewife!

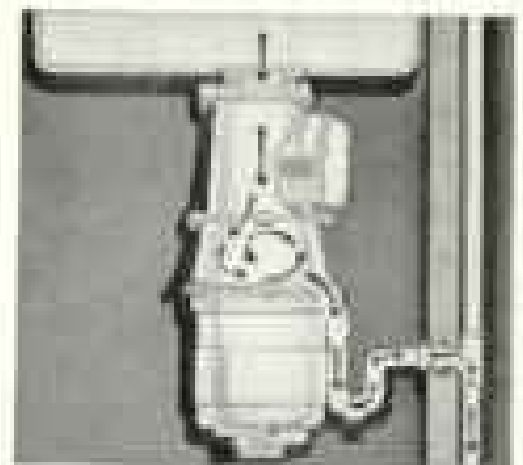
Her days of garbage-lugging are over. She's said "good-bye forever" to messy, sloppy, drippy garbage. She has seen the last of the garbage can—breeder of filth and germs.

Today, all food waste is disposed of immediately—right in the sink. Her Disposall means a brighter, cleaner, more sanitary home!

Meet hundreds of happy housewives!

A recent survey shows 97% of users questioned enthusiastic about the Disposall. They say: "I'd never want to be without it again!" "Saves me 32 minutes each day!" "No more garbage to handle . . . no garbage odors!" "It's perfect!"

You'll agree—once you've installed this new kitchen marvel!



1. Under-the-sink view. A simple appliance that fits almost any sink. Will handle all food waste from any average meal.

MEET THE GENERAL ELECTRIC DISPOSALL!



2. You can dispose of all food waste immediately, this easy, sanitary way. Disposall's swirling action helps keep drains clean.



3. You lock protecting cover on drain with a twist, once waste is scraped into drain. Openings let in clean, flushing water.



4. Turning on cold water automatically starts the Disposall. Food waste is shredded, flushed into sewer or septic tank.

So easy to "Go Modern" in your kitchen! First step is to your retailer's. He'll show you how easily a Disposall can be installed in your kitchen. Ask him, too, about the perfect laborsaving combination, the All-Electric sink that teams up a General Electric Dishwasher with the Disposall! General Electric Company, Bridgeport 2, Conn.



DISPOSALL

DISPOSALL MEANS
GOOD-BYE TO GARBAGE
AUTOMATICALLY!

*General Electric's registered trademark for its food-waste disposal appliances.

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For Low Pressure Comfort and Safety

THE NEW GENERAL SQUEEGEE... for 24 pounds of air...embodies all our Top-Quality experience with low pressure. Lithe and clean of line... without a hint of clumsy bulk... easy to steer and park, it yields to the contour of the road like something liquid... holds on curves without a trace of weave. Flexible, free-rolling ribs of rubber make it shadow-silent in motion. Its Action-Traction means quicker-stopping, rain or shine.



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Does the high cost of living have you up in the air, too?

You don't like the high cost of living—and neither do we. Our business is geared to serve many people—the more the better. When prices are up, fewer can buy.

We try to keep prices *down* and quality *up* by increased efficiency and improved products. National Dairy research works to that end. And once each month the ablest men from all our companies meet at a round table to develop ways to give you *top quality at lowest possible price*.

Here are some figures which show how milk prices compare with food prices, from 1939 to 1948:

Increase in cost of food	116%
Increase in cost of fluid milk	78%

Notice that milk has not increased nearly so much as the average of other foods. Our profit from all of our milk divisions averaged less than $\frac{1}{2}$ cent per quart sold in 1947—far less than the public thinks business makes—and much less than the average profit in the food industry.

It was never so true as it is today that milk—nature's most nearly perfect food—gives you more for your money than anything else you can eat. We guard the quality of milk, and cheese, butter, ice cream and other products made from milk. *Then we make them available to the largest number of people at the lowest possible prices.*

An impartial national survey shows that most Americans consider 10%-15% on sales a fair profit for business. Compared to this, the average profit in the food industry is less than 5%. And National Dairy's profit in its milk divisions in 1947 was less than 2%.



