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Today on the Delaware, Penn's Glorious River

With Map and 33 Illustrations
27 in Natural Colors

ALBERT W. ATWOOD
ROBERT F. SISSON

Strange Babies of the Sea

With 13 Illustrations
Including 8 Paintings

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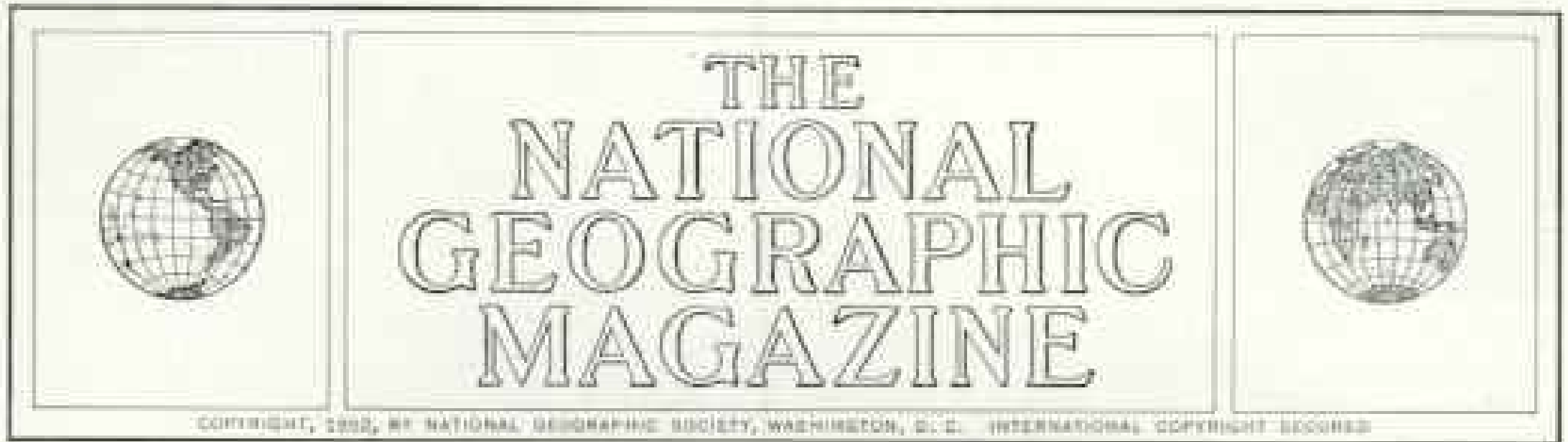
ROBERT L. CONLY
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Today on the Delaware, Penn's Glorious River

BY ALBERT W. ATWOOD

With Illustrations by National Geographic Photographer Robert F. Sisson

TRICKLING from mountain spring and duck pond, the Delaware grows—as the Nation has grown—from small beginnings to a mighty role in our busy industrial world.

Latest act in the drama of the river is the rise of one of the world's greatest steelworks, 3,800 acres of vast, towering structures, amid the somewhat surprised artists, writers, and farmers of Pennsylvania's placid Bucks County.

In today's closely interconnected world, a mountain in Venezuela and deepening holes in Minnesota can cause a steel plant to spring from broccoli fields on the Delaware. For the Venezuela mountain is mostly iron ore, and the holes are the rust-red pits where power shovels are nearing the bottom of the richest United States iron ranges.

To meet the South American ore, steel-makers turn to the Delaware, wide, deep, majestic bearer of burdens in its lower reaches. "A glorious River," William Penn, the founder of Philadelphia, called it.

Might Have Been Called the Hudson

Seeking a passage to the Orient, Henry Hudson probed the river's broad bay in 1609. Shoals turned back his *Half Moon*, and he sailed on north; otherwise the Delaware instead of the Hudson might bear his name.*

Such lordly streams later determined the location of many of our major cities. Rivers like the Hudson and Delaware, which met the simple needs of early settlers, are equally essential to the teeming millions of today.

The Delaware forms a natural boundary for parts of four States (map, page 5). It is a source of water supply for the country's third city, and a future source for its first; it

forms a great recreational area near both; and its lower reaches are becoming one of the most heavily developed industrial water fronts on the globe.

River Born as Puny Twins

Both branches of the Delaware begin humbly, a few miles apart, on the western slopes of New York's Catskill Mountains.

A spring on a hill near the resort town of Stamford gives rise to the West Branch (p. 2).

Outside Grand Gorge, in a small marshy pond close to a creamery, the East Branch is born. Although so insignificant here, it is potentially fecund enough 40 miles to the south to warrant thirsty New York City spending more than a hundred million dollars to impound and tap its waters.

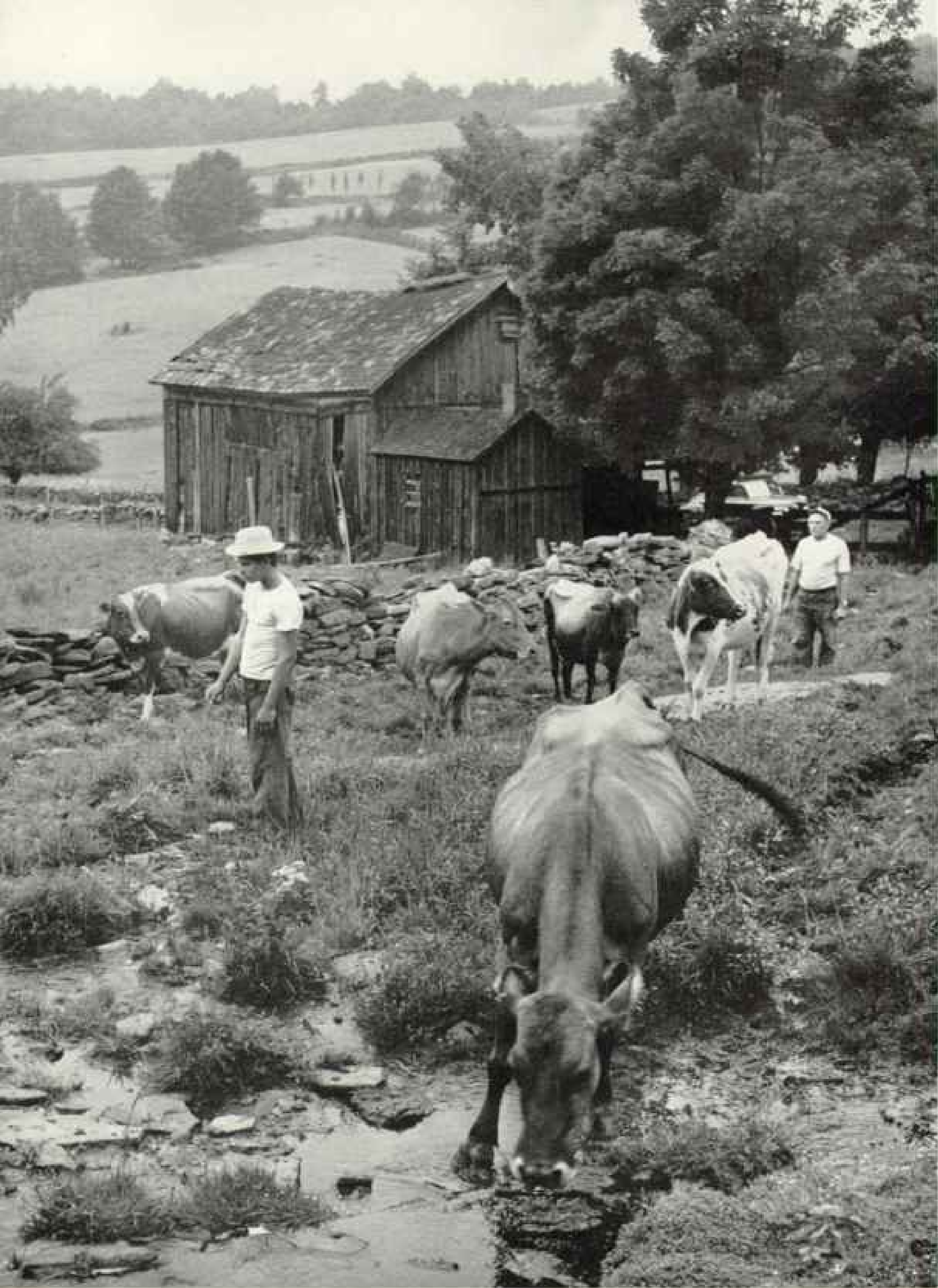
At the time of my visit the little pool was filled with ducks, half wild and half tame.

"They stand me in \$5 apiece for feed," said the creamery manager, "but I like them."

For some 60 miles the two branches parallel each other, zigzagging along from 8 to 15 miles apart. They come together at Hancock, New York, to form the Delaware (pages 12-13). Both branches and the main stream as far south as Trenton, New Jersey, have an almost primitive, unspoiled beauty early recognized by the artist George Inness and the naturalist John Burroughs.

In many places rugged wooded hills or mountains rise abruptly from the water's edge; in others spread long stretches of bottom lands. The alternation of hill and valley makes for varied and exquisite scenery.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "The Mighty Hudson," by Albert W. Atwood, July, 1948; and "Henry Hudson, Magnificent Failure," by Frederick G. Vosburgh, April, 1939.



Carl Muller's Cows Drink from the Delaware's Northernmost Headspring

From a Catskill pasture near Stamford, New York, the West Branch's headwaters drain south. Indian warriors first followed the 360-mile river. Four States took boundaries along its course. Water reserves, recreation areas, farmlands, factories, and a great port measure its bounty today.

It is a gracious, gentle stream, this upper Delaware, and there is no record of a flood of the magnitude of a disaster.

Canals Carried the Region's Coal

On a trip down the Delaware, abandoned ditches show that canals once figured importantly in the life of this New York-Pennsylvania-New Jersey region. When anthracite coal was discovered in the Pennsylvania hills, canals were built to carry it to market in New York and Philadelphia.

At Minisink Ford, New York, one of the first bridges erected by John A. Roebling, designer of the Brooklyn Bridge, is still in active use after 103 years of service.

As a pedestrian, I crossed this suspension bridge for two cents to Lackawaxen, Pennsylvania. If I had ridden a bicycle, it would have cost five cents; and if I had driven my car, twenty-five.

Originally the bridge was an aqueduct carrying coal-bearing canal boats across the river on their way from the Pennsylvania coal fields at Honesdale to Kingston, New York. Roebling built it so well that, after railroads ended the usefulness of the Delaware and Hudson Canal, the bed of the aqueduct was simply changed to a roadway, now used by automobiles (page 4).

The Delaware River in its course separates New York and New Jersey from Pennsylvania, and New Jersey from Delaware. Three of these States—New York, Pennsylvania, and New Jersey—come together near the confluence of the Delaware and Neversink Rivers in a cemetery in the outskirts of Port Jervis, New York, and I was glad to find enough boyishness left in me to enjoy standing on the small stone that marks the spot (page 25).

Now an important division point on the Erie Railroad, which winds along the river for nearly 100 miles, Port Jervis first found itself on the map when the Delaware and Hudson Canal was built. The town's name honors John Bloomfield Jervis, the canal's chief engineer.

From the Port Jervis area almost as far south as Trenton the upper Delaware's major industry is recreation. This is true especially at the Delaware Water Gap, where the river makes a spectacular break through the Kittatinny range (page 21), and in the Pocono Mountains to the west.

Shrewd Tom Penn Gets a Bargain

Downriver I came to the first sizable cities, Easton, Pennsylvania, and adjacent Phillipsburg, New Jersey, at what the Indians described as "the forks" of the Delaware. At Easton the Lehigh River joins the larger stream.

Treaties with the Delaware Indians were made at the "Place of the Forks," some of them in Easton's First Reformed Church, still standing after several remodelings.

Near-by landmarks commemorate the notorious "Walking Purchase" of 1737. The Indians promised Thomas Penn as much land as a man could walk in a day and a half and felt tricked when a trained walker did 66½ instead of an expected 40 miles.

Today Easton and Phillipsburg hum with varied manufacturing industries, and the area around three Lehigh Valley cities, Allentown, Bethlehem, and Easton, is a leader in the country's cement production.

Lafayette College, nearly half of whose students specialize in engineering, towers over Easton and the two rivers from its heights above the city.

Three important canals radiated from Easton in the great canal era—one up the Lehigh Valley, one across New Jersey, and the third south along the western bank of the Delaware, down to tidewater at Bristol, Pennsylvania, a few miles from Philadelphia.

It is largely the latter, the Delaware Division of the Pennsylvania canal system, that gives so much charm to the river's western bank, nearly all the way from Easton to the great new steel mill of the United States Steel Corporation at Morrisville, Pennsylvania (page 35). For many miles the winding, wooded road follows the canal and river.

Curtain Up—Waterfall Off!

In 1900 Philadelphia artists began to settle in and around New Hope, Pennsylvania, 15 miles above Trenton, attracted by the canal, old stone houses, inns, and abandoned grist-mills. The little village was then a quiet, out-of-the-way backwater.

The canal ceased to operate in 1931, but the remnants of towpath, locks, and aqueducts still make excellent subjects for painting and the right setting for art schools and coffee-houses (page 24). The State recently restored portions of the canal, but in any case its remains have long since lost the appearance of artificiality; they seem as natural as the river itself.

Today New Hope is a tourist town and summer resort as well as art colony. This is partly because of the Bucks County Playhouse, which occupies an old mill (page 16). Lillian Gish was playing when I visited it, with "Alice in Wonderland" next on the bill.

Other summer playhouses may have as good productions, but this is the only one I know where a waterfall must be turned off before each performance, for there is a large and noisy one directly outside the theater.

Visiting stars exclaim in dismay, "I can't



A Century Ago, When the Bridge Was a Canal, Coal Barges Floated above the River

Formerly the Delaware and Hudson Canal offered the only transportation between Pennsylvania anthracite fields and the Hudson River. In 1849 John A. Roebling spanned the river with a suspension aqueduct at Minisink Ford. The canal is now a tree-grown hollow, but Roebling's stone piers and iron-cased wire cables remain in use between Lackawaxen, Pennsylvania (background), and Minisink Ford, New York (page 3).

shout over that noise!" They do not believe the manager at first when he says it will be turned off. But the water can be—and is—diverted to another channel well in advance of each performance.

New Hope has become a symbol as well as a center of a large surrounding Pennsylvania and New Jersey area in which old houses and farms have been bought up for homes by former New York and Philadelphia notables. Hereabouts live many celebrities; Pearl Buck and Paul Whiteman are examples.

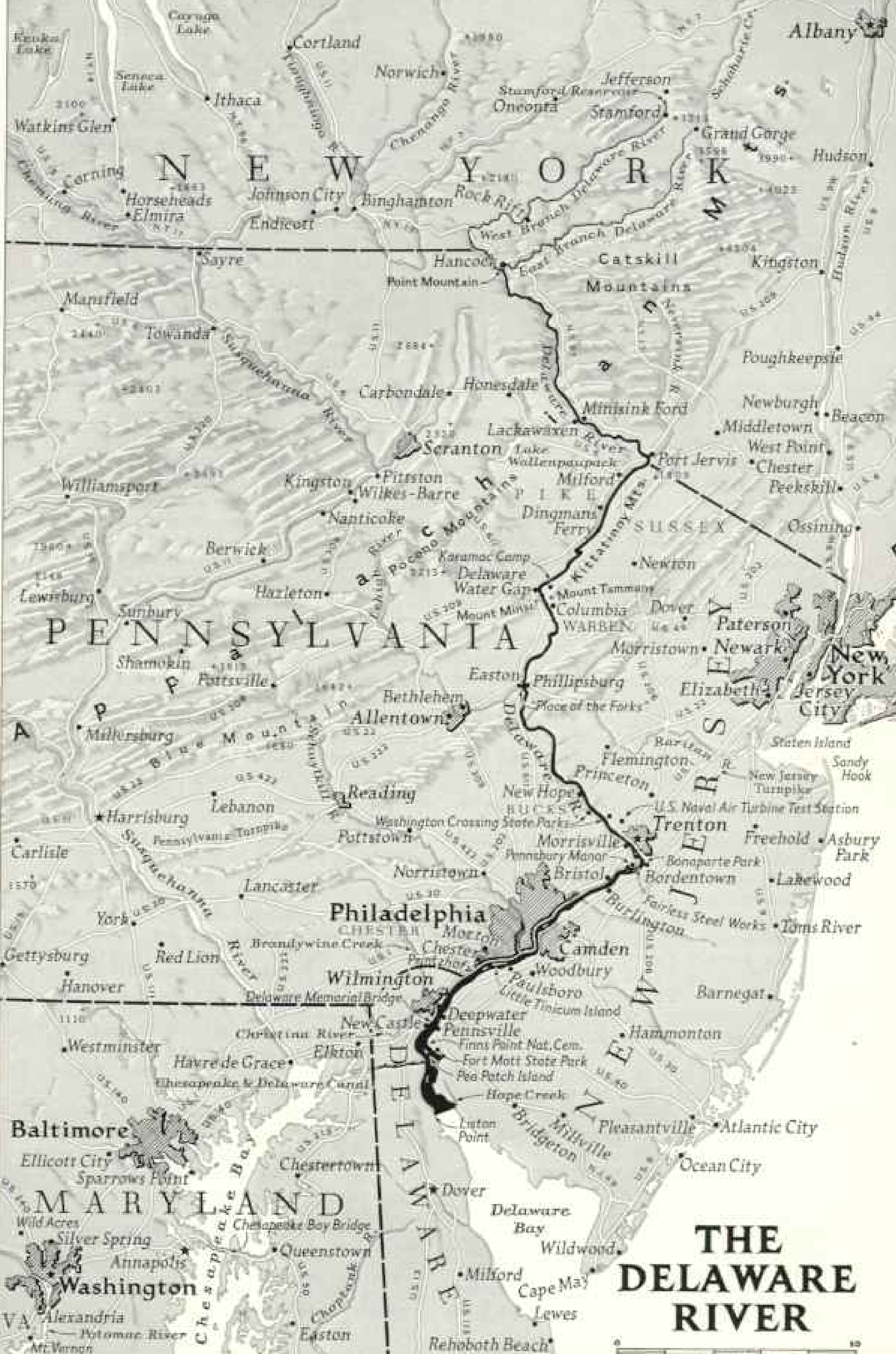
Fifteen years ago a mile-and-a-half dirt road had seven houses occupied by seven dirt farmers. The houses are still there, but they are now occupied by a retired movie star, a stockbroker, the manager of a large city hotel, a Philadelphia advertising man, a retired general, the owner of a small steel mill, and a family of independent wealth.

Farther downstream, the Delaware flows through history. Each year the Chamber of Commerce of Trenton, New Jersey, gets some 10,000 requests, mostly from school children, for historical information concerning Washington's daring exploit, the crossing of the Delaware on Christmas night, 1776 (pages 14 and 15).

One boy in California asked for soil from the site of the crossing. It was sent to him, but only after being properly sterilized against Japanese beetles by order of the U. S. Department of Agriculture.

Washington's Christmas Surprise Party

Not only school children but many adults suppose that Washington crossed at Trenton. Actually the crossing took place eight miles above Trenton. Pennsylvania and New Jersey State parks now mark the points of embarka-



NEW YORK

PENNSYLVANIA

MARYLAND

THE DELAWARE RIVER

100 STATUTE MILES

tion and landing. In roaring contrast to Washington's flat-bottomed boats is a Navy jet-propulsion experiment station a few miles east of the New Jersey park (map, page 5).