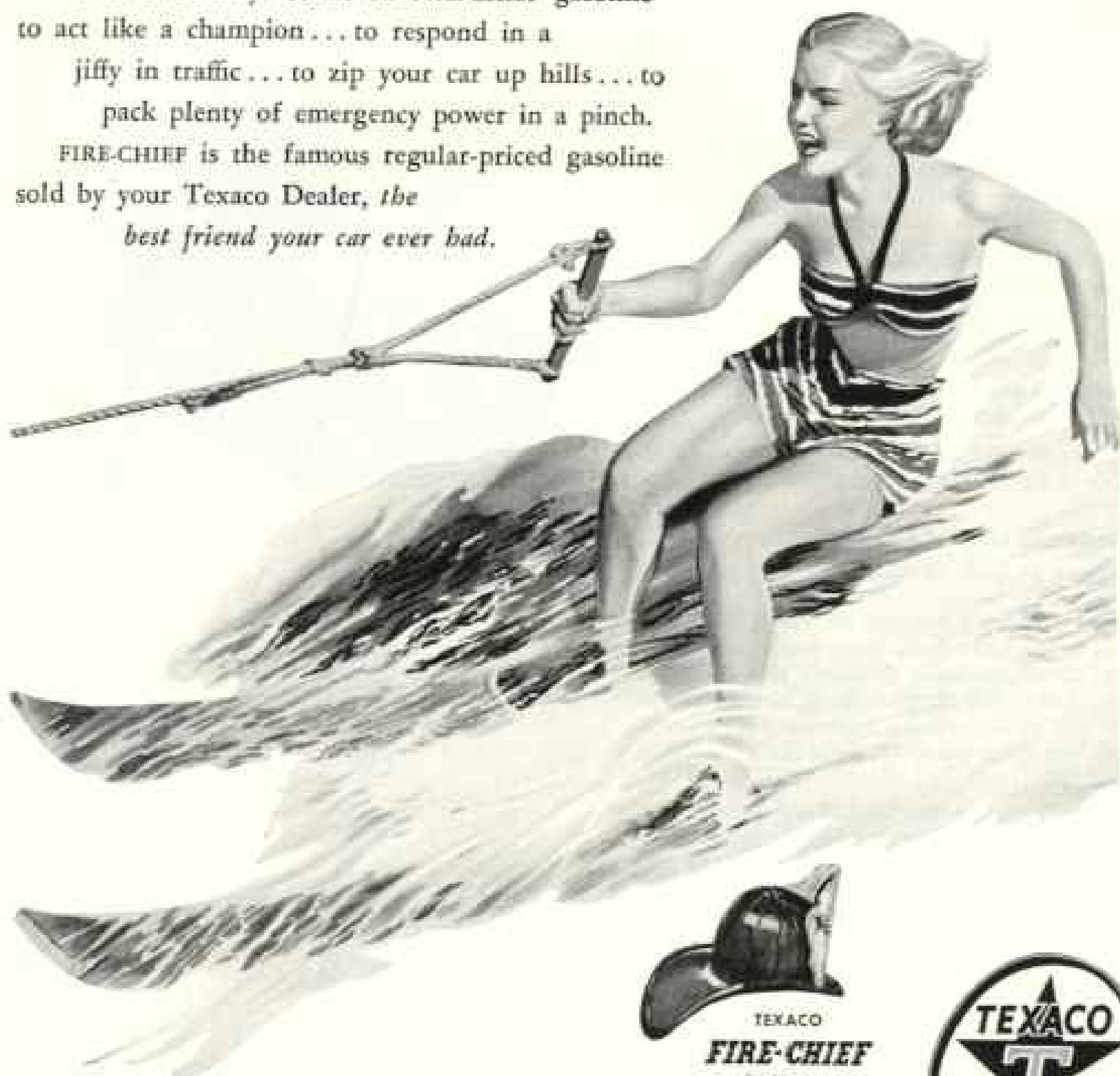
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New Wings for an Eagle!

FOR NEWS OF THE FUTURE

... keep your eye on the Martin star! Martin has been pioneering new fields, helping to guard the peace and build a more abundant world through research in military aircraft, trans-sonic speeds, rocketry, commercial airliners, plastics, other projects. Martin research is blazing the trail to a bright tomorrow!



OUTSTANDING

... among the eagle's new wings is the Martin Mauler dive-torpedo bomber, shown above. During the past year, according to top Government officials, we were a poor third in airpower ... but your Navy foresaw the need for powerful new carrier-based planes and worked closely with Martin engineers in developing this rugged slugger. Now, with America aroused to the need for additional airpower, Maulers are entering service with the Navy to help maintain security along the far-flung outposts of freedom.



TOUGH OLD EAGLE!

That's the Martin B-10 bomber which won the Collier Trophy for Glenn L. Martin. Although 10 years old at the time of the Jap attack, these planes, flying with the Netherlands East Indies Air Force, gave a fine account of themselves. For advanced new military planes, as epoch-making as the B-10 in its day, count on Martin!

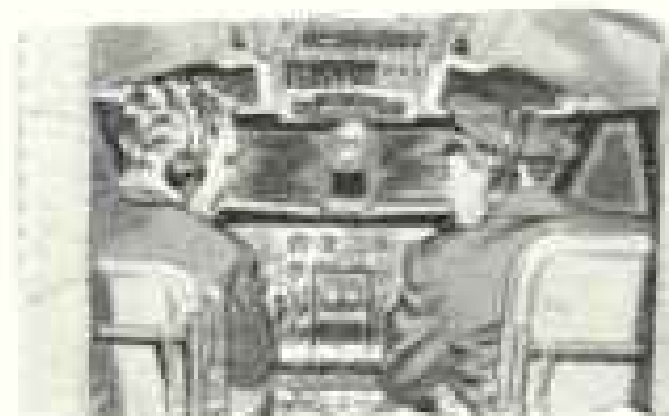


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Thanks to numerous easily accessible hatches for inspection or maintenance, and high-pressure underwing refueling, the Martin 2-0-2 airliner cuts ground time to a minimum. Shorter stops between hops mean time gained for passengers, more revenue for airlines. Look for more 2-0-2's on the nation's airways as the year progresses.

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... to a real future, learn aviation with the Air Force, Navy or Marines. If you've got what it takes, you can build a lifetime career in a field with a real future. Ask for details at your nearest recruiting office.



"E" FOR EFFORTLESS!

Easy to fly ... that's another feature of the Martin 2-0-2 airliner. All control handles are different shapes and colors ... pilot seats are superlatively comfortable ... and the panel is simplified. Result: less pilot fatigue, greater ease of handling. Yesterday, today and tomorrow, Martin sets the pace! The Glenn L. Martin Co., Baltimore 3, Maryland.

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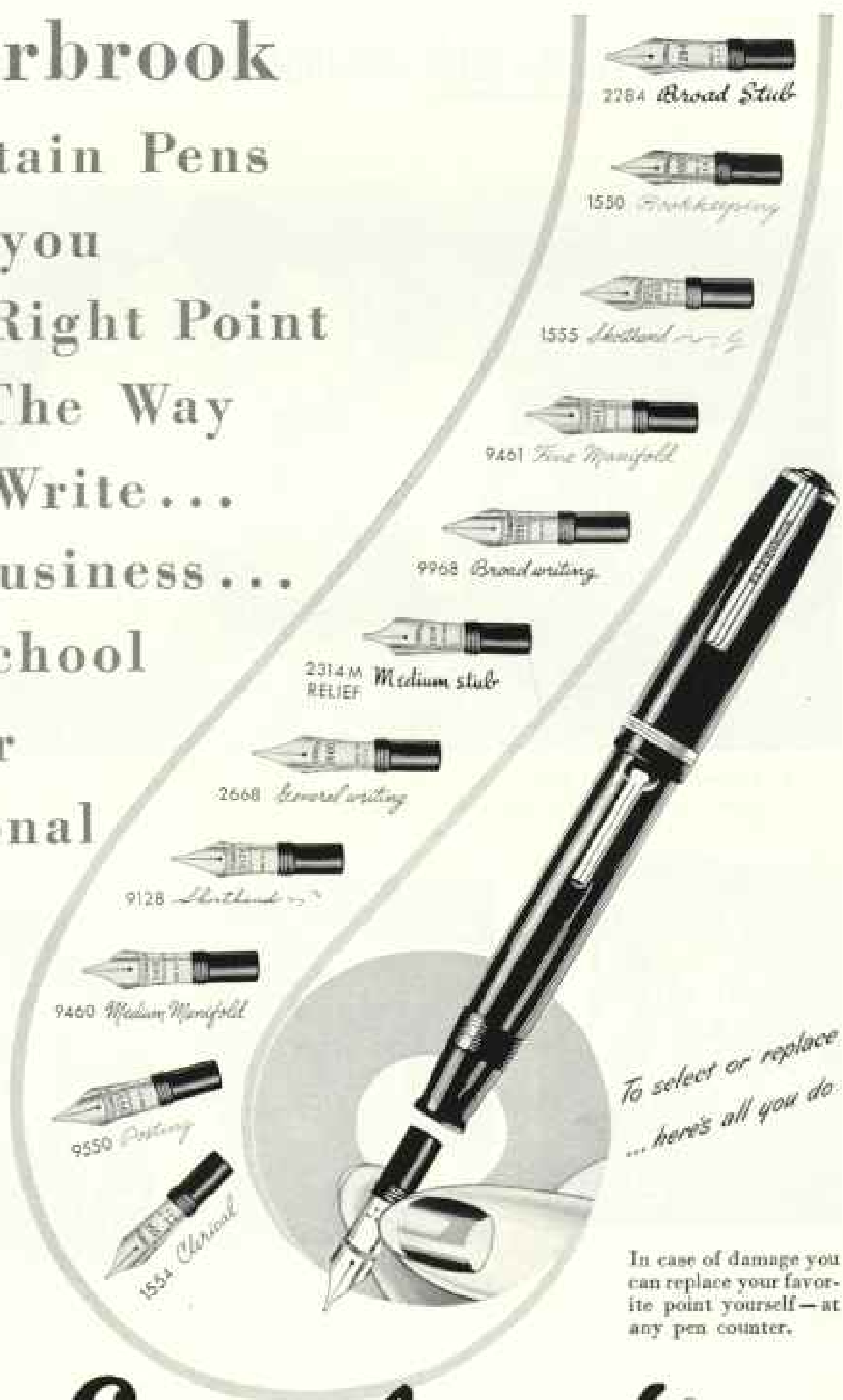
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- 2.** You're completely at ease enjoying the conversation and companionship of your kind of people . . . as you sip a long, frosty drink in the spacious lounge car reserved for Pullman passengers.