At the site of the crossing the river is only 1,000 feet wide. But one gets a thrill standing where the boats put off on their perilous journey, and it looks a long way to row through floating ice.

Washington had been thoroughly routed by the British in 1776 and chased from one side of New Jersey to the other. As he crossed the Delaware to take refuge in Pennsylvania, he gathered in all the Durham boats, chief means then of transporting fresh provisions on the river.

Col. Johann Gottlieb Rall, Hessian commander in Trenton, could have built boats or brought them from the Raritan River to pursue the retreating Colonials, but he had too much contempt for Washington's "farmers" to make the effort or even to fortify the town, despite urgent warnings from his own staff.

General Washington planned to recross with three columns, one at Trenton, one south at Bristol, and his own eight miles north of Trenton. His alone got over.

Washington's column of 2,400 men marched the eight miles to Trenton, took the Hessians completely by surprise, killed and wounded a number of the enemy, and took about 1,000 prisoners without loss of a man killed. Colonel Rall was mortally wounded. This thrilling victory, a turning point in the Revolution, put new life into the colonial cause.

"Trenton Makes, the World Takes"

It is a curious fact, not generally realized, that Washington as Commander in Chief spent a fourth of his time in New Jersey and moved his army across the State four times.

To this day, indeed, New Jersey is the most traveled State in the Union, being the natural corridor between the first and third largest cities. Benjamin Franklin described it as a cider barrel tapped at both ends. Crossroads of the Middle Atlantic States, it is crisscrossed by 13 major railroads and has more track per square mile than any other State.

On the main line of through travel across New Jersey stands Trenton, its capital, and each day 170 passenger trains cross the Pennsylvania Railroad bridge which spans the Delaware at this point.

Millions of passengers see a sign that reads, "Trenton Makes, the World Takes," appropriate because Trenton is among the most highly industrialized of American cities (page 28). Despite this fact, it has been singularly fortunate in being able to retain as park three miles of river frontage wholly free from factories of any kind. In this riverside park are

the Capitol Building and other State office buildings. Several persons deserve credit for saving Trenton's water front, Governor Woodrow Wilson among them.

Near by is the historic section of the city, with its old churches, its tablets and monuments, as well as banks, stores, and hotels. Perhaps the most striking relic is the Old Barracks, built for troops in the French and Indian War and later occupied at various times by Washington's forces and by the British and Hessians who opposed him.

New Jersey is such a small State that no legislator can live more than 100 miles from Trenton or require more than three hours to reach it by rail or automobile.

From Steel Bridges to China Cups

Possibly the best known single industry in Trenton is the John A. Roebling's Sons Company, builder of bridges and the country's largest specialty wire manufacturer. It makes more kinds of wire rope than any other firm.

After more than a century the firm is still owned and operated by the same family, now in the fourth generation, and, unlike many large manufacturers, has all its plants in or near its headquarters, Trenton.

John Augustus Roebling was educated in engineering at the Royal Polytechnic Institute in Berlin. He got his start in this country by persuading the State of Pennsylvania to use 1¼-inch-diameter wire rope, in place of the clumsy, weaker, 3-inch hempen rope, to pull canal boats up the inclined portage railway across the Allegheny Mountains.

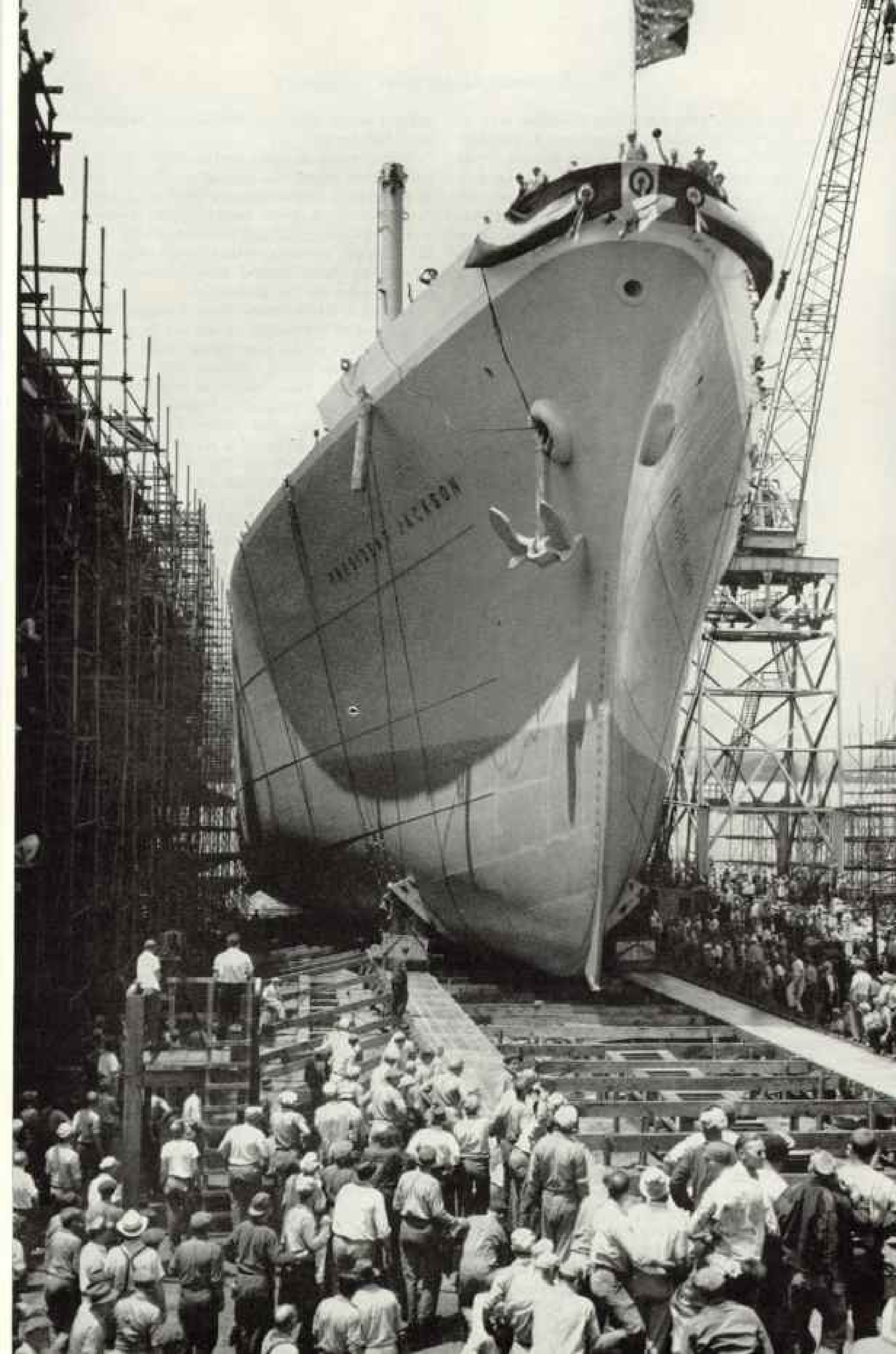
Of all Trenton's varied industries, the average visitor would probably find most of interest in the potteries, of which there are some forty in the city. Their wares are used not only in dining room, kitchen, and bathroom but in many different industries.

In the showroom of Lenox, Inc., makers of fine china, may be seen samples from dinner sets made for Presidents Woodrow Wilson and Franklin D. Roosevelt, for a son of King Ibn Saud of Saudi Arabia, Cardinal Spellman, and other celebrities (page 26). Wilson was the first President to order a state dinner set of American-made china, 1,700 pieces. Roosevelt re-ordered in 1932.

New York Shipbuilding Corporation

S.S. *President Jackson* Slides into the Delaware at Camden →

New York Shipbuilding Corporation in June, 1950, launched the liner for peace or war. Complete with air-conditioned staterooms and decks strengthened for gun platforms, she was designed to carry 204 first-class passengers or 1,550 G.I.s. Requisitioned, the *Jackson* was renamed the *Barrett*. In April, 1952, she completed her sea trials as the first fully air-conditioned troop transport.



The Lenox concern's first building was so erected that it could be turned into a tenement if it failed, so uncertain were Walter Scott Lenox's backers of his ability to make fine china in America. Unfortunately he became both blind and paralyzed just as success came, but he went to the factory every day in a wheel chair. The son of the chief assistant to Lenox then is now president.

Here the River Changes Its Character

Although the so-called "Falls" at Trenton are merely rapids, the city is on the fall line, that geological boundary where rivers pass from rocky formations to softer soils. Close to the fall line there has developed a north-east-southwest axis of trade and travel, from New York through Trenton, Philadelphia, Wilmington, Baltimore, Washington, Richmond, and on through the Carolinas to Georgia.

In a number of cases ocean-going vessels can navigate rivers below the fall line, while even a canoe has difficulty above it. The Delaware Valley levels off at Trenton into a low coastal plain, and the river itself becomes an inlet of the sea, gradually widening into an estuary and merging into the broad expanse of Delaware Bay.

Thus the bay and lower river form a long, continuous navigable channel for cheap water transportation. But more than half a billion cubic yards of sand, gravel, and rock had to be dredged from the river during the past 35 years to maintain deep draft to Philadelphia.

Further dredging between Philadelphia and Trenton will create, in effect, a single port or harbor which will include many cities and towns. Among them, besides Trenton itself, are Bordentown, Burlington, Camden, and Paulsboro in New Jersey; Bristol, Philadelphia, and Chester in Pennsylvania; and Wilmington in Delaware.

Steelmakers Turn to the Delaware

On both shores lie extensive areas of low, level ground suitable for heavy industry. Already this has become one of the world's great industrial regions, and the new Fairless Works of the United States Steel Corporation, for which ground was broken on March 1, 1951, three miles south of Trenton at Morrisville, Pennsylvania, may so speed up this process as to change the whole economic picture of the Nation, geographically speaking.

Although America's first open hearth furnace, the type in which most steel is now made,* was set up in Trenton in 1868, steel production in modern times has centered in the Pittsburgh, Youngstown, Buffalo, Cleveland, and Chicago areas. A single large company, the Bethlehem Steel Corporation, main-

tains a major plant on the Atlantic seaboard, near Baltimore.

Bethlehem's striking success with its Sparrows Point plant, the saving on freight rates to east coast consumers, the increasing use of foreign ores, a good market area, locations where raw materials and finished products can be shipped by water—these and other considerations have caused steelmakers to seek eastern sites on the Delaware.

At the United States Steel Fairless Works it is planned eventually to use ore from Venezuela. The works now being built will not be the largest in the country, but will be by far the largest ever erected at one time.

The site is a peninsula formed by a great bend in the river just below Trenton. The land area to be occupied is roughly one-fourth smaller than the entire city of Trenton and is so large that the plant can be materially expanded. There are six miles of river front.

More than 50 acres will be devoted to treating industrial wastes and purifying water taken out of the river and returned to it. Although 230,000,000 gallons a day will be taken out, about 242,000,000 gallons will be returned, because most of 15,000,000 gallons obtained from underground sources also will be turned into the river.

Huge Mill Sprouts from 63 Farms

The steel mill will occupy the site of 63 different farms, the largest being the Starkey Farms, Inc. Several colonial dwellings and other structures had to be removed.

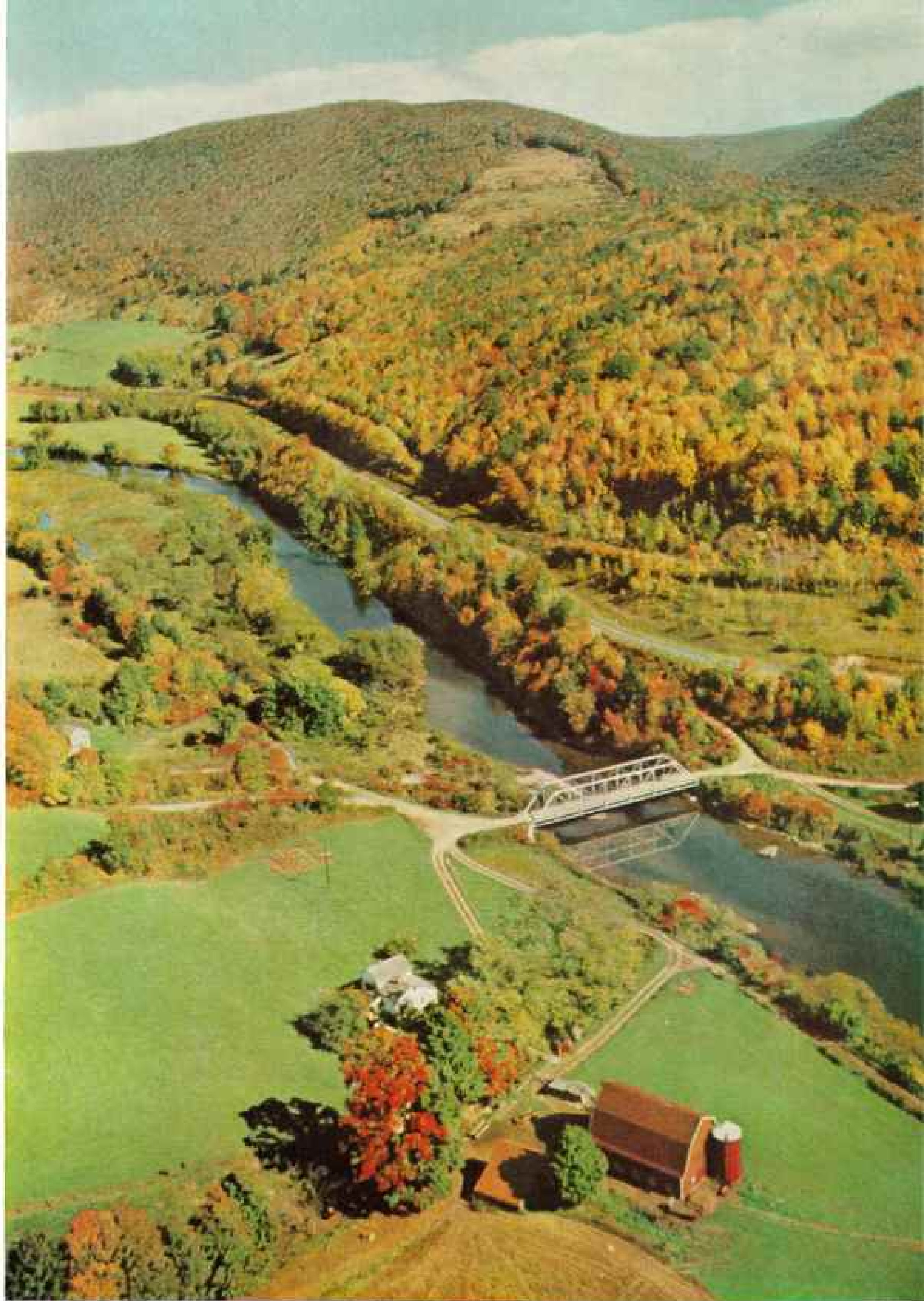
When I visited the scene, the material in some old houses was being sent to the Mount Vernon Ladies' Association. A small part of it was usable in restoring the servants' quarters and greenhouse at Mount Vernon, Virginia.

Of approximately 5,000 employees which the works will need, it is hoped that 85 percent can be recruited and trained within a radius of 30 miles. Admittedly, the sudden transition from farm to industry in this Bucks County area has raised many difficult problems of employment, housing, traffic, and utilities.

Below Trenton are several old river towns, such as Bristol on the Pennsylvania, and Bordentown and Burlington on the New Jersey side, which thus far are little affected by the valley's mounting tide of industrialization.

"If we are forced to flee to America, I should choose a place between Philadelphia and New York and on the Delaware River, in order to get news by packet," tradition has Napoleon saying to his brother Joseph, onetime King of Naples and Spain.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Pittsburgh: Workshop of the Titans," July, 1949, and "Steel: Master of Them All," April, 1947, both by Albert W. Atwood.



Autumn Tints Wooded Hills along the Delaware's West Branch

Pastoral landscapes adjoin the stream. Farmhouse and barn lie on the outskirts of Rock Rift, New York.



A Canoe-borne Lancer, Defeated in a Tilting Contest, Topples into the Delaware near Columbia, New Jersey

Recreation on the upper Delaware is a major industry. These vacationers enjoy a water show at Karamac Camp, a mile above Delaware Water Gap (page 21). Rules permit tilters to land jabs from the knee up. They wield 8-foot poles tipped with canvas-covered rubber.

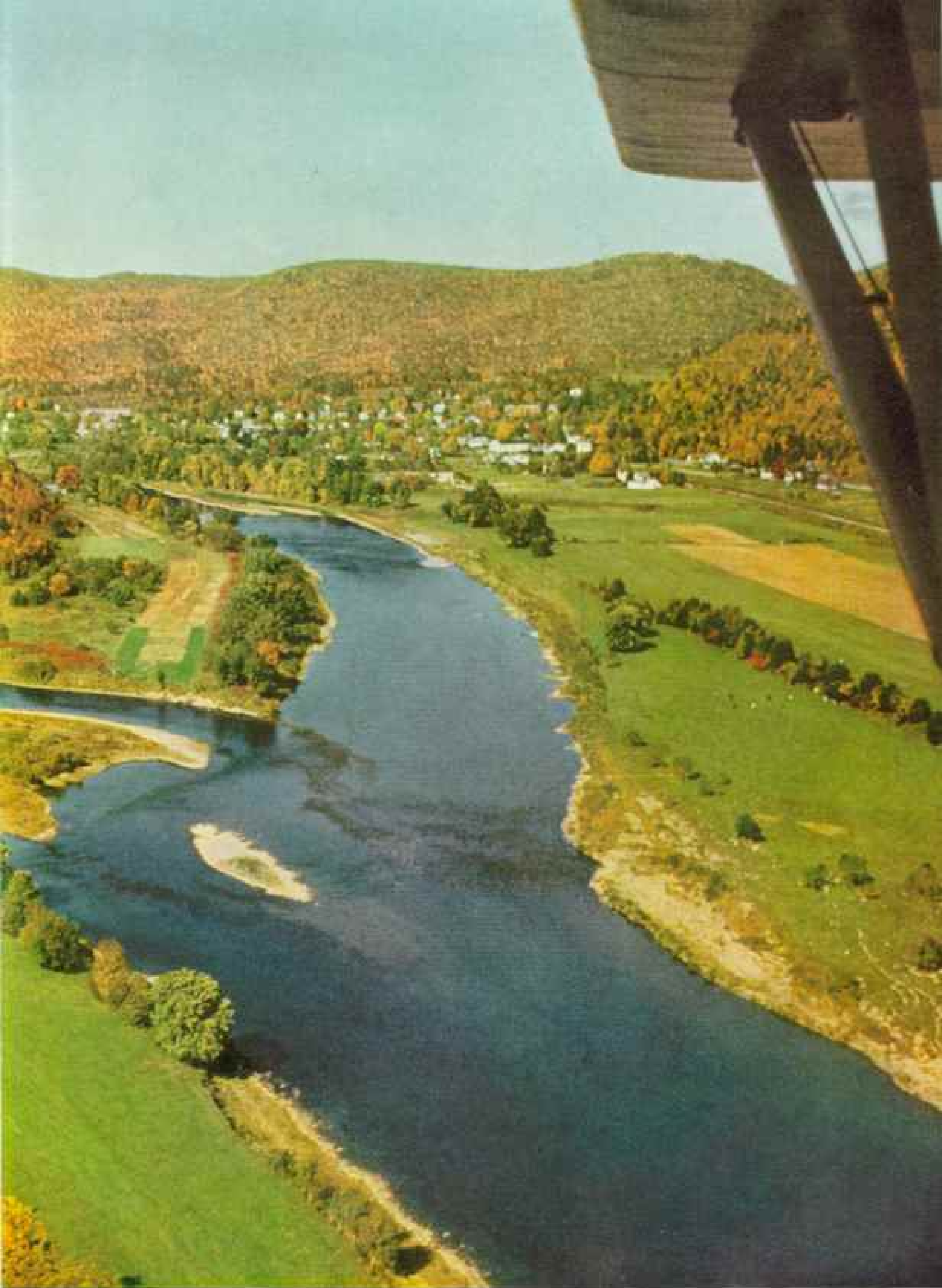
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Illustration by Robert E. Ström





West and East Branches Converging at the Pennsylvania-New York Line Form the Delaware
The road (left) runs along the Pennsylvania side. Point Mountain (center) stands in New York.