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Go Pullman

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See the Pullman Exhibit of New Accommodations at the Chicago Railroad Fair—July 20 to Sept. 6.

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Department store demonstrations show how television makes shopping easier—saves time!

Shopping by Television—a coming convenience

You know television as an exciting source of news and entertainment. But what about its many other uses?

250,000 people—at a demonstration arranged by RCA Victor—learned the advantages of "Shop-by-Television." Television receivers, located throughout a big store, showed customers what was going on in other departments . . . saved time, made shopping simpler.

88% of these customers said television was a major help . . . 62% said the program had drawn them to the store . . . more than half intended to visit departments where televised merchandise was sold. Sales of many televised items jumped 200% above normal!

Beyond its value *within* a store, "Shop-by-Television" is already reaching across the air waves to enter customers' homes. How convenient it will be to see merchandise on the screen of your RCA Victor television receiver, and then

be able to do much of your shopping by telephone!

Progressive research leads to new uses for radio-electronic products and services, and to the quality you associate with the names RCA, and RCA Victor.

• • •

When in Radio City, New York, be sure to see the radio, television and electronic wonders at RCA Exhibition Hall, 36 West 49th Street. Free admission. Radio Corporation of America, RCA Building, Radio City, N. Y. 20.



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FOR A GIFT to cherish—none is more perfect than a watch. Your jeweler has a wide choice to show you, achievements of free craftsmen—of America and Switzerland—oldest democracies on two continents. No matter what the make of your watch, it can be repaired economically and promptly, thanks to the efficiency of the modern jeweler.

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The WATCHMAKERS OF



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SAVES YOU OVER \$100, TOO!

Because it comes to you by mail, the Zenith "75" also saves you over \$100. If its price had to include "fitting," middlemen's profits and high sales commissions, this top quality hearing aid would have to sell for \$195, instead of \$75. So do as tens of thousands have already done. Order your Zenith "75" and find new happiness, new zest for living. You owe it to your family, friends and business associates. Use the convenient coupon below.

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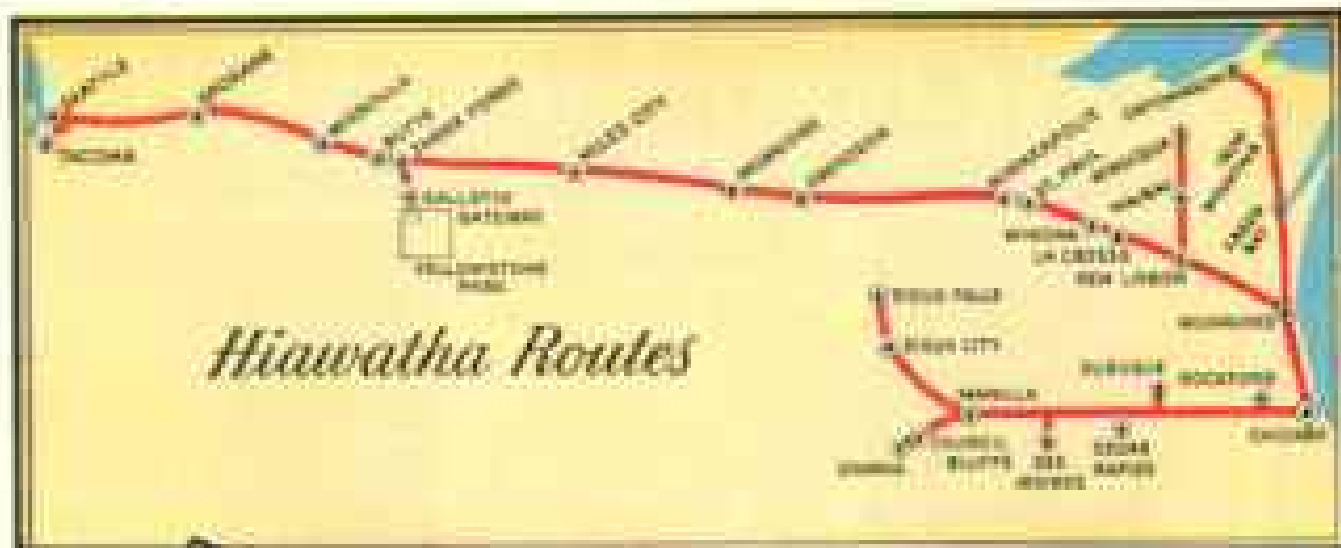
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The distinctive, glass-roofed Skytop Lounge shown in the illustration is a new type of observation room for trackside to mountain top scenic views. Skytop Lounges are carried on the Morning and Afternoon Twin Cities HIAWATHAS and soon will appear on the Olympian HIAWATHA. These cars typify the advanced styling of other Speedlined equipment included in The Milwaukee Road's extensive car building program.