Hancock, New York, a Summer Resort, Lies Beneath the Rolling Catskills

In colonial times Hancock was a roistering port of call for raftsmen floating logs out of the mountains.



© 1914 by William M. Chase

★ Washington's Crossing of the Delaware Is Unveiled

German-born Emanuel Leutze painted *Washington Crossing the Delaware* in 1851 for the United States Congress. When fire marred the canvas, Leutze sold it to the German Government. He completed a copy for the Congress, but Members refused to buy.

A 1947 Allied air raid on Bremen destroyed the original. The world-famed copy above is now the property of New York City's Metropolitan Museum of Art.

On February 22, 1952, Leutze's painting was placed on exhibition in Pennsylvania's Washington Crossing Methodist Church, near the site of the Continental Army's embarkation. Boy Scouts here guard the canvas while Mrs. Ann Hawkes Hutton opens the exhibit.

→ Schoolboys Enact the Crossing

Washington led his ragged troops across the Delaware on Christmas night, 1776, and seized Trenton. G. S. Stradling, superintendent of Washington Crossing State Park, rows these youngsters.

Reproduction by Robert F. Hinson and John H. Pritchett





June Lockhart Rehearses Her Lines on the Steps of Bucks County Playhouse

This summer theater, housed in an old mill, overlooks the Delaware at New Hope, Pennsylvania. Director Robert Caldwell (foreground) coaches Miss Lockhart and John O'Hare in an outdoor rehearsal of *Claudia*.

Joseph did go to America in 1816 and lived for 23 years on the large Point Breeze estate on the outskirts of Bordentown. Of this Bonaparte Park, 242 acres and one of the original Bonaparte buildings remain intact, now in the hands of a religious order.

On the outskirts of town I scrambled up a weed-covered railroad bank to stand on the first piece of railroad track built in New Jersey. This formed a part of the Camden & Amboy Railroad, one of the first sections of track of the vast Pennsylvania Railroad system. Here was assembled and tried out on November 12, 1831, the famous *John Bull* locomotive, now in the Smithsonian Institution in Washington, D. C. The parts had been brought from England.

On the river's edge in Burlington stands St. Mary's Hall, an Episcopal Church school for girls, founded in 1837 by one of America's best-known hymn writers, Bishop George Washington Doane. In his residence, Riverside, now part of the school, he wrote "Fling Out the Banner" and "Softly Now the Light of Day."

Dredges Gouge Artificial Lakes

Millions of Pennsylvania Railroad passengers between Philadelphia and Morrisville must have noticed several big artificial lakes made by dredging out gravel. The ice cap which once covered so much of the continent left large deposits of sand and gravel along the Delaware at this point, and the Warner Company, founded in 1794, owns 200,000,000 tons of it on land adjoining the new Fairless Works.

The deposit is one of the richest in the country, and many of the streets, subways, schools, churches, office buildings, and manufacturing plants in Philadelphia have been made from this material, which is carried down the river on barges.

The Warner land is leased to the King Farms Company, which supplies much of the food used in the whole coastal area from Boston to Washington. It raises asparagus, broccoli, spinach, string beans, and beets on its completely mechanized and irrigated farm, the water being piped from the artificial lakes made by dredging gravel. It is one of the largest farms of its kind in the country and uses 1,000 temporary laborers at harvest time.

In 1932 the Warner Company gave Pennsylvania nearly 10 acres of the original Pennsbury Manor tract on which, in 1683, William Penn built a noble mansion facing the slow-moving river. Archeologists of the Pennsylvania Historical and Museum Commission have unearthed enough of the house to make possible a handsome restoration, well worth a visit.

Twelve miles below Pennsbury Manor and the new steel mill the river nudges the extreme northeastern corner of that great sprawling metropolis, Philadelphia. The Nation's third largest city stretches for some 20 miles along the Delaware River.

Philadelphia's "Scituation" Grows

William Penn planned and built the original city at the junction of the Delaware and Schuylkill Rivers. "The Scituation," he wrote, "is a Neck of Land and between two Navigable Rivers . . . whereby it has two Fronts upon the Water. . . ." Since then the city has spread out from an area 2 miles square until it now covers 135 square miles.

Some 50 years ago Henry James, novelist and essayist, wrote of Philadelphia's "admirable comprehensive flatness," of the "absence of the note of the perpetual perpendicular, the New York, the Chicago note . . ."

Philadelphia's great abundance of flat land has resulted in a natural spreading out of population and industry alike. Thousands of workmen live near the plants where they work, in single two-story row houses, many owned by occupants, rather than in tall, rented apartments, as in New York.

Although Philadelphia was the largest seaport in the country for about a century and is now the second largest in tonnage of water-borne commerce, there is very little feeling of the sea about it, no tang of salt air. A person may live in Philadelphia all his life and not even know it is a seaport.

This is natural because the city is 101 miles from the ocean. Yet 17,635 vessels arrived at and cleared from the Port of Philadelphia area in 1951, bound from and to most of the ports of the world.

\$500,000 for a Street

The Philadelphia water front is well worth a visit. When you get within a couple of blocks of the river, you suddenly and abruptly leave department stores and ordinary office buildings behind and come upon customs brokers, marine insurance companies, stevedoring companies, and dealers in marine and ship supplies.

Stephen Girard, early merchant, philanthropist, mariner, and banker, and founder of Girard College, dreamed of a tree-lined boulevard along the water front, but did not live to see it. He left the income from a \$500,000 trust fund "to lay out, regulate, curb, light, and pave a passage or street, fronting on the Delaware River, to be called Delaware Avenue."

And there it is, Delaware Avenue, not tree-lined but a fine long, broad water-front thoroughfare.

Philadelphia is not a regular passenger port like New York, but it handles a great variety and volume of merchandise. Far overtopping everything else in imports is petroleum, although large quantities of iron ore, to be greatly increased in the future, and sugar and molasses, with lesser amounts of honey and syrup, are brought in. The chief exports are manufactured goods and grain.

The Delaware has always been one of America's chief shipbuilding centers, and during the two World Wars was a veritable American Clyde. The Sun Shipbuilding and Dry Dock Company at Chester, Pennsylvania, built some 40 percent of all United States tankers in World War II.

This company and the New York Shipbuilding Corporation at Camden, New Jersey, directly across the river from Philadelphia, together with the Philadelphia Navy Yard, are the principal builders and refitters of large ships in that area, although there are several other concerns which build smaller vessels. The New York Shipbuilding Corporation occupies nearly a mile of water front in Camden (pages 7 and 30).

Six major oil companies, including two with headquarters in Philadelphia, are spending several hundred million dollars to expand and modernize their refining capacity on both sides of the river at and below Philadelphia.

An oil tanker may seem an unromantic foundation on which to build a great port, but the modern world moves on oil, and Philadelphia is becoming one of the world's foremost refining centers.

No crude oil is produced near this city, but it can be brought in from the Gulf area, South America, and the Near East, and refined products shipped away, by cheap water transportation.

Philadelphia, "Workshop of the World"

The oil companies have chosen this area for their operations for several reasons. Available to them is a huge transportation network, not only of railroads and highways but of coastal and inland water routes; nearly 21,000,000 people live within a radius of 100 miles, and thousands of manufacturing plants are concentrated here.

Railroad travelers between New York and Washington cannot fail to see these huge refinery installations sprawled along the river banks. The stills and "cats"—catalytic cracking plants—the maze of pipes, and the far-flung tank farms are fantastic by day and covered with myriad winking lights at night.

Clustered close to the Delaware and Schuylkill Rivers are many other kinds of industries, and Philadelphia likes to call itself the "Workshop of the World."

There is no dominant industry or dominant manufacturing company in the greater Philadelphia area. Forty-five different trades each produce \$20,000,000 or more of goods a year.

It is not any one thing but a combination of things which makes the city great. This gives it a stable economic base.

In 1691 Penn boasted that his settlers made linen "such as no person of quality need be ashamed to wear." But he probably would be amazed to learn that today the textile and apparel mills in Philadelphia and surrounding counties number 1,650.

Penn started a tannery in 1683, and there are still more than 130 concerns in Philadelphia that make leather or leather products.

Benjamin Franklin, the city's most famous resident, was a printer, and printing and publishing still form one of its chief industries.

190 Firms More Than a Century Old

Philadelphia lays claim to more century-old business concerns than any other American city; approximately 190 are 100 years old or more. Many of these concerns are leaders in their industry, their names almost synonymous with the products they make.

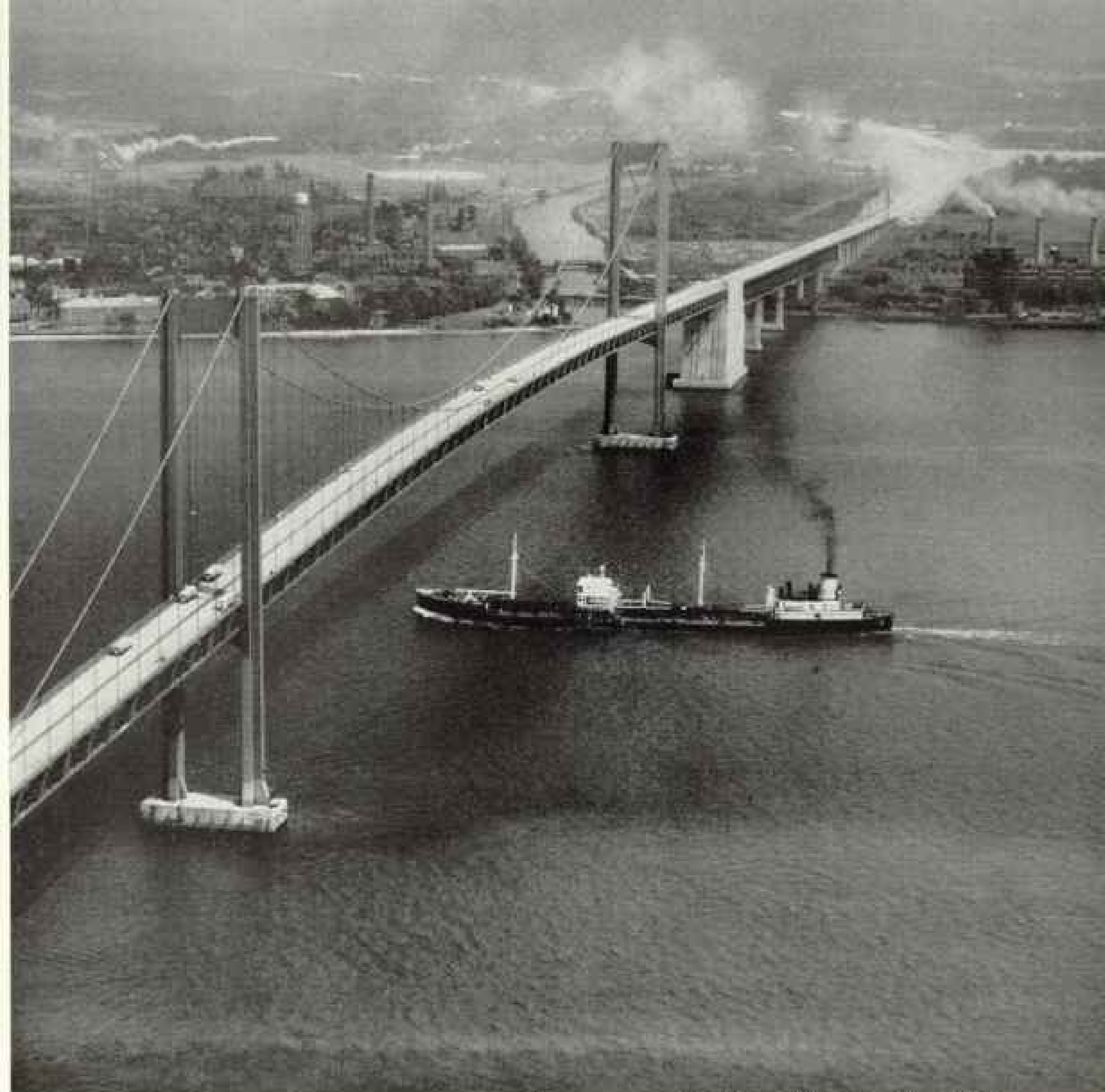
Such a firm is the Esterbrook Pen Company in Camden. Close to a century old, it was founded by the great-grandfather of its present president. It is the largest producer, in volume, of ink-writing nibs—that is, pen points—in the United States, and these nibs represent the most widely diversified types manufactured by any American company. Over the years Esterbrook has made more than 1,000 types of nibs (page 26).

Philadelphia at last count had 85 makers of confectionery. Well past the century mark is Whitman's, one of whose presidents conceived of the well-known trade-mark box, the Sampler, based on an old piece of embroidery his grandmother owned.

In 1844 a dentist, Samuel Stockton White, began to make improved false teeth in the garret of his house on 7th Street. Today the S. S. White Dental Manufacturing Company is the world's largest manufacturer and distributor of dental equipment and supplies.

Just in the last half-dozen years the company has been developing and perfecting an entirely new and revolutionary dental invention, the Airdent Unit, for the "airbrasive technique," based on the principle of the sand blast, for excavating tooth cavities.

In 1833 at the age of 14, Henry Disston, English born, was apprenticed to a Philadelphia sawmaker. Now the Disston concern, with more than 3,000 employees, occupies 65 acres near the Delaware River. Among its many tools is a one-man gasoline-powered chain saw which cuts down a tree two feet



Goodbye, Slow, Irsome Ferries! Delaware Memorial Bridge Now Does the Job

Ferries, long overtaxed by holiday traffic jams, stopped running the day the span opened in August, 1951. As the last boats left New Castle, Delaware, and Pennsville, New Jersey, church bells tolled, sirens screamed, and ships blew a farewell whistle. Bridge and approaches extend $3\frac{1}{2}$ miles; the central arch clears the water by 190 feet. Du Pont's Deepwater Point plant (left) stands on the distant New Jersey shore (pp. 32-33).

thick in one minute and then slices it into logs and strips off the branches.

Not all Philadelphia industries are old; some are startlingly new.

Twelve years ago several young engineers, barely out of their teens, designed a helicopter in their spare hours in a small store. A few years later they formed a company, and the chairman of the board, Frank N. Piasecki, is now only 32 years old. At last account the Piasecki Helicopter Corporation had 4,000 employees and a \$150,000,000 backlog of orders (page 34).

People commonly think of automobiles as being made in Detroit, but a substantial pro-

portion of all the bodies of several important makes of automobiles is manufactured in Philadelphia plants of the Budd Company, pioneer of the all-steel automobile body.

Each day Budd's two Philadelphia plants must deliver 135 freight-car loads of automobile, truck, and trailer body parts, roofs, chassis frames, doors, hoods, trunk lids, fenders, floor pans, and brake drums—a cataract of steel which merges with countless other parts on the final assembly line to make the finished car (page 29).

Budd is naturally one of the country's largest users of mechanical presses and welding equipment. As specialist in lightweight

sheet metal, it has made many of the modern streamlined, stainless-steel railroad passenger trains. Recently it has been making the Vista Dome-type car and the self-propelled passenger car, or RDC (for "rail Diesel car").

The Budd Company had only 13 employees when it was formed in 1912; now it has more than 20,000.

The largest single employer and taxpayer in Philadelphia is not one of these great industrial plants but the country's largest railroad system, the Pennsylvania. It has its headquarters in Philadelphia, owns \$215,000,000 worth of property in the city, operates 577 passenger trains in, out, and through it daily, and owns 15 large and 182 smaller passenger and freight stations there.

Philadelphia is the heart of a railway network which reaches most of the cities of the Atlantic seaboard and Middle West. There is no other city approaching Philadelphia in size through which so many million railroad passengers travel with no intention of getting off. Nor is there any other city in the world of Philadelphia's size that exists less than 100 miles from such a giant as New York. It survives and thrives despite the nearness of the metropolis, which, by the very nature of its gravitational pull, draws men and resources from places near and far.

Hallowed Shrines in New National Park

For nearly a century Philadelphia stood first among American cities, eminent in many respects. It was the seat of government during the Revolution and for ten vital years afterwards, and it holds the most hallowed shrine in America, Independence Hall, birthplace of the Nation (page 39).*

On January 2, 1951, the National Park Service of the Department of the Interior took over administration and maintenance of the Independence Hall group of buildings. Thus the history-packed older section of the city becomes Independence National Historical Park, the country's most important historic project today.

The city deserves the Nation's gratitude for acquiring Independence Square and its shrines from the State of Pennsylvania in 1818 and maintaining them for 133 years.

The State is now cooperating with the Federal and city governments by working to build a landscaped mall from the front of Independence Hall to the Delaware River Bridge. Some of the demolition work already has been done.

The new national park will also include, either by ownership or cooperative arrangement, Carpenters' Hall, where the First Continental Congress was held; the properties of the First and Second Banks of the United

States; the home of Bishop William White, the leader in forming the Protestant Episcopal Church in the United States after the Revolution out of what had been the Church of England in colonial days; Christ Church, where a number of the founders of the Republic worshipped; the site of Benjamin Franklin's residence; and other historic sites and buildings.

Hope to Unearth Ben Franklin's Home

It is probably easier to capture the beginnings of our history in Philadelphia than in any other large city. Here the historic buildings—domestic, ecclesiastical, and public—can be seen in the compass of a short walk.

The presence of great men of the past, such as William Penn and Benjamin Franklin, is strangely pervasive. But unfortunately there is not a single place where Franklin worked or lived left standing. Archeologists for the National Park Service plan to excavate foundations under Franklin Court to see if any remains of his residence can be found.

Seven Signers of the Declaration of Independence, including Franklin, are buried in the churchyard of Christ Church or in its burial ground, a few squares from the church itself. If the visitor to Philadelphia does nothing else to resurrect the 18th century, he should follow the quaint winding brick walk from the burial ground gate to the simple graves of Franklin and his wife, Deborah.

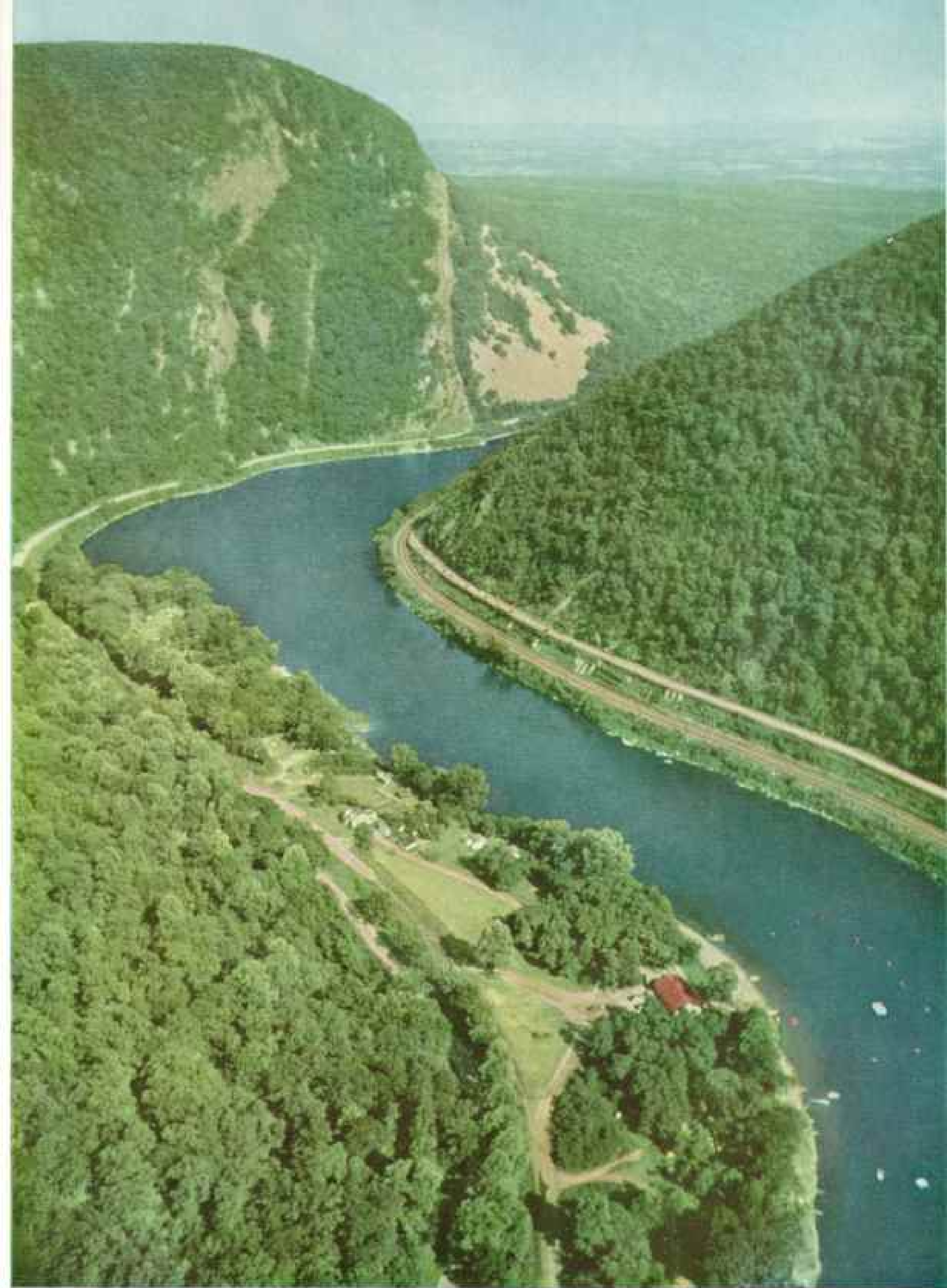
Many famous Philadelphia cultural institutions, such as art galleries, museums, and scientific institutes, stand on the Benjamin Franklin Parkway, which radiates northwest from City Hall.

Bounded by Market Street, Franklin Parkway, and the Schuylkill River is a nondescript triangle soon to be redeveloped in the grand manner. This area has been held back by the "Chinese Wall," the elevated tracks by which Pennsylvania Railroad passenger trains have long penetrated the heart of the city to the old Broad Street Station.

This station and wall will shortly be removed, and trains will then use two relatively new stations, one underground for suburban trains, at the eastern end of the triangle, and the other the large 30th Street Station just across the Schuylkill River from the triangle.

Partly because of subways running east and west and north and south under City Hall, and partly because of the underground suburban station, the heart of Philadelphia is underlaid with a perfect maze of pedestrian passageways. In the redeveloped triangle another series of sunken pedestrian plazas has been

* See "Shrines of Each Patriot's Devotion," by Frederick G. Vosburgh, NATIONAL GEOGRAPHIC MAGAZINE, January, 1949.



Roads, Rails, and River Wind Through the Mountain-girt Delaware Water Gap

Here the Delaware breaks through the Kittatinny range. New Jersey's Mount Tammany (left) and Pennsylvania's Mount Minsi (right) rise over 1,200 feet from the water's edge. Moored floats (lower right) adjoin a beach club.

Trotting Horses Parade to the Post at New Jersey State Fair

Trenton held its first fair in 1745 under a charter from the King of England. A half century later the New Jersey legislature abolished such gatherings. Not until 1858 did Trenton witness a revival of the old-time fair.

Various agricultural exhibitions were held in the city after the Civil War. They gradually evolved into the New Jersey State Fair, which has occupied its present site since 1888.

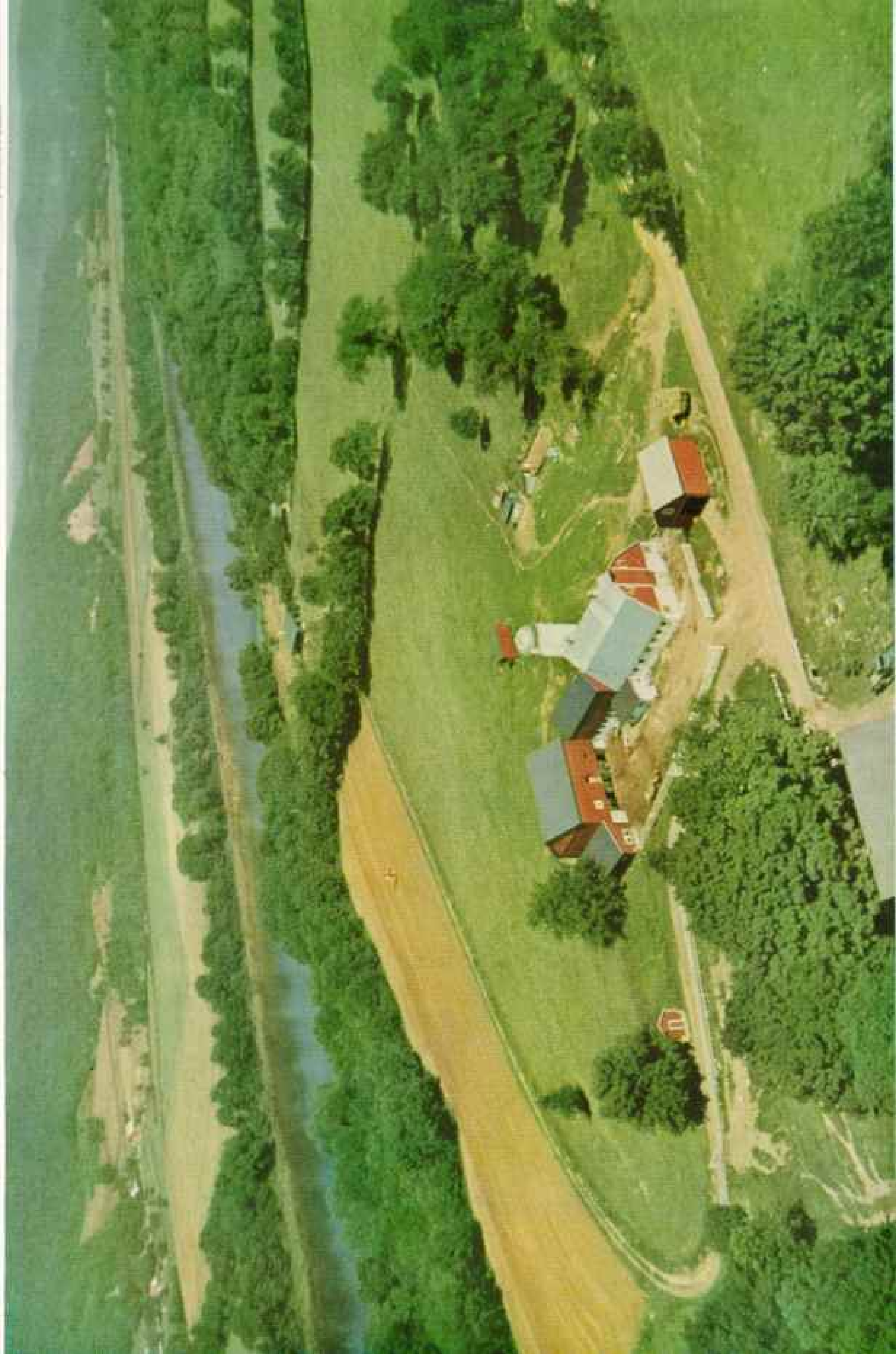
New Jersey combines extensive industrialization with agriculture; hence the fair is a showroom for hundreds of products from factory and farm.

Between harness races the management stages vaudeville and circus acts on the track's infield. Photographer and girls are aerialists. Having completed their act, they gather at the rail for the start of a race.

✧ Flood discharges on the upper Delaware are small. Cultivated fields safely crowd its tree-lined banks. This farm lies near Dingmans Ferry, Pennsylvania.

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A Buttonwood Tree Bursts Out of an Antique Shop's Roof in New Hope, Pennsylvania
Builders erected this shop around the tree. Roots are embedded in the basement floor. Girls in the doorway examine a spice cabinet made of pewter, brass, and copper.

→ **A Stone Marks
the Spot Where
Three States Meet**

New York, Pennsylvania, and New Jersey touch boundaries at the edge of a cemetery near Port Jervis, New York. Leaning on the market, Mary Neenan, of Port Jervis, occupies a portion of all three States. Behind her a sand bar separates the Delaware (right) from its tributary, the Neversink (left). The two streams merge in the distance.

↘ **Housewives Shop
at a Farm Market**

Truck farms abound along the Delaware Valley. Much of the produce is sold at open-air markets. Growers from widely scattered localities brought these apples and watermelons to the Rice farm, an auction place near New Hope, Pennsylvania.

Rephotomages by Robert P. Blum





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Illustration by John E. Fletcher

★ **Millions of Words Will Flow
from Points She Inserts in Fountain Pens:**

Esterbrook Pen Company, of Camden, New Jersey, is the largest producer of ink-writing nibs, or points, in the United States. Production of these items exceeds 300,000 per day. The company's nibs, fountain pens, and pencils are sold in many countries.

▼ **An Artist's Delicate Strokes
Decorate Lenox China**

Trenton, New Jersey, is the home of approximately 40 pottery industries; among them Lenox, Inc. In its showrooms the company displays samples of fine china made for kings and presidents. This woman applies a color band; the plate rests on a potter's wheel.

Illustration by Willard B. Carter





Swedish Colonists Erected Philadelphia's Old Swedes' Church in 1700

Square-rigged *Kalmár Nyckel* (Key of Kalmar), which in 1638 carried Swedish pioneers up the Delaware, hangs in miniature from the ceiling of Gloria Dei Church. Gothenburg Font (right) came over a few years later.



Kodachrome by John E. Fletcher



Wheel and Hammer Sound the River's Anvil Chorus

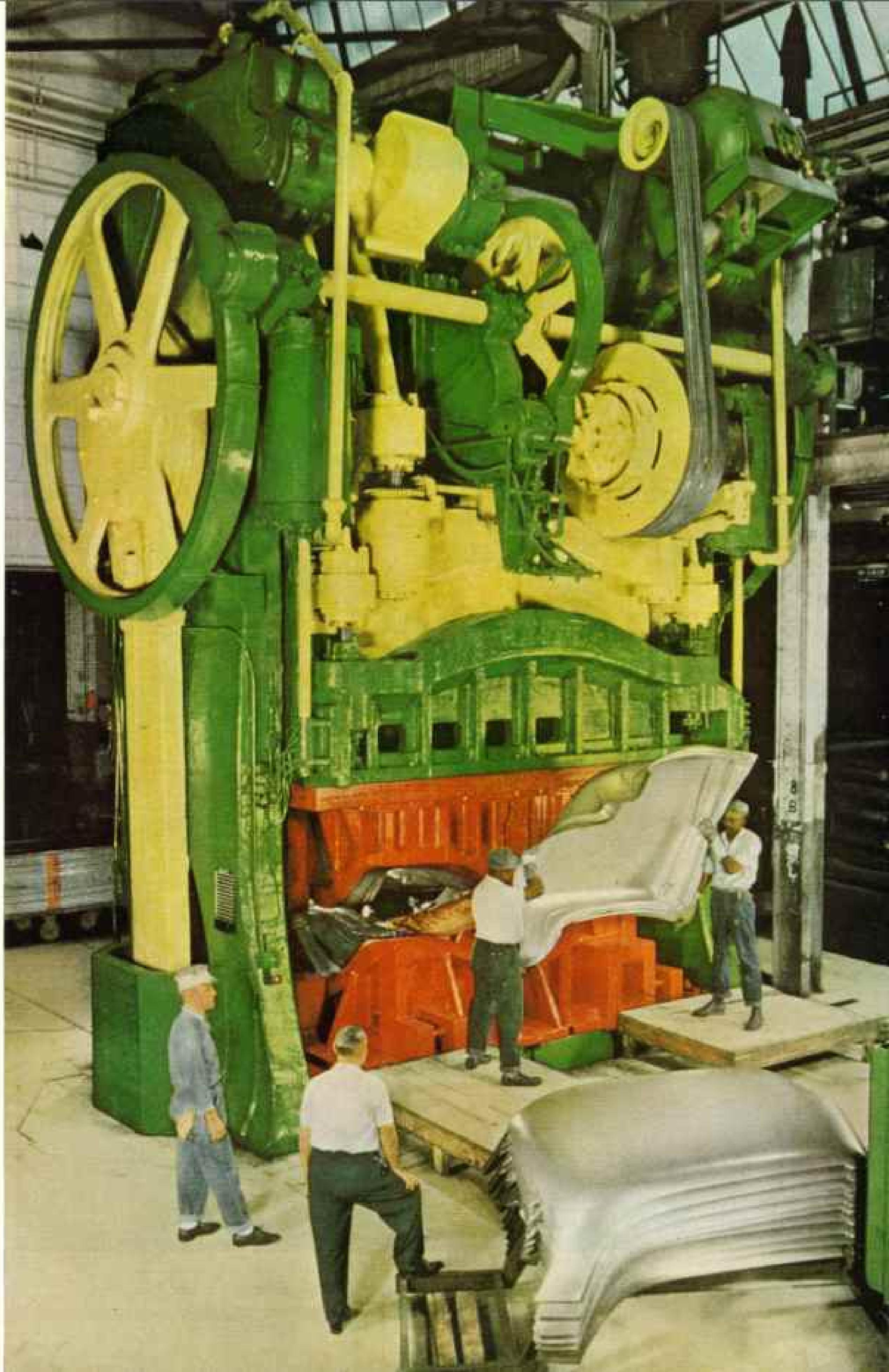
↗ A generation ago Trenton's Fisher-Norris Anvil Company drew its power from a canal flowing through the factory. The old water wheel still hangs below this anvil finisher's workshop. Today electricity spins his grinding disk.

↖ Shock-resistant wrought-iron chain, still hand-forged as in colonial days, holds ships at anchor, hoists massive machinery, protects life and property. Craftsmen at the 68-year-old Woodhouse Chain Works in Trenton shape this glowing end link for an antisubmarine net chain. Ships carrying Woodhouse chain to far-flung ports give meaning to the city's motto, "Trenton Makes, the World Takes."

→ A 1,300-ton press at Philadelphia's Budd Company stamps out automobile tops from flat steel sheets.

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Kodachrome by Robert F. Tramm





Passenger Liners Refitted as Troop Carriers Get a Rust-resistant Yellow Undercoat
New York Shipbuilding Corporation occupies nearly a mile of Camden water front. Philadelphia looms across river.



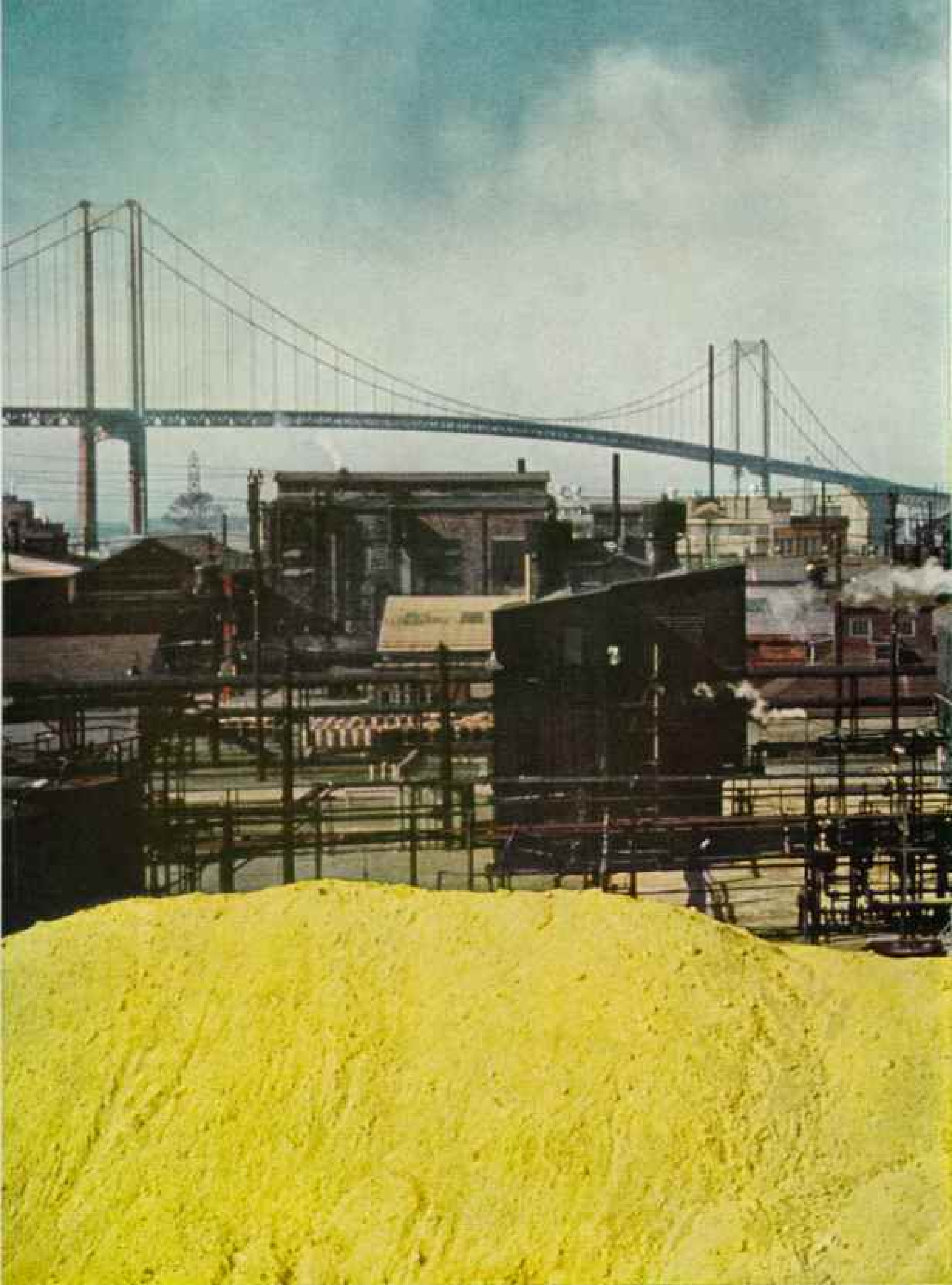
↑ **Golden Discs in a Ghost-filled Vault
Preserve "His Master's Voice"**

RCA Victor's vault at Camden holds a half-century's musical history on priceless master recordings. Gold and silver coated for electroplating, they perpetuate the genius of such artists as Caruso and Paderewski. Nipper listens to a 1905 Victor Talking Machine.