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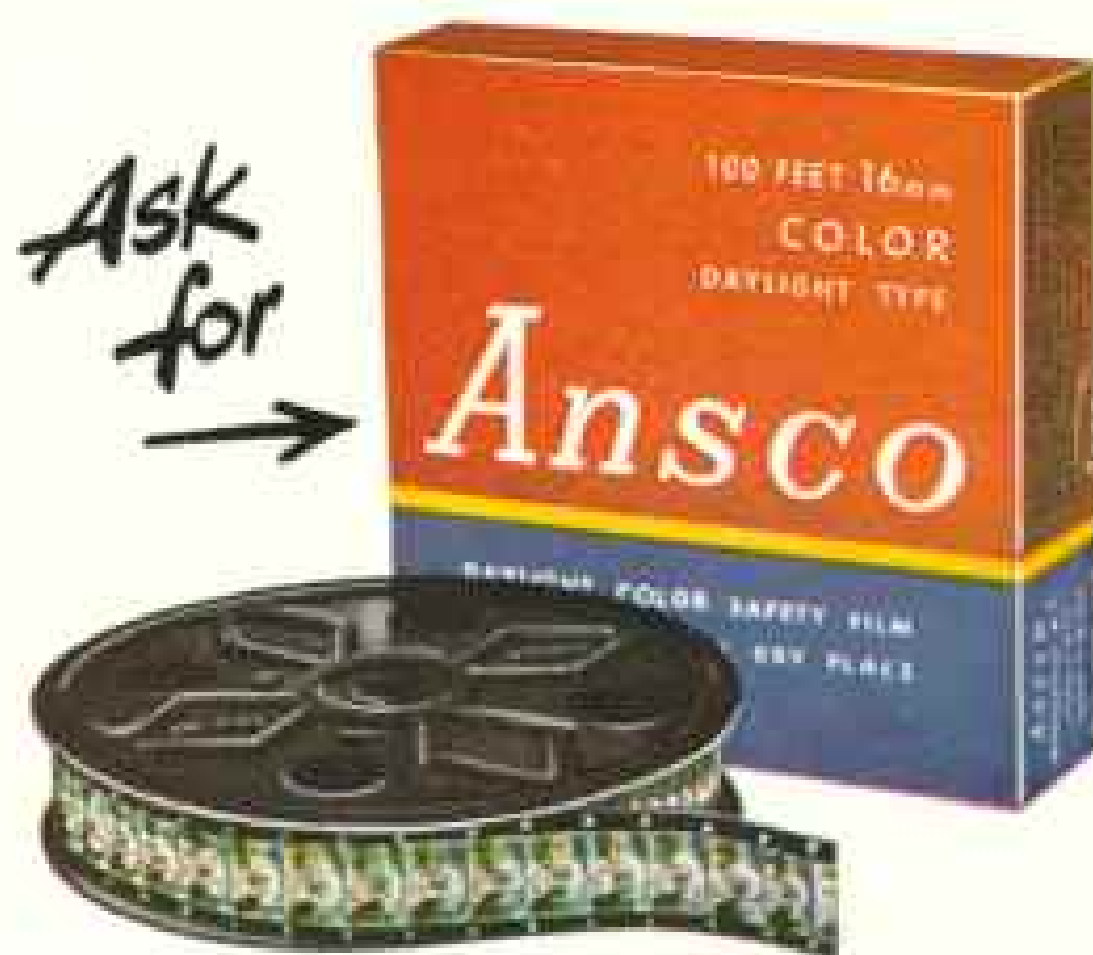
Just wait till you see your first 16 mm movies on glorious Anasco Color Film!