↓ **NATIONAL GEOGRAPHIC Color Flows
from Kodachrome to Copper Plate**

Since 1912 the Beck Engraving Company of Philadelphia has made nearly all the color-plate and black-and-white engravings from which the NATIONAL GEOGRAPHIC's illustrations are printed. This picture was made by more than 2,300,000 raised dots on 4 plates.





Sulphur Heaped Like Sand Feeds the Du Pont Plant near Delaware Memorial Bridge

High above this huge chemical plant at Deepwater Point, New Jersey, motorists roll across the world's sixth longest suspension bridge. The new arch links Delaware highways with the 118-mile New Jersey Turnpike.



Exhaust Stacks Stand Like Giant Beanpoles amid a Jungle of Tangled Pipes

Largest of Du Pont's 71 plants in 25 States, the Chambers Works sprawls along the New Jersey bank across the river from Wilmington, Delaware. Its chemical and dyemaking processes gulp hills of brimstone.



Kodachrome by Robert F. Hixon

DU PONT SYNTHETIC FIBERS

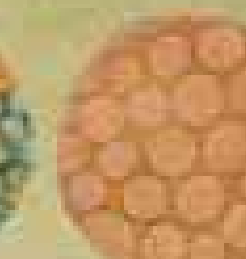
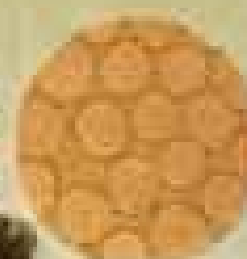
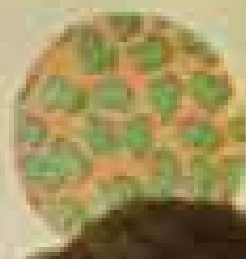
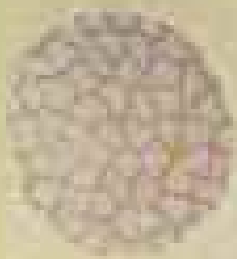
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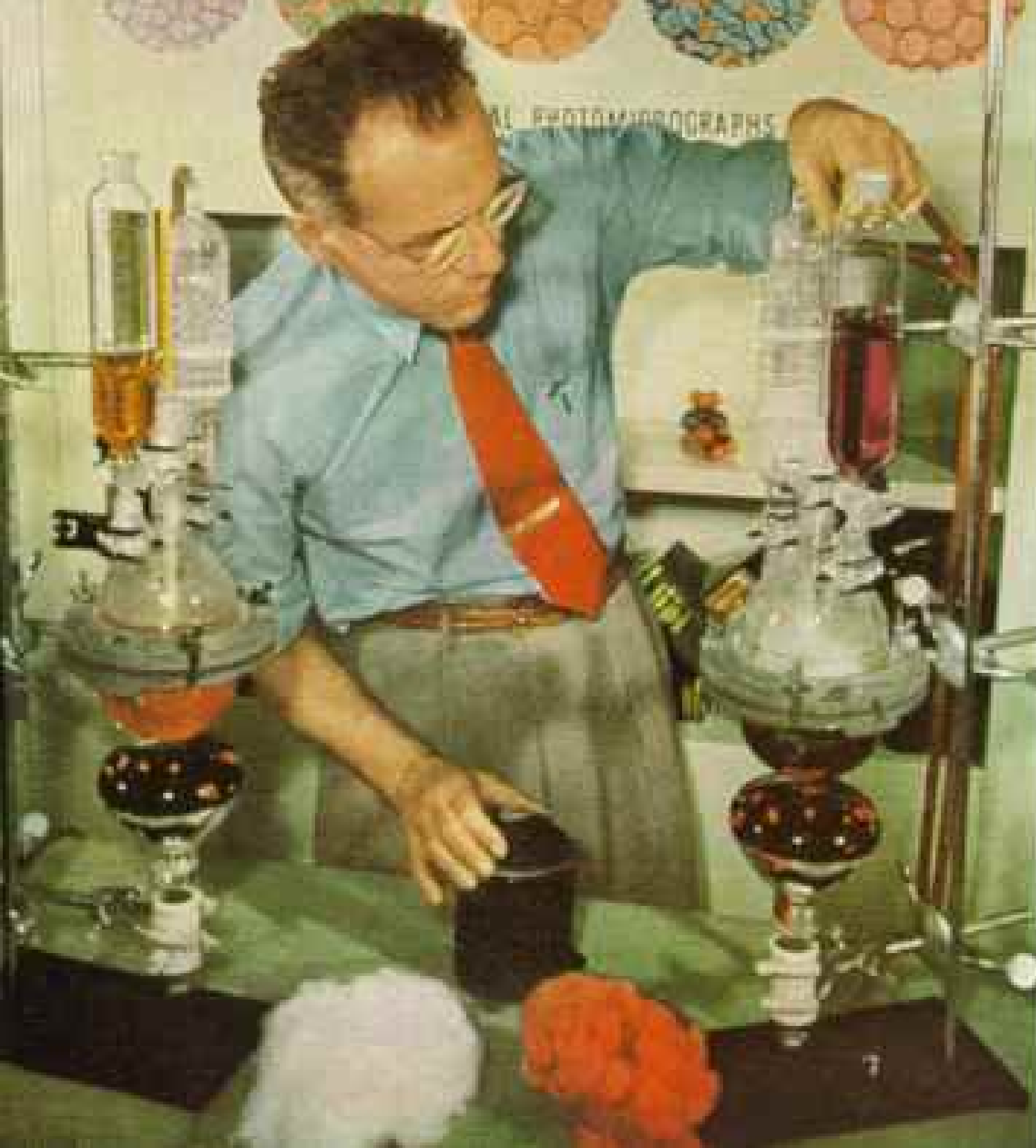
NYLON

ORLON

DACRON



PHOTOMICROGRAPHS



◆ Rosie the Riveter Tattoos a Modern Sky Hook

Twelve years ago a group of engineers barely out of their teens designed a helicopter during their spare time in a Philadelphia store. At last accounts the Piasecki Helicopter Corporation had nearly 4,000 employees and a backlog of orders worth \$150,000,000. Korea proved the value of helicopters like the Piasecki HUP-1 (above). Riveters stitch its fuselage at Morton, Pennsylvania.

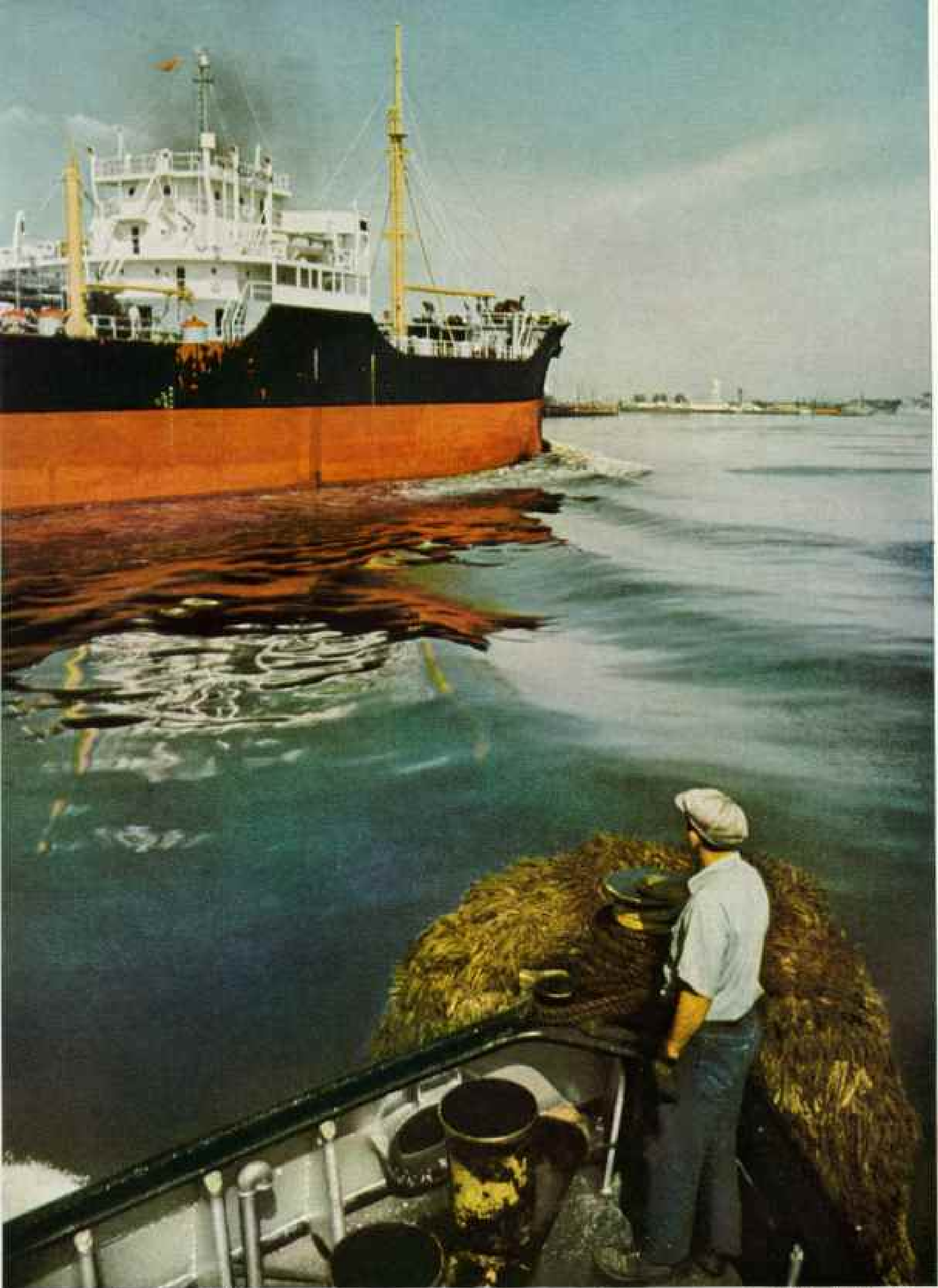
← Du Pont pioneered in the magic of making synthetic textile fibers from raw materials such as coal, air, and water. The chart names five of its man-made fibers. Viscose and acetate, both derived from cellulose, are not true synthetics. Nylon is the source not only of gossamer fibers for women's stockings but of toothbrush bristles and mechanical bearings that need no lubricants. Orlon acrylic fiber, which can be made to resemble either silk or wool, is exceptionally resistant to sunlight. Dacron polyester fiber, Du Pont's newest textile yarn, is quick-drying, moth- and wrinkle-resistant, yet feels like wool. Here Dr. George R. Seidel, Du Pont research supervisor, conducts an experiment to improve fibers.

→ Blast-furnace towers march along the Delaware at the Morrisville, Pennsylvania, site of the United States Steel Corporation's new Fairless Works. This furnace is designed to produce 1,650 tons of iron a day.

© National Geographic Society

Kodachrome by John E. Fletcher





Riding High, an Oil Tanker Passes a Tug in the Port of Philadelphia

Philadelphia, which lacks the tang of salt air, is actually the Nation's second largest seaport in cargo volume, and one of the world's greatest refining centers. Tankers, which bring in oceans of oil, usually depart empty.

proposed, but these will be open to the sun and sky, ornamented with trees or shrubs, and straddled above by three large office buildings.

A serious black mark against Philadelphia and neighboring cities in the past has been the pollution of the Delaware, Schuylkill, Brandywine, and other rivers by vast quantities of industrial and human waste. But this basic piece of municipal and State housekeeping is at last being attended to.

One estimate places the amount of coal culm in the Schuylkill in 1947 as equivalent to an island 90 miles long, 200 feet wide, and 10 feet deep—the result of a century's coal-mining operations in the headwaters region. About 20,000,000 tons washed down from the Schuylkill into the Delaware; now much of it has been dredged out.

Four States Develop a Water Plan

Philadelphia, Camden, Wilmington, and other cities are building big disposal plants to relieve the Delaware from the burden of bearing waste. Through "Incodel"—the Interstate Commission on the Delaware River Basin—New York, New Jersey, Pennsylvania, and Delaware are working together toward an over-all water plan for the entire river basin.

By building four reservoirs above Trenton, it will be possible to capture and store more than half a trillion gallons of water in the freshet months of March, April, and May, when snows are melting.

This water is partly to be used by the great cities, but most of it will be released to the lower river in the low-water and often drought months of August, September, and October, to reduce pollution, provide water for industries, and hold back injurious ocean salt.

Although William Penn founded Philadelphia, the first permanent settlement in what is now Pennsylvania was made by Swedes in 1643, a few miles below the southern boundary of the city.

As I stood near the ruins of the foundations of the Printzhoof, capitol of New Sweden, a glance showed the extraordinary variety which the great river affords:

At one side of the little park was a yacht club; on two sides were miles of factories as far as I could see.

Out in the river a hunter was shooting at ducks. Beyond him was Little Tinicum Island, like several others in the river scarcely inhabited despite millions of people near by. Still farther out, large freighters were passing as if in a procession.

Following the busy river onward, I came to Wilmington, which, with its fast-growing metropolitan area, contains more than two-thirds

of the entire population of the little State of Delaware. Through the city's heart flows the historic Brandywine Creek, emptying into the Christina River. It in turn flows into the Delaware two miles from the city.

A City That Chemicals Built

Wilmington has a highly favorable location, halfway between New York and Washington. It refers to itself as the most southern of northern cities or the most northern of southern cities. Although it is only the 93d largest American city, it is served by some 200 passenger trains a day. As a matter of course, Wilmingtonians go to New York or Washington and back the same day, and to Philadelphia for dinner and the theater and back the same evening.

Wilmington calls itself the "chemical capital of the world," because the mighty Du Pont empire has its headquarters here. So do the Atlas and Hercules Powder Companies, which were created from Du Pont in 1912. Though originally explosive makers, they too have become large producers of chemicals.

None of the three manufactures anything in Wilmington, but all have plants up and down the river, on both the New Jersey and the Delaware sides. The largest of Du Pont's 71 plants in 25 States is the Chambers Works, occupying some 550 buildings at the New Jersey end of the new and near-by Delaware Memorial Bridge (pages 19, 32-33).

Most of Delaware is relatively flat, but the small hilly section of the State begins at Wilmington, and the impressive civic center, Rodney Square, crowns an elevation.

Du Pont Overflows Its Huge Building

On one side of the square bulks the Du Pont-Nemours Building, one of the country's largest commercial structures occupied almost entirely by one company. A solid, massive, colossal landmark, it greets the visitor approaching Wilmington by rail, auto, or air.

So vast are the operations of E. I. du Pont de Nemours & Company that it is now leasing space in about 30 other buildings in Wilmington for office use. It is also erecting a large office building near Newark, seat of the State university, 13 miles southwest of the city.

To visit the Du Pont Experimental Station, a \$30,000,000 addition to which was dedicated on May 10, 1951, I drove several miles through Brandywine Park, which follows the picturesque winding creek. Progress is being made in cleansing the stream of pollution, largely through the efforts of a former Du Pont chemist, Clayton M. Hoff.

In July, 1802—150 years ago—the founder of the Du Pont empire began to build little stone powder mills along the Brandywine; sev-

eral are still intact. Three sides were strongly built; but the roof and the river side were flimsily constructed to blow out easily in case of explosion.

Powder Mills Housed Researchers

About half a century ago the company began research work in a few of these out-moded mills close to the river. Gradually more modern buildings were erected farther up the hillside, and the new \$30,000,000 addition stands on top of the hill. A casual, un-informed visitor might suppose he had strayed onto an unusually large university campus.

This research center, although the company's largest and most important, represents less than half its total research, which is carried on in 60 other locations. But this station has some 800 chemists, physicists, engineers, and other technically trained men from 200 colleges and universities (page 34).

Among the numerous non-Du Pont Wilmington industries are textiles, braided rubber hose, glazed kid and morocco, and vulcanized fiber.*

J. E. Rhoads & Sons, maker of industrial leather products, celebrates its 250th anniversary this year. The concern is America's third oldest business establishment. It began in Chester County, Pennsylvania, but the factory was eventually moved to Wilmington. The main office is now in Philadelphia.

During my last visit to Wilmington, one of the greatest private collections of early American decorative arts ever assembled was opened to the public. Henry Francis du Pont, fifth in the Delaware du Pont line, gathered these treasures, displayed in some 100 rooms in his former mansion, Winterthur.

Here are two centuries, 1640 to 1840, of domestic architecture, ceramics, furniture, metalwork, textiles, paintings, and prints collected from New Hampshire to North Carolina. Visitors must apply in advance and are limited to 20 a day, taken through in groups of four.

The first permanent settlement in the Delaware River Valley was made in 1638 by the Swedes at the Rocks on the Christina River, still to be seen at the foot of East 7th Street, Wilmington. Later the Dutch conquered the region from the Swedes, and still later the English took over, the small river settlements being easily captured by naval attack.

Spectacular Bridge Replaces Ferry

A victory of quite a different sort is the conquest of the full-grown river by bridge-building engineers. On August 16, 1951, the Delaware Memorial Bridge, sixth longest suspension bridge in the world, was opened for business from a point a few miles south of

Wilmington to Deepwater, New Jersey (page 19). Until then, there had been no crossing, except by ferry, of the long, wide stretch of the river below Philadelphia.

Much of the bridge traffic is of a through nature, for the span connects with the new 118-mile New Jersey Turnpike and is a key link in the quickest route between New York and Washington.

But workers in the offices and laboratories of Wilmington and the laboratories and chemical plants in New Jersey can now live in either State. New Jersey residents can enjoy the commercial and cultural advantages of Wilmington, and Delaware residents can easily reach the New Jersey beaches.

Approaches to the bridge are very long and rise to a great height so that the largest naval and commercial vessels can pass beneath the central span. Already as many as 35,921 cars have crossed the bridge in a single day. Primarily responsible for promoting the bridge was Francis V. du Pont, long chairman of the State Highway Commission.

New Castle Preserves Its Past

Although Wilmington was the first permanent settlement in the Delaware Valley, a little river town, New Castle, six miles to the south, was once the metropolis of the region. It also was the State capital, court town, market town, seaport, and junction of a land-and-water route between North and South, before either Wilmington or Philadelphia attained importance.

Left off the main route when the rail lines south of Wilmington went inland to go around the head of Chesapeake Bay, New Castle became known in late years, but only in passing, to millions of motorists hastening to cross on the New Castle-Pennsville ferry. The new bridge, which replaced the ferry, is several miles to the north, and I saw a number of ferryboats lying idle in their New Castle and Pennsville slips.

Today's visitors have leisure to see old New Castle, one of the best preserved bits of colonial America. It retains its charm in the compact section of the Green and in surrounding buildings and streets, despite the close crowding in of industry from the north.

Following the river below New Castle, on winding and little-used roads, one soon leaves the pressure of industrialization for the peace of a land where settlements are few and the landscape consists of farms, inlets, creeks, and vast marshes beloved of hunters in autumn.

On Pea Patch Island is Fort Delaware, a

* See "Diamond Delaware, Colonial Still," by Leo A. Borah, NATIONAL GEOGRAPHIC MAGAZINE, September, 1935.



A London Bus Brings Fleet Street to Philadelphia's Independence Square

Independence Hall houses America's Liberty Bell. Here, on July 4, 1776, the Continental Congress declared to the world, "When in the Course of human events . . ." This British bus was one of three touring the U. S.



An Obelisk Marks the Line Where the River Becomes Delaware Bay

Henry Hudson, searching for a Northwest Passage, explored hereabouts in 1609: "Then wee found the land to trend away northwest, with a great bay and rivers. But the bay wee found should . . ." Here the author examines the shaft which marks the river's mouth at Liston Point, Delaware (text below). Officially that's the Delaware River at left and Delaware Bay at right.

huge, grim moated structure, which became the largest Federal prison in 1863. It confined 12,595 Confederate prisoners after Gettysburg and, at various times, a number of generals. It is being made a State park.

Opposite Fort Delaware, on the New Jersey side, is another abandoned fort, now Fort Mott State Park, and Finns Point National Cemetery, where 2,436 Confederate prisoners who died in Fort Delaware are buried.

Just below Pea Patch Island one of the country's most important canals, the Chesapeake and Delaware, connects the river with an arm of Chesapeake Bay, thus shortening by 330 miles the trip between the two great ports of Philadelphia and Baltimore. As we stood by the drawbridge, traffic was almost continuous. One large freighter was loaded with lumber from Tacoma, Washington.

Because the river broadens gradually and merges imperceptibly into Delaware Bay, the legislatures of Delaware and New Jersey were obliged arbitrarily to fix the mouth at a line drawn between a monument at Liston Point, Delaware, and one at the mouth of Hope Creek, New Jersey.

To reach Liston Point, we found our way through a tract of farm land of 1,050 acres belonging to two brothers. First there was the old barnyard where we opened and shut several gates and passed noisy ranks of geese and ducks. Then came a mile or so of moor that had the feel of the open sea and not a single city smell. Trudging across these silences to the beach, we saw the last of the Delaware, now more like a sea than a river.

It is one of the oddities of geography that the man for whom river and bay are named probably never saw either. The Dutch of New Amsterdam called the stream the South River to distinguish it from the North River, or Hudson. But an English adventurer, Samuel Argall, bestowed the name that stuck, in honor of Lord De La Warr, first colonial governor of Virginia.

The christening was certainly a casual one, but somehow the name seems appropriate, with its soft, harmonious syllables. It fits this commodious, versatile river, an early pathway for pioneer settlers and now a potent bearer of the burdens of the civilization that sprang from those seeds.

Strange Babies of the Sea

Scientists Are Slowly Solving the Mysteries of Plankton, the Ocean's Vast Underwater Pasturage

BY HILARY B. MOORE

Professor of Marine Biology and Research Associate of the Marine Laboratory, University of Miami

Since July, 1950, the National Geographic Society has been cooperating with the Marine Laboratory of the University of Miami, Dr. F. G. Walton Smith, Director, in a study of the plankton found in the Gulf Stream outside the coral reefs off Miami Beach. Here the scientist in charge describes some of the current results of this investigation.—The Editor

AS APPLIED to many of the creatures of the sea, there is special truth in Shakespeare's line: "It is a wise father that knows his own child."

On land we are accustomed to young animals whose parentage is at least guessable. A young bird, for example, is obviously a bird, although the average person may be hard put to it to say just what kind it will grow up to be. With a grub he is still less certain, having doubts whether it will turn into a moth, a beetle, or perhaps some other insect. Even these, however, are fairly closely related.

Among the strange and fantastic youngsters of the sea the story is very different. Though scientific study is steadily revealing fascinating facts of parentage and life history, many riddles remain.

New World of Tiny Life

Back in the middle of the last century, when Johannes Peter Müller developed the method of straining plant and animal life from sea water with a fine net, he opened up a whole new world of minute life. Some of the larger animals had been known to earlier naturalists, but most of the smaller ones were of new and strange types, often wholly unlike any known animals from land or even fresh water.

It was almost as if man had just discovered the insect kingdom, with its gorgeous butterflies, teeming termite nests, and swarms of locusts. Here was a new field to be explored, with promise of exciting discoveries. Naturalists were not slow to follow Müller's lead.

At first, collections were made in the more accessible waters near land. Then came the historic ocean-going H.M.S. *Challenger* expedition in 1872-76 and its many successors, which studied this drifting plant and animal life in oceans around the world. Eventually Victor Hensen, of Kiel, Germany, proposed a collective name for it: plankton, from a Greek word meaning "wandering."

Scientists found, too, that plankton hunting could involve them in just as much difficulty, hard work, and disappointment as hunting for bigger game.

For example, the *Challenger* had to use several miles of rope to lower its plankton-catching nets into the ocean's abysmal depths. All this rope had to be coiled down by hand each time it came back on board, for there was no winch drum capable of taking it. All the different specimens found had to be described and sketched, a work which, when completed, amounted to a quarter-ton of scientific reports.

Usually we do not weigh the value of scientific discovery quite so literally, but this does illustrate the magnitude of the labors of just one expedition in the exploration of the oceans.

Commercial Fish Live on Plankton

The early workers with plankton were fully occupied in distinguishing between the various new animals they found and in classifying and describing them. The next step was to find out something about their life and habits.

This undertaking was seen as especially urgent, for naturalists had come to realize that plankton is the sole food of many commercially valuable fishes. Further, it appears that plankton acts as a nursery for the young of such important food animals as the lobster and even oysters and clams.

The plankton serves the same purpose in the sea as do pastures on land. We need to know its workings if we are to understand the great fisheries which are so dependent upon it. The farmer profits from research on how plants seed, on the special requirements of seedlings, on the life histories of the beneficial and harmful insects that affect his crops. In the same way, the need for such knowledge of the ocean pastures gave impetus to the study of how plankton grows up.

Such early workers as the Swedish botanist Carolus Linnaeus (1707-78) sometimes gave names to strange new plankton animals without realizing that they were looking at babies whose parents were already well known. So it was that the name "Zoea" was given to a queer little rounded shrimplike object, and "Megalopa" to one that looked halfway between a lobster and a crab. Today we know that both are stages through which most young



David O'Berry

A Plankton Net Goes Down for a Sample of Abundant Underwater Life

Profound mysteries lie hidden in the plankton, the meadows of marine life that sustain sea creatures as large as whales. The name plankton, from the Greek word for "wandering," was given to the minute organisms because of the drifting life they lead. This 12-foot net gathers plankton specimens for researches by the National Geographic Society and the University of Miami. The brass mechanism at the right closes the net.

crabs pass in the course of their development.

Such an error is easy to understand. When a mother bird cares for her young, their parentage is clear. A butterfly abandons her newly laid eggs, but it is usually possible to keep the female captive until she has produced eggs, see what kind of caterpillar hatches from them, then observe what kind of moth or butterfly it turns into. But matters are far less simple in the sea.

Mouths Too Small to Feed

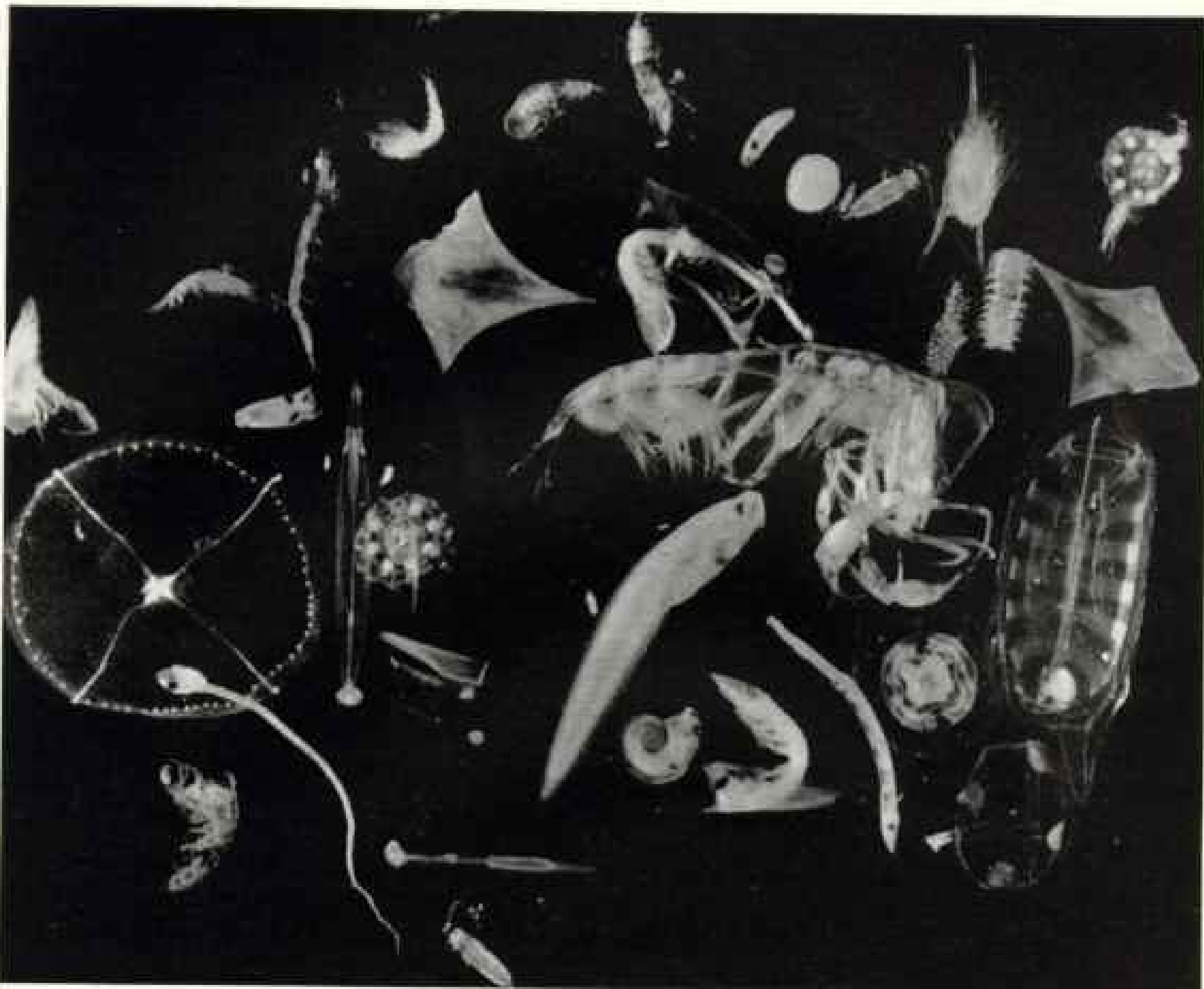
To begin with, most plankton animals—we do not quite know why—are extremely difficult to keep alive in captivity. Accustomed as they are to the cushioning of the ocean waters, they may conceivably bruise themselves fatally when they bump into the walls of an aquarium. Or perhaps we do not yet know the right food to give them, and they just starve. Many of them, it is true, have

mouths so small that they could not swallow anything bigger than a few thousandths of an inch across.

When you add to all this the fact that many of the most exciting animals come from deep, cold waters into which daylight never penetrates, where the pressures are tons to the square inch, you will see why so many of them are killed even before we can bring them to the surface in our nets. To keep them alive in the laboratory is a problem.

It is understandable, then, why so few of the animals found in the plankton have been watched through their whole life cycle. Sometimes, though, we have pieced together the story bit by bit, managing to keep a baby shrimp alive long enough to see it grow into the next stage, then catching a slightly older one; and so on.

A few people, such as Dr. M. V. Lebour in England, seem to have "green fingers" where



Marine Laboratory, University of Miami

A Random Catch of Ocean Small Fry Resembles a Selection of Anglers' Lures

Plankton includes two main divisions: zooplankton, animals; and phytoplankton, plants. Magnified four times, these tiny animals include a transparent salp (right), a lobsterlike pelagic amphipod (right center), two kite-shaped pteropod mollusks, a jellyfish (crossed ring, left), arrowworms (named from their shape), a small-shaped heteropod mollusk, and several beady-eyed fishes.

this process is concerned. Among them they have built up a picture of the kind of life history which is typical of most of the groups of marine animals.

As with the butterfly, we can also catch specimens of the various kinds of marine animals, wait for them to lay eggs, and see what they hatch into. Sometimes they live for only a short time, but a few have been reared until they themselves became parents. This method does not help, however, when the parents themselves live in the depths of the ocean and defy all attempts to "bring 'em back alive."

Offspring of a Living Fossil?

One way or another, we have by now learned enough to say roughly what most kinds of plankton babies will grow up into. We generally know what family they must belong to; but the day when we can be sure of the

exact species of all or even most of them is still far ahead.

Some still remain utter mysteries. One of these, with the name of *Planktosphaera*, floors us completely. Occasionally our nets bring one up from the deep ocean waters—a transparent, spherical animal about half an inch long. It just does not fit into any known group of animals, although it hints tantalizingly at relationship with several.

A possible solution to the problem, and an exciting one if true, is that it might be a young crinoid, or sea lily, one of the living fossils of the deepest ocean floors. We hope that someday we may be able to rear one and find out. Where on land can you find an animal that still, after some fifty years, can't be classified?

The best introduction to these plankton babies is, of course, to see them for yourself. Alive and in their natural colors, they are

things of entrancing beauty. It is no easy task to catch their air of delicate fragility on paper. Nor is it easy to paint a glassy-clear animal, as transparent as the water in which it lives, revealed only by glancing reflections of light and such patches of color as it may contain.

Eyes Seemingly Without an Owner

Sometimes I have spent five minutes examining a dish of live plankton before noticing an inch-long lobster baby that was swimming right under my nose. Even then it was revealed only as a pair of dark eyes, apparently swimming around all by themselves. I had been looking right through the body without noticing it.

This transparency may make things difficult for us, but it gives us an X-ray-like ability to watch such processes as the beating of a heart. On the other hand, it must be a great advantage to a baby lobster which is being hunted by a fish to wear a cloak of invisibility that prevents the fish from seeing its prospective meal.

We tried painting these transparent babies on white paper, and they looked beautiful but unnatural. We tried again with a black background, which came closer to the natural conditions in which they live. This was better, but they looked much too solid and harsh.

At this stage, Nature stepped in to justify an old adage by sending a very ill wind—in fact, a hurricane—to Miami. This was too much for the roof of my laboratory, and the next thing we knew there was a torrent of water pouring out under the door and down the stairs.

Sadly trying to dry out wet papers next day, we came on one of Craig Phillips's sketches. Somehow the rain water had washed out the black background to just the right shade of blue and softened the outlines of the painting until we had exactly the effect we had been seeking. The reader can judge how well the artist has profited from this heaven-sent tip.

It would take a whole book to describe the life found in these waters, but Jacqueline Hutton has captured the general atmosphere in her two paintings (pages 48, 49). The emphasis in these is on the crabs, fishes, and other reef animals rather than on the corals themselves. It is these other animals which provide so many of the plankton babies which we find in the Gulf Stream as it runs northward outside the reefs off Miami.

To the many visitors to Miami and Miami Beach who enjoy good sea food, the spiny lobster may appeal as one of the most important inhabitants of the reefs. They may de-

bate the relative merits of Florida and Maine lobsters, but perhaps our best escape from the argument is to say that they are quite different animals.

Northern baby lobsters look rather lobster-like when a few weeks old; the southerners spend the first six months of their life swimming around in the plankton and looking much more like squashed spiders (page 51). Only the hint of a lobster tail at the end of their leaflike bodies points to their future shape.

Most of the animals grow more or less continuously, but the lobster, like its relatives the crabs and shrimps, saves up its growth to expand in sudden jumps each time it molts. The armor plating which it wears will not stretch; so at intervals it has to throw this off and replace it by a size larger, incidentally changing its shape at the same time if this is necessary.

One important result of our work in the Gulf Stream has been the tracing of the 11 stages through which the Florida lobster passes before it is ready to settle to the bottom as a lobsterling. It must have traveled far on the current during its six months afloat; wandering plankton is providing important clues to the movement of ocean currents.

Transformation of a Baby Crab

We have mentioned already that the baby stages of crabs were a puzzle to early zoologists. Page 50 shows the Zoea stage of a porcelain crab similar to the one shown on the bottom on page 49. We say similar, because this is one of the many cases where we know only the approximate parentage. We are not sure yet to which of several kinds of porcelain crabs these babies belong. With long-drawn-out spines in front and behind, they look, when swimming, absurdly like medieval knights charging, lance in hand.

Later, in the Megalopa stage, the creature begins to look quite like a crab (pages 50, 51). True, its tail still sticks out behind like a lobster's, instead of being neatly tucked away underneath the body as the parent has it. On the other hand, the claws are obviously those of a crab, and, in the case of the one on page 51, the keel along the top of the claw points strongly to the box crab as parent (page 48).

These claw ridges, when the little crab settles to the bottom, will fit tightly against the front of its shell and help keep sand grains from its mouth and gills as it burrows into the bottom. In much the same way, the backward-hinged claw tips of the ghostly little mantis shrimp shown on page 50 foreshadow the pen-knife action of the claws which have earned the adult the local name of "split thumb" (page 48).



Glassy Plankton, Adrift in Sea Pastures, Raise Families in Strange Ways

Opossum Shrimp (top) keeps its young in a pouch. **Phronima**, just below, uses the Tunicate's discarded barrel-shaped house as a nursery. **Blue Copepods** wear orange aprons of eggs. **Salps** shed young by budding.



Transparent Bodies and Spots of Color Camouflage Nursery Life in the Plankton

Spotted baby **Squids**, flanking a fish egg at right, can change color by expanding or contracting dots. **Siphonophores** (left), cousins of stinging Portuguese men-of-war, lay eggs in one generation, bud like plants in the next.



Craig Phillips

Life and Death Swim Side by Side. An Egg-laden Arrowworm Seizes a Copepod
Copepod, from the Greek, means "oar foot." The shrimplike creatures, which form the bulk of all animal plankton, row with waving limbs. Arrowworms, like this marauder, resemble tiny transparent torpedoes.



Graduates of the Plankton World Inhabit Sunlit Florida Reefs

Handle-bar feelers of the **Spiny Lobster** take the place of claws. **Mantis Shrimps** (top) are as savage as praying mantises of the insect world. **Acorn Barnacles** (foreground) wave fernlike fronds for food. **Box Crab** rests beside watermelon-striped **Sea Urchins**. Branched sea rods, brain and lettuce corals (left) resemble plants.



Danger Lurks in Camouflaged Claws, Bristling Bayonets, and Waving Arms

Sponge Crab crouches in portable ambush. **Green Porcelain Crab** rests beside three shelled cowries (right). Wary sea creatures avoid **Black Urchin's** stinging spines. **Female Argonaut**, or **Paper Nautilus**, an octopus, uses her shell only as an egg nest. **Squirrelfish** (top) and green **Cowfish** swim among coral and weeds.