Wait till you see the splendid reproduction of the colors you saw through the view finder! Wait till you see the delicate colors of nature, the subtle flesh tones, the gorgeous hues and tints of beautiful skies!

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Available in 50- and 100-foot 16 mm spools... or for the same glorious *true color* in "stills," 35 mm cartridges, 120 and 620 rolls, and sheet sizes. Anasco, Binghamton, N.Y.

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FOR THE YEAR 1949 IN THE
(The list for 1948 is filled)

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* *The Membership Dues, Which Are for the Calendar Year, Include
Subscription to the National Geographic Magazine*

To the Secretary, National Geographic Society,
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1948

I nominate _____

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Address _____

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* DUES: Annual membership in United States, \$4.00; Canada, \$5.00; abroad, \$5.00. Life membership, \$100.00 U. S. funds. Remittances should be payable to National Geographic Society. Remittances from outside of continental United States and Canada should be made by New York draft or international money order.

8-43



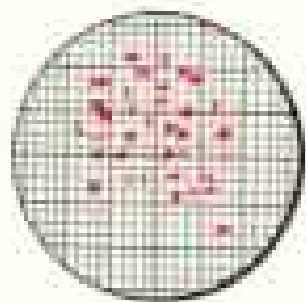
Blood—a barometer of Health!

Q. How do blood tests help guard your health?



A. These tests help to reveal the condition of your blood so that your physician can detect "hidden" diseases that are often difficult to diagnose in their early stages. Many doctors use blood tests as a regular part of periodic physical examinations. So if your doctor suggests a blood test, don't worry. He is using, for your benefit, one of the valuable procedures of medical science.

Q. What does a blood count tell your doctor?



A. Checking the number, size, shape, and condition of your blood cells is called a blood count. The number of red cells and the amount of hemoglobin in them is one of the indices which help reveal your general physical condition. A count of white cells may be of value in diagnosing certain diseases. It is sometimes combined with the sedimentation test, which establishes the time taken by blood cells to settle.

Q. What will chemical analysis of the blood show?



A. Your blood is composed chiefly of water, salt, sugar, fat, and proteins. Chemical analysis of the blood is used to determine whether or not these and other components are present in normal amounts. This is important in aiding the diagnosis of certain diseases. For example, excessive sugar, salts or waste products in the blood indicate conditions requiring medical treatment.

The American Red Cross has prepared a helpful booklet on the blood and its relationship to good health, entitled "The Story of Blood." Through the courtesy of the Red Cross, the Metropolitan is able to send you a free copy on request. Write today for booklet 88-N.