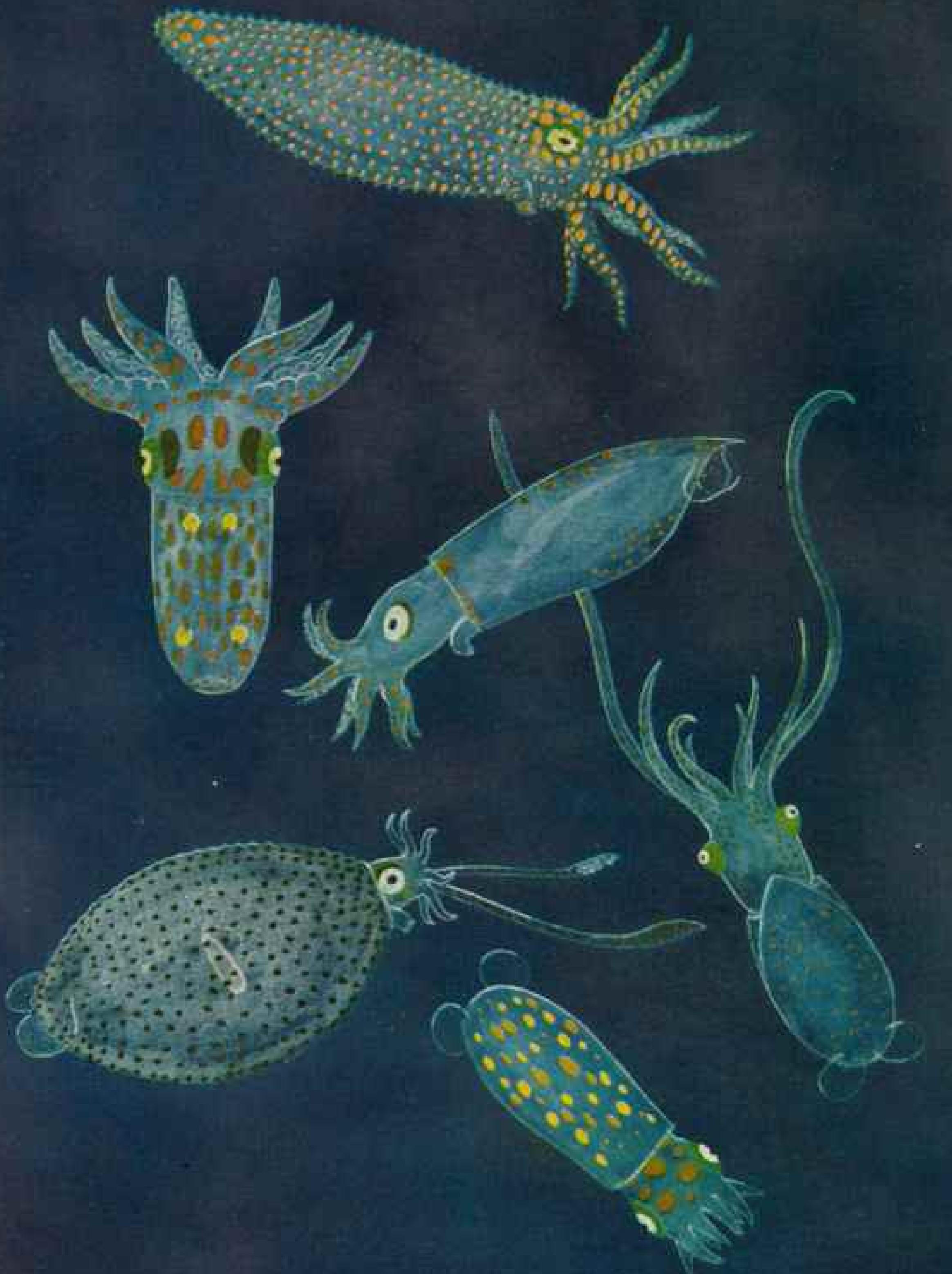
Children of the Reef Dwellers Leave Home in Nightmare Shapes

Needle-nosed babies are **Porcelain Crabs**. Male **Argonaut** (left) is nearly fully grown; female (upper right) grows long arms. **Squirrelfish**, **Mantis Shrimp**, **Sponge Crab**, and **Flatfish** plankton are greatly magnified.



Spun-glass Spider (Left) Is a Spiny Lobsterling. Sea Urchins Float at Top

So transparent is the baby lobster that the eyes seem to swim by themselves. **Speckled Box Crab** (center, right) and white **Brittle Star** soon will settle to the bottom. Jewellike baby barnacles rest beside a green star bud.



Craig Phillips

Little Acorns of the Sea Grow into Tentacled Squids and Octopuses

Related to the oyster and the snail, these are baby cephalopods of six different types, several of uncertain parentage. When startled, the little **Cranchia** (lower left) pulls in its head like a timid turtle.

For yet another relative of the lobsters the study of plankton babies has helped solve a problem which defeated earlier zoologists. The acorn barnacle, which grows limpetlike on the rocks (page 48), and the related ship's barnacle, were first classified as mollusks. After all, they had shells, so where better could you put them? The French naturalist Georges Cuvier (1769-1832), apparently with some misgivings, so classified them in his *Animal Kingdom*, although he no longer accepted the medieval myth that they would later drop off and grow into barnacle geese!

Babies Aid Study of Parents

However, when young barnacles were examined as they first swam away into the plankton from the shelter of the parent shells, they were found to have quite unmollusklike jointed legs. In fact, they belonged to the same order as the crabs and lobsters, albeit as humble relatives.

This is just one of many cases where a study of young animals has led to a better understanding of the parents, a principle surely applicable to man himself.

Sea urchins and starfish are among the most colorful inhabitants of the reefs. The unwary diver is liable to make an all-too-close acquaintance with the spines of the black urchin shown on page 49. Each female urchin sets free thousands of minute eggs into the plankton; as they drift there, they grow into animalcules even stranger than the young lobsters and crabs.

Page 51 shows the young of both sea urchins and brittle stars—frameworks of slender arms connected by a small body in the middle. These arms are stiffened by the most delicate of supporting skeletons, sometimes built with three lengthwise rods and connecting struts like a radio mast. These are joined in the middle to a basketlike cage which protects the body.

When these babies, looking like long-legged stools, are ready to leave the plankton some six weeks later, they change to the grownup shape in an even weirder way than the lobsters. In the case of the starfish, a bud begins to grow out of the back of the body, and from it tiny starfish arms emerge. The bud grows away from the rest of the baby on a slender stalk, which finally breaks off. Then the little starfish settles to the bottom of the sea, while the old body and arms swim away and eventually die.

A somewhat similar trick is played by some of the planktonic baby snails. The massive shells which their parents can drag about on the bottom would be far too heavy for the babies to swim with, even in a miniature edition.

Usually the young snails get around this difficulty by forming an early shell which is exceedingly thin and delicate. But this is none too strong a foundation on which to start building the adult shell; so some relatives of the well-known cowries have two shells. The baby uses one of these, a crystal-clear spiral with rows of sawteeth around the edge and completely unlike the adult shell. Then a second shell is formed inside this one, and, as the baby grows up, it throws off its old house and starts building on the new foundations.

The squids and octopuses may look far removed from cowrie shells, but they are really quite close relations. Though their young (pages 46, 52) do not usually differ as widely from the parents as do some that we have been considering, they deserve mention, notably for their beautiful coloring. The skin which covers their transparent bodies contains sacs of various colored pigments. The animals can expand or contract these, and so produce constantly changing color effects.

Not content with this, many of these creatures are equipped with light-producing organs, also in assorted hues, so that they can put on a most spectacular fireworks display in the deep, dark waters in which they live.*

"Searchlight" Shines into Squid's Body

As usual, the more we study these animals the more problems they present. Why, for instance, should some of these little squids have elaborate searchlights, complete with lens and reflector, arranged so as to shine into the body instead of outward? And what strange design formed another kind which always has one eye large and the other small?

Another curious specimen is the little *Cranchia* on page 52. When we brought it up in the net, it swam gently around a dish until it bumped into anything solid. Then it would hide its head, like the legendary ostrich, by pulling it inside its mantle. It would lie there looking out at us through the transparent mantle walls, for all the world as if it felt safe behind a glass window.

We have been fortunate to catch the young stages of another very interesting octopus, the argonaut, or paper nautilus (page 49). The adults probably live somewhere outside the reefs, because they are occasionally found washed into shallow water after a gale. Their shell, which delights the collector fortunate enough to find one, does not house the body of the animal, as it does in snails, but rather serves as a baby carriage in which the female

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Round Trip to Davy Jones's Locker," June, 1931, "Depths of the Sea," January, 1932, and "Half Mile Down," December, 1934, all by William Beebe.



National Geographic Photographer Robert F. Hixon

Each Haul of the Net Could Yield a New Species

Crew men on the research ship *Atlantis* here empty a haul of plankton caught above the Mid-Atlantic Ridge; the springs ease the strain on the net-towing cable. Plankton is found at all depths, especially in the upper 1,000 feet. Deep water's prodigious pressures do the tiny creatures no harm.

guards her eggs until they are ready to hatch.

Page 50 portrays a planktonic baby—a female argonaut. It also shows a nearly full-grown male, and this is the real prize. The males never grow much larger than a pea and as a result rarely have been found by collectors. The difference in size between the adult male and female is relatively as great as between, say, a chipmunk and an elephant!

Many reef animals, as we have seen, cast their young adrift to fend for themselves in the plankton. For example, the shrimplike copepods shown on page 47 shed their brilliantly colored eggs into the plankton to take care of themselves. These little copepods, usually a quarter of an inch or less in length when fully grown, are the grazing animals of the plankton and play the same part as the cattle and deer on land. Like these,

too, they are preyed upon by carnivores, which in the sea range from big fish and whales down to the little arrowworm shown in the same plate. Though only an inch or so long, these arrowworms are a swift and long-fanged peril lying in wait for the copepods.

Plastic Nursery, Jet-propelled

Other reef animals care for the offspring in one way or another until they are well-grown replicas of their parents. At this extreme is the opossum shrimp on page 45, with its brood pouch like that of a kangaroo. Through the transparent walls of the pouch one can see the babies, which will be well-formed little shrimps before they are let loose. The *Phronima* shown in the same painting is even more ingenious. Since Mother Nature has not provided her with a pouch, she takes over the discarded house of another plankton animal, a Tunicate.

This house, or tunic, for which the animals are named, is a transparent barrel made, surprisingly, of cellulose. The *Phronima* creeps into this ready-made plastic barrel, and, by paddling water through it with her legs, achieves very effective jet propulsion. At the same time the barrel makes a splendid nursery for the babies. They are as safe from attack as human babies behind the glass windows of a hospital ward; yet the streams of water pumped in by the mother bring them a steady supply of the minute food which they need.

Every time we touch on another aspect of plankton animals we run into fresh problems, and it is these which make the exploration of the plankton world so exciting. There is, for instance, the old question as to which came first, the chicken or the egg. In the plankton we meet an even more baffling question:

Which is the parent and which the child?

Take the Salps (members of the Tunicate group) on page 45. When the eggs hatch and the young grow up, they are different animals from their parents—so much so, in fact, that they originally were described as a different species. What is more, this second generation does not lay eggs. Instead, it grows a long chain of buds, which finally break off to grow up into the egg-laying generation again.

The situation is about the same as if a greyhound had puppies which turned out to be dachshunds, and these dachshunds grew extremely long tails which broke off and grew into greyhounds. Absurd as it sounds, this is what happens, and which are we to call the parent of which?

The same situation is found in the beautiful little jellyfish (Siphonophores) shown on page 46.

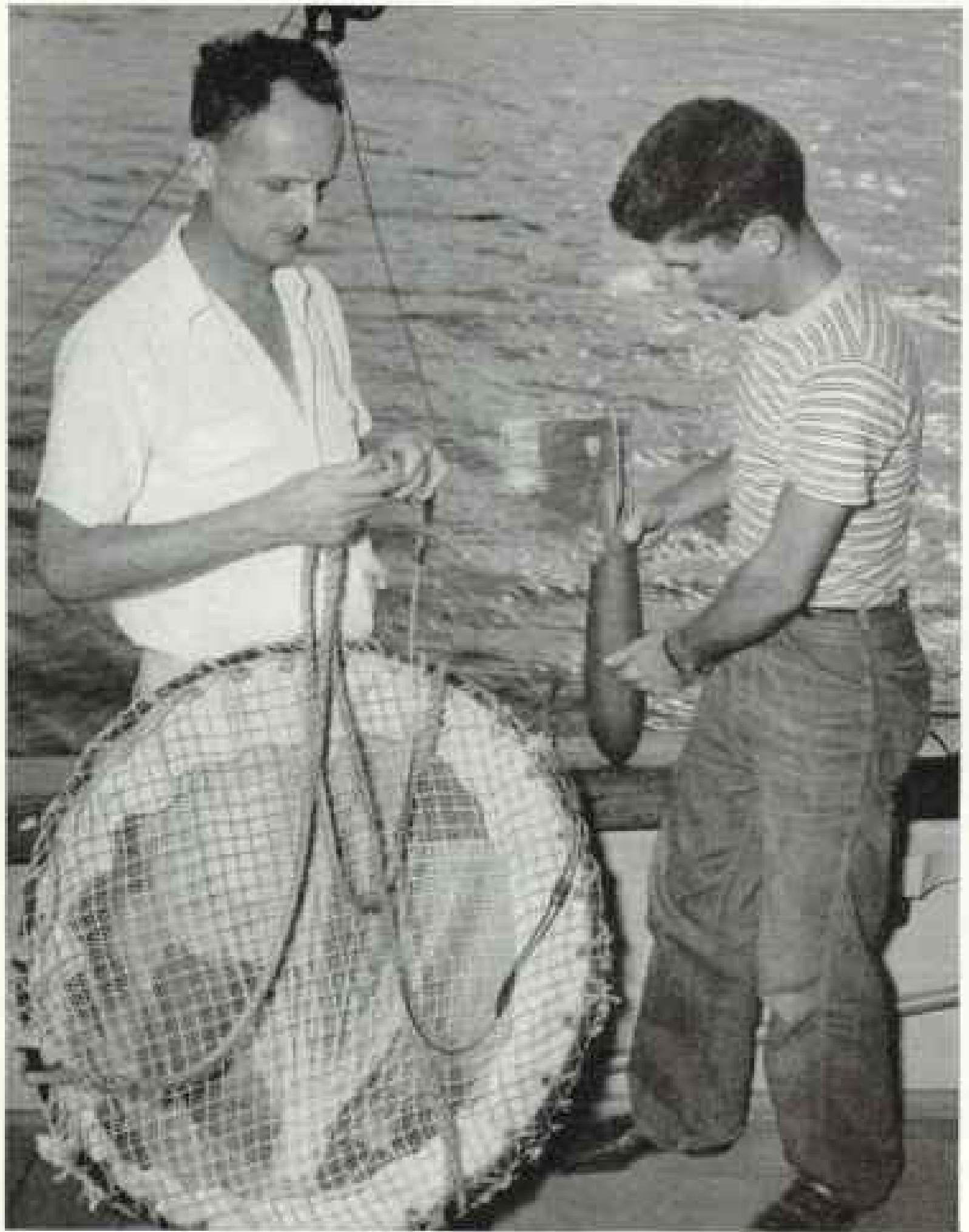
Why do so many animals use the plankton as a nursery school?

Why are so many of the young quite different-looking from their parents? And, for that matter, what becomes of all the surplus babies?

There is a lot to be said for turning offspring loose into the plankton. The parent does not have to expend energy looking after them or share her possibly meager food supply with the children. Instead, she can put her whole energy into getting the next brood ready to follow them.

Then, too, the young are being scattered far afield by the ocean currents, just like the wind-borne seeds of plants, and, like the seeds, they have the chance of finding new grounds to settle on. To an animal like a coral or sponge, which cannot walk about, this is essential; even to a lobster or crab it is extremely useful.

Just as plant seeds have to be lightly built and often have hairs or wings to help keep



Marine Laboratory, University of Miami

Eight Million Plankton May Not Balance a 50-pound Sinker

The author attaches the net to the towing cable for a sweep through the plankton-rich Gulf Stream. A guard mesh across the net's mouth rejects sargasso weed. The torpedo-shaped weight, equipped with fins, holds the towing line at the proper level.

them airborne, so the plankton has to be specially adapted to drifting in water. Heavy shells, like those of a lobster or oyster, are obviously undesirable. They must be replaced by much more delicate structures. Air bubbles or oil droplets are helpful in keeping afloat. Above all, long projecting arms or feathery spines help to turn the creatures into living parachutes, and fins help them swim.

Add to this that the young animals may eat quite different food from that of their parents and need different mechanisms for catching and chewing it, and you see again why the two are likely to look so different.

One trouble about turning babies loose in the plankton is that they are more likely to be eaten by some carnivore than they would be if their parents mounted guard over them



Magnification, Making a Dime Bigger than a Dollar, Lays Bare the Teeming Sea

Planktonic organisms dwell in lakes and rivers as readily as in oceans. They reproduce with unbelievable fecundity; acorn barnacles may raise 20 tons of young a year for each mile of shore (below and page 48). This sample consists largely of seedlike copepods (pages 45 and 47). Transparent ribbons are arrowworms; two elongated triangles are pteropods. A salp's diaphanous form (right) suggests the ectoplasm of a ghost.

until they were old enough to take care of themselves. The answer to this is to produce so many babies that there are plenty to spare.

This process has been carried so far that the average egg production from each female creature in the plankton is probably about a million a year. Since most of these will be eaten before they ever grow up, this adds up to a tremendous food supply for such fishes as herring and mackerel. The little acorn barnacles that grow on our rocky coasts may produce as many as 20 tons of babies a year for each mile of shore, and the barnacle is but one of the many animals that live there.

Of course, it must be borne in mind that the plankton is not composed solely of babies or even of animal life. Plant life and tiny but adult animals compose a large percentage.

The farther we go from shore, and the deeper below the surface, the less we know about plankton. It is only natural that the more accessible places should have been ex-

plored first. Yet there is much that we urgently need to know about the life of the open ocean.

We know that fresh-water eels go to deep midocean waters to breed. We know too the story of the thousands of miles that the baby eels have to travel to return to the rivers.

But what about gamefish like marlin, wahoo, and others? They probably live their early life in the ocean plankton, but we do not know where or how.

These ocean waters come very close inshore along Florida's east coast; half an hour's sailing from Miami and you are in them. One laboratory in one year, or even in a lifetime, can begin to touch only the fringe of the problems that lie waiting in these waters. Yet we hope to continue learning more and more about the private life of the plankton.*

* See "Living Jewels of the Sea (Plankton)," by William Crowder, NATIONAL GEOGRAPHIC MAGAZINE, September, 1927.

North Star Cruises Alaska's Wild West

Gay-hearted Eskimos Welcome the Annual Supply Ship to Lonely U. S. Shores That Face Siberia

BY AMOS BURG

With Illustrations from Photographs by the Author

SEEKING a bird's view, I clambered up the foremast to the crow's-nest of the *North Star* to view the stout vessel's annual departure from the harbor of Sitka, Alaska, for Bering Sea and the Arctic Ocean.

Already her exploding 1,750-horsepower Diesel was sending convulsive shivers through the 5,000-ton Alaska Native Service ship and up her mast as Capt. Charles H. Salenius' voice boomed from the bridge: "Let go the bow lines! Let go the stern lines! Hold the spring line!"