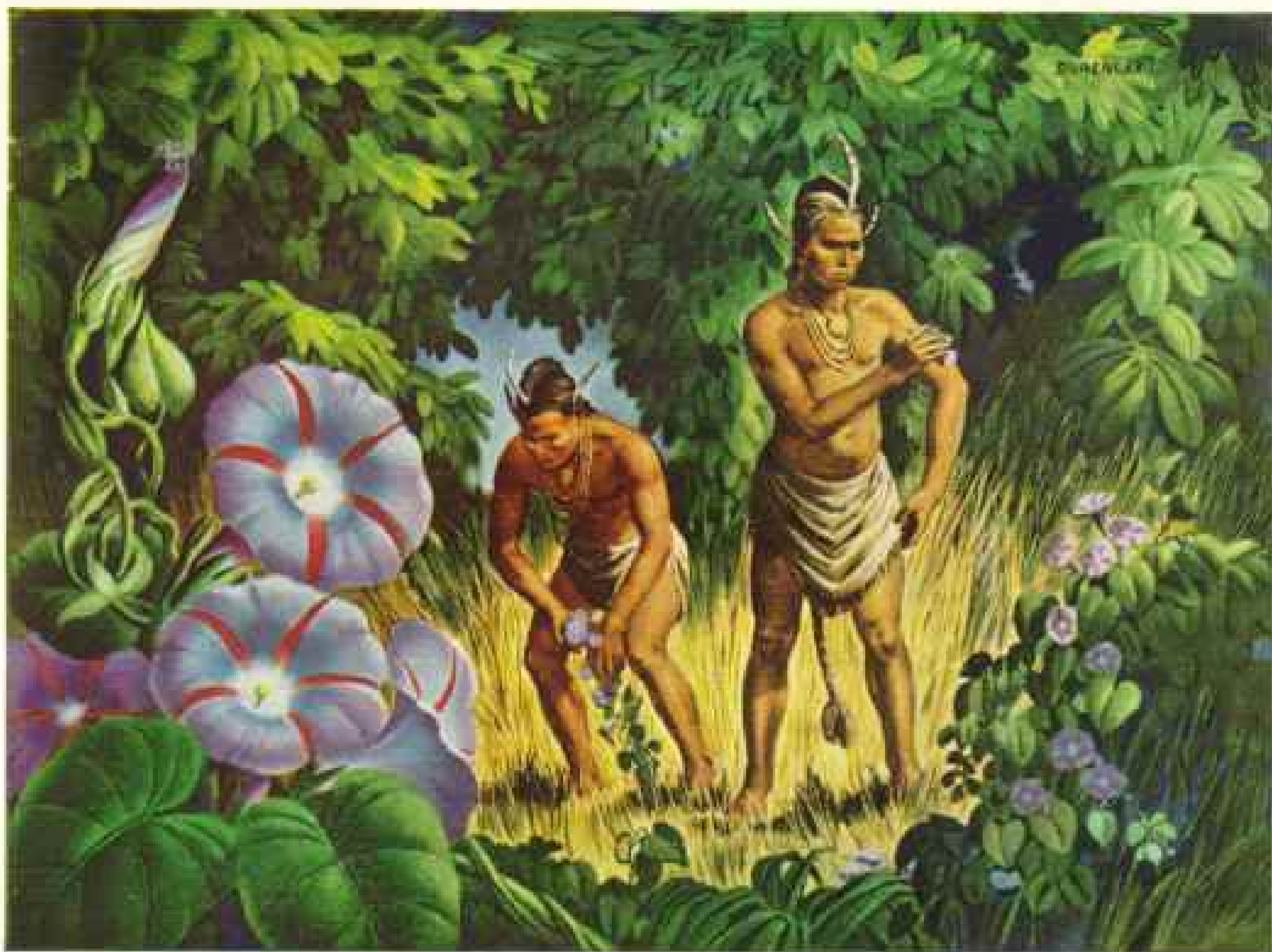
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1 MADISON AVENUE, NEW YORK 10, N. Y.

TO VETERANS—IF YOU HAVE NATIONAL SERVICE LIFE INSURANCE—KEEP IT!



Mark Catesby's tale of the magic weed

WHEN MARK CATESBY came to America in 1712 to gather material for his natural history, he found settlers eager to tell him of the oddities of the new land.

From a Colonel Moore, whom Catesby called "a gentleman of good reputation in Carolina," the naturalist first heard of the way the Indians tried to guard themselves against snakebite.

The Indians, Colonel Moore said, daubed their bodies with the juice of the purple bindweed. Then, having applied this lotion, they figured they could handle even the deadly rattlesnake without harm from its venom.

Luckily, Catesby never put this method of avoiding snakebite to the test. For this custom, like so many of the precautions that primitive man developed to keep clear of his common dangers, was completely useless.

Modern men realize that even the best preventive devices fail, and they turn to insurance for protection.

And what a thorough job insurance can do in

protecting you from losses any family man must reckon with!

Through accident insurance, you can arrange to tide your family over a tough spot should a fall on cellar steps land you in bed.

And through life insurance, you can make sure your family will get along, even though you're no longer on hand to earn for them.

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5¢

Ask for it either way... both trade-marks mean the same thing.

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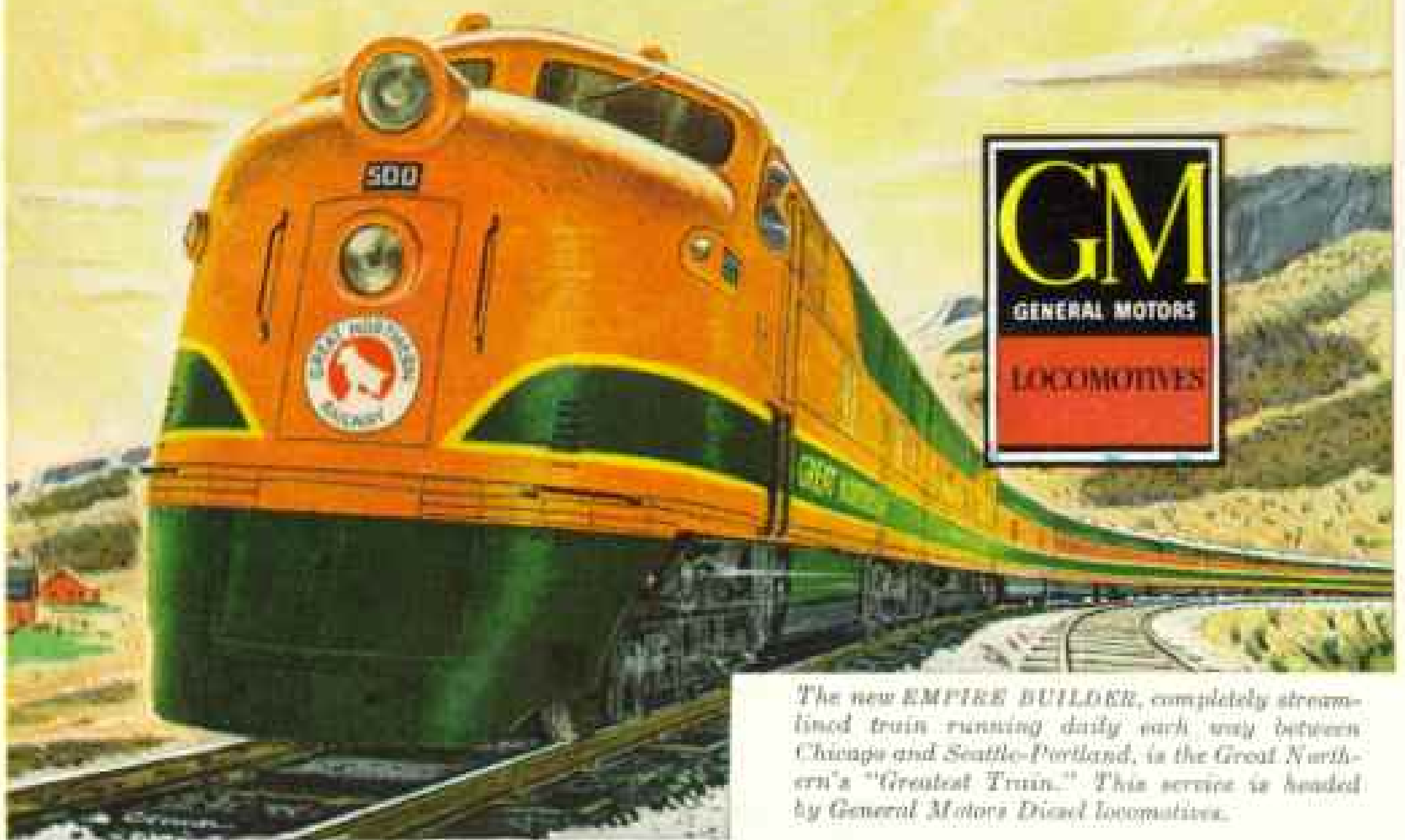
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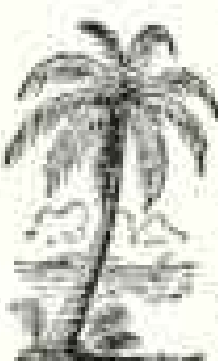
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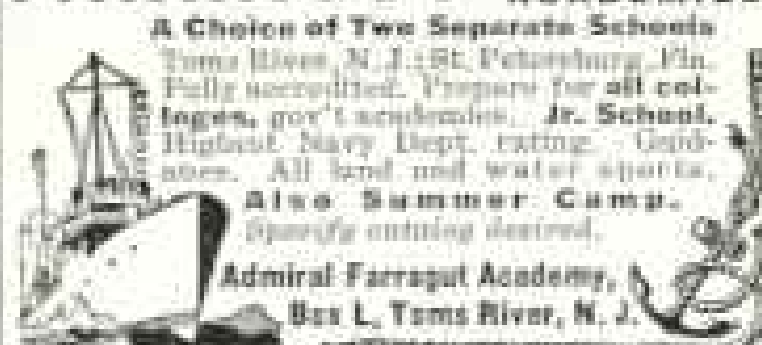
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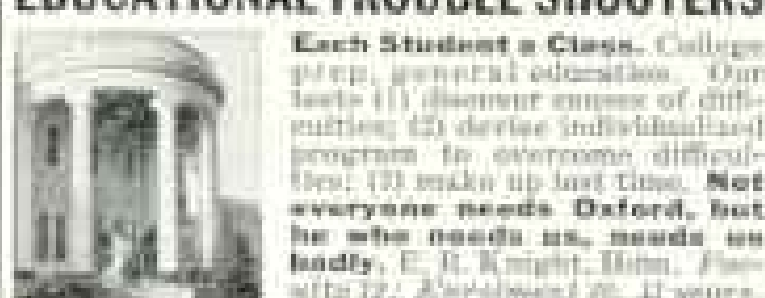
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