On the deck below me, sailors scrambled about as they hove in the thick manila lines, like writhing pythons that the rumbling winch drums took up and subdued.

Native Students Wave at Their Ship

As we got under way, Aleut, Indian, and Eskimo students at the new Mount Edgecumbe Educational and Medical Center on Japonski Island kept pace with the ship on foot. They waved to native friends aboard and shouted messages until our gathering momentum sped us beyond the reach of call or gesture.

This was their ship; on our voyage we would visit 45 of their home villages, reaching all the way to the northernmost tip of Alaska.

Down on deck I had to pick my way. Every available foot of space was crammed with a deck cargo of oil drums, tractors, and boats, all lashed down in proper sequence for delivery.

These were only part of the 300,000 items, purser Bill Wanser told me, that packed the ship from deck to keel. They made up the annual consignment of essential supplies and equipment bound for teachers, schools, hospitals, and native cooperative stores scattered along 2,000 isolated miles of coast.

By twilight the *North Star* plowed into the Pacific Ocean past cratered Mount Edgecumbe, for two centuries the guiding sentinel for mariners steering from seaward for Sitka Sound. Cruising at 11 knots, she reached westward for the Aleutian passes that would lead north into Bering Sea (map, page 58).

In three days we picked up the rocky Shumagin Islands and threaded their passes westward along the south coast of the Alaska Peninsula. Islands and mainland, devoid of trees, seemed to have been sprayed by a thin

green paint through which rock protruded everywhere. Poking its peak through the clouds, 8,900-foot-high Pavlof Volcano puffed smoke like a giant slow-breathing locomotive.

"There are at least 76 major volcanoes along this coast," pointed out a teacher bound for Akutan. "Quite a few are smokers. The natives are afraid of them."

On the evening of the second day from the Shumagins, the *North Star* passed Scotch Cap Light at the entrance to Unimak Pass. A heavy fog blanketed the light. But on our ship's mainmast, high above the flying bridge, the radar scanner revolved ceaselessly.

Unimak Pass, guarded by two great lights at its north and south approaches, passes almost all the traffic between Bering Sea and the Pacific. This traffic includes an estimated million fur seals bound for the Pribilof Islands,* hordes of red salmon for Bristol Bay, and countless thousands of dog, or chum, salmon that crowd up icy Arctic rivers to furnish the grateful Eskimo with his hors d'oeuvres.

And sea traffic is not all: the direct air route to Tokyo passes over Unimak Pass.

Slack Time Hits Dutch Harbor

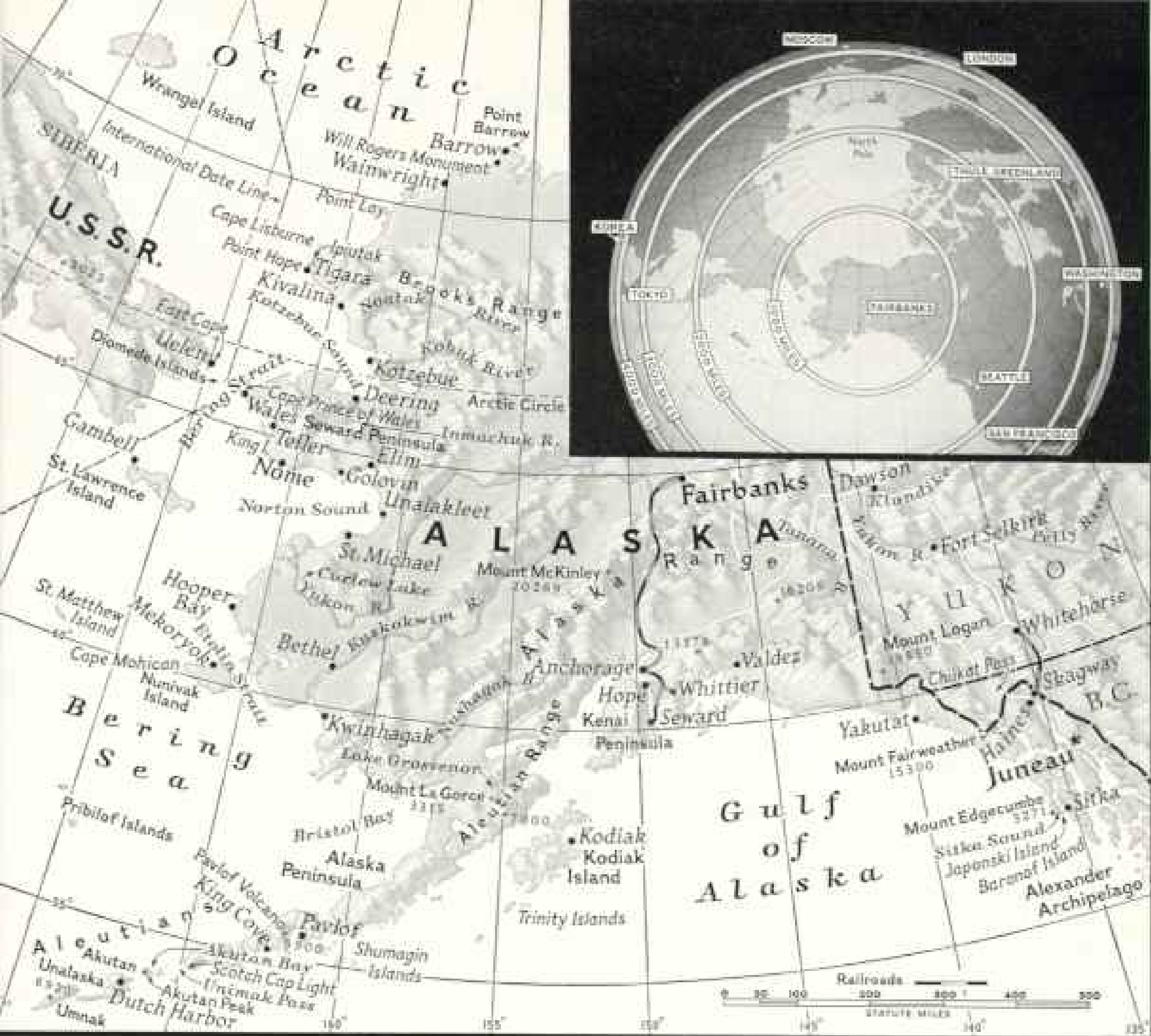
At 5 a.m. we docked at Dutch Harbor. When last I had seen that wartime naval base, in the autumn of 1941, bulldozers and power shovels had been tearing frantically at the mountainsides to create a fortress against Japan. Lonesome, rain-drenched soldiers carried out maneuvers on the mountains.†

Now we looked out from the *North Star* on a vast huddle of empty, shuttered barracks whose surplus contents had been power-barged south to Seattle junk yards. A few Marines on lonely vigil said we could not go ashore.

The marshal of Unalaska and his jailer came aboard. They said they'd killed 500 sea lions that summer, combining sport and conservation. One man here declared a sea lion ate a thousand pounds of salmon daily. Later I consulted the ship's encyclopedia, which reduced the sea lion's diet to 40 pounds and gave him a wider choice of foods.

* See "The Fur Seal Herd Comes of Age," by Victor B. Scheffer and Karl W. Kenyon, NATIONAL GEOGRAPHIC MAGAZINE, April, 1952.

† See "A Navy Artist Paints the Aleutians," by Mason Sutherland, NATIONAL GEOGRAPHIC MAGAZINE, August, 1943.



Alaska, Defender of the North Pacific, Thrusts a Rugged Fist Toward Siberia:

Sparse roads and the single main railroad point up the disparity between Alaska's population and size—about 178,000 people in a territory larger than Texas, California, and Montana combined. Tough terrain and bad weather, which hinder defense, equally discourage aggression. Aboard the *North Star* the author visited Eskimo outposts along the west coast. Inset shows how Fairbanks sits 4,100 air miles from Moscow.

Williwaws poured down the leeward slopes and swept the harbor with hurricane fury. The whirling winds raised misty waterspouts.

Aleuts a Sadly Depleted Race

During the years the Russians occupied Alaska, they enslaved the friendly Aleuts to pursue sea otter and fur seals; the European masters almost exterminated all three.

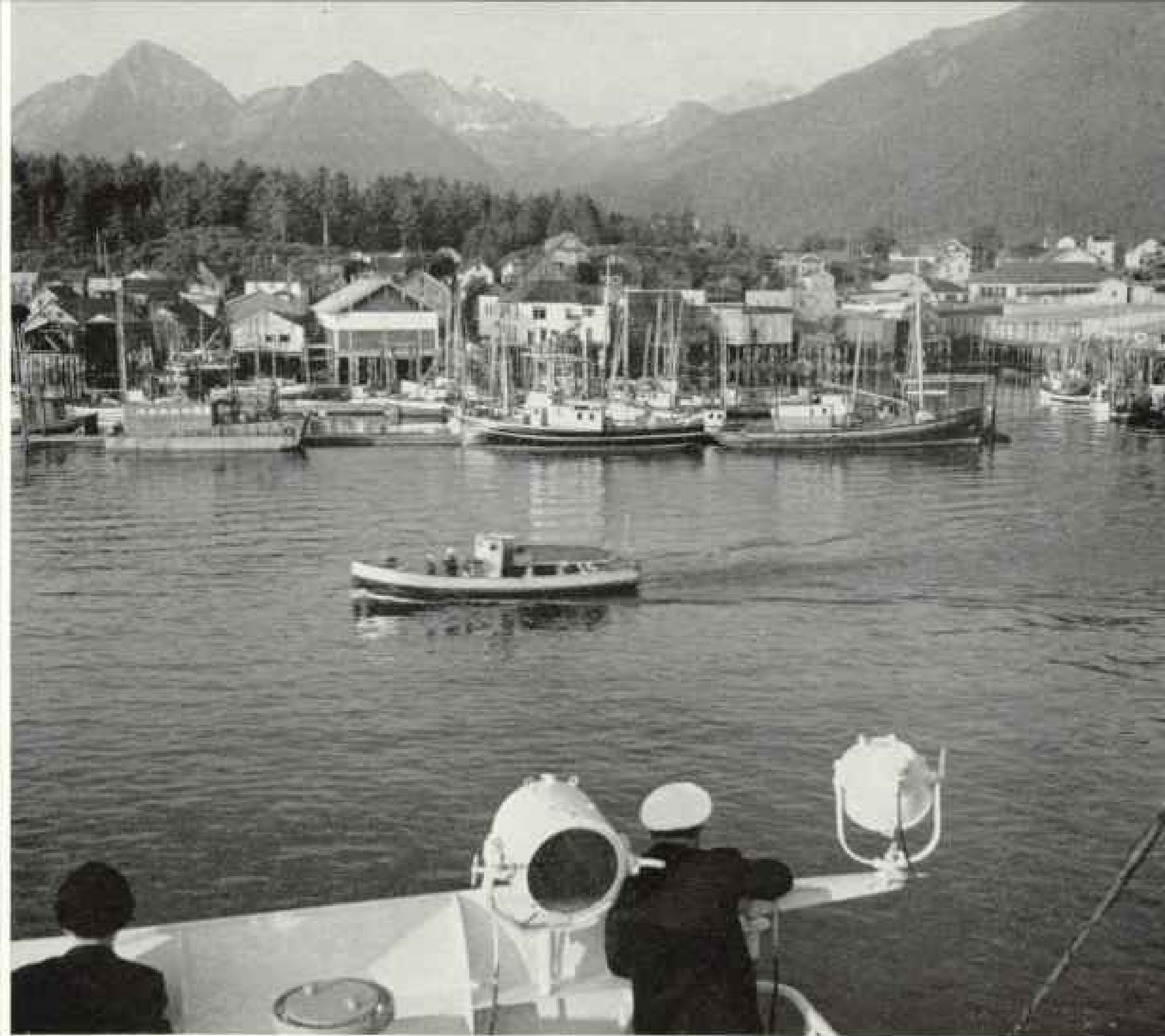
On the far-flung Aleutians, where formerly some 20,000 to 25,000 Aleuts ventured joyously through rough seas in graceful *bidarkas*—boats of stretched skins—sea birds rise in clouds from once-populous islands. The Aleuts now number only about 1,200, according to recent estimates cited by the Alaska Native Service at Juneau.

After filling our water tanks, we sailed from Dutch Harbor for Akutan, pulling away from

the last wharf we were to touch until our return, 7,000 logged miles later. Sheer cliffs rising from the restless tides presented the most dramatic scenery of the voyage.

We anchored in Akutan Bay at twilight. The village perches on a narrow beach at the foot of a mountain. It was easy to see in what esteem the returning teachers were held by the way most of the 80-odd inhabitants swarmed out in boats to greet them. All but the girls. "They are so shy," said our teacher friend, "that they are probably up on the mountainside peeking around rocks."

This hamlet is the only one left of seven original villages on Akutan Island. The local whaling station closed down in 1938, but the men find seasonal work in canneries, fur sealing on the Pribilofs, dragging for king crabs in Bering Sea, and salting cod.



Sitka's Warehouses Stand on Tiptoe High above Tide and Fishing Fleet

Former capital of Russian America, Sitka became Alaska's capital under the Stars and Stripes, but later yielded the honor to Juneau. Base of 650 boats, the port annually clears a salmon and halibut catch worth \$1,000,000. It is the home of the Presbyterians' Sheldon Jackson Junior College, whose 74 years make it Alaska's senior educational institution. Ship's officers here conn *North Star* up the channel.

Most villagers are descended from an old Scot who jumped ship in the Aleutians before the Civil War, married an Attu native, and lived in Akutan for 60 years. His oldest son is postmaster. His wife brought her people's fine art of basketry to Akutan. I asked the last surviving basketmaker why she didn't teach others to carry on the art.

"Oh, these modern children don't have the patience to split a thin blade of grass three ways with fingernail to weave fine basket," she said.

Like firewater to the Indians, drink has been a curse to the Aleuts.

"Now we impose a fine of \$25 for drunkenness," the Aleut chief explained. "Up in King Cove a villager is fined \$50 for being drunk, council members \$100, and the chief \$150.

"It pays off. Energies and money are

diverted to useful activities. In the past two years, with the help of our teacher, we've built seven new houses and many new boats."

Ash-throwing Akutan Peak lifts its 1¼-mile-wide crater just eight miles away. It has been responsible for a lot of insomnia in the village. Residents wonder when it will blow its top. Some families have moved away.*

Bering Sea, Broad but Shallow

Out of Akutan bound north, I noted a different behavior of the ship. Although the winds lashed Bering Sea and buffeted the sooty-brown goonies, or black-footed albatrosses, riding astern on stiffened wings, the *North Star* did not roll as she had in the Pacific.

* See "Exploring Aleutian Volcanoes," by G. D. Robinson, NATIONAL GEOGRAPHIC MAGAZINE, October, 1948.

"Bering Sea is too shallow to work up a swell," Walter Hammond, the chief mate, explained. "The Pacific south of the Aleutians is four miles deep; now there's only a hundred feet of water under our keel. The whole eastern side of this 1,000-mile-wide sea is very shoal."

When we passed Cape Mohican on Nunivak Island, I imagined that even the flounders lying on the bottom had to duck our keel.

Some 470 miles north of Akutan we anchored off Hooper Bay. An Alaska Housing Authority barge came alongside. Hooper Bay's 300 Eskimos, among Alaska's most primitive, live in dome-roofed, sunken sod houses (*barabaras*) which until recently had dirt floors.

"We are raising the Eskimo out of a hole in the ground, where he is dirty and snug, to the surface, where he will be cleaner and probably cold," said a construction foreman.

Northeast of the Yukon Delta, whose marsh grass flats barely peep above high water, we nosed into anchorage off St. Michael, Bering Sea doorway to the vast Yukon Basin. It has little left to show for the swashbuckling role it played in the gold-rush days around 1898, when it was the relay point for transfer of men and supplies from seagoing vessels to the Yukon River boats.

Herb Johnston, genial port captain for the long-established Northern Commercial Company, still going strong, piloted a group of us shoreward in his towboat for a conducted tour of shrunken St. Michael. From the harbor, sidewalks wandered off aimlessly across the houseless tundra.

"Most of the buildings were burned for firewood," Herb explained, "including the old U. S. Army barracks."

Boneyard of Gold-rush River Boats

I inquired about St. Michael's boneyard of steamboats that once held the battered historic hulls of the *Susie*, *Sarah*, *Hannah*, *Louise*, *Will H. Isom*, and other river palaces that a half century before had transported thousands of frenzied gold seekers up the Yukon into the Klondike.

"They were burned, too," Herb said, pointing to a heap of ashes and twisted iron.

But today, after all, most Alaskans are too busy creating a present and a future to think about the past.*

From St. Michael we headed north across Norton Sound for Golovin to discharge and pick up passengers. Because of the shallow water, we had to anchor eight miles from town in a choppy sea. Our new passengers, arriving stuffed in the cabin of a pitching, spray-smothered tug, were half seasick and dizzy from engine fumes.

The *North Star's* Arctic-wise officers hoisted the newcomers aboard in slingloads, then deposited shore-bound passengers on the tug with a skill born of long experience (page 74). They were justly proud that in 45 anchorages they had never dropped a slingload of freight or passengers.

Sailing on, we passed through Bering Strait, its shores obscured by fog. As we crossed the Arctic Circle, His Majesty Boreas Rex, Sovereign of the Frozen Wastes and Ruler of the Midnight Sun, alias the captain, held court with his gracious queen, alias the bosun, whose lovely hairdo was achieved with one of his newest deck mops.

Lacking certification of membership in the Top of the World order, I joined the initiates in kissing the queen's foot (prompted by vigorous whacks from the court policeman's paddle) and waded in a tub of ice cubes representing the frozen Arctic. Finally I endured some forced feeding of that Eskimo delicacy *muktuk*, consisting of whaleskin and blubber, and of *quak* (frozen raw herring), and the Nectar of the Gods, ingredients unknown.

Sounding an Ocean with an Oar

At Kotzebue, our first Arctic village, I rose early to go ashore—and found that we seemed to be anchored in the middle of the Arctic Ocean (page 63). The low shore was a faint blue line 15 miles away.

Sixteen passengers were lowered to a barge already stacked with 35 tons of freight, and an Eskimo tug towed us off into the emptiness of Kotzebue Sound. One man bailed; another steered with one hand, using the other to tinker with a sputtering gasoline engine.

Three hours passed. While the other passengers drowsed, I noted apprehensively that the tug's motor had stopped for the sixth time, that both ship and shore were lost to view, and that the wind was rising. I began to entertain visions of being washed overboard in an Arctic storm; or perhaps we would drift across to Siberia and end our days in forced labor.

Just then the Eskimo bailer jabbed an oar over the side. Silly, I thought, sounding with an oar in the middle of an ocean. The oar blade struck bottom at two-and-a-half feet depth. Both tug and barge were stuck on a bar. We were traversing shallow flats built up by silt carried into Kotzebue Sound during summer by the Kobuk and Noatak Rivers.

Probing for the channel like two confused bird dogs, our Eskimo pilots finally located the old wreck and bobbing black barrel that mark the channel to Kotzebue.

After six wearisome hours the features of

* See "Strategic Alaska Looks Ahead," by Ernest H. Gruening, NATIONAL GEOGRAPHIC MAGAZINE, September, 1942.



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Photograph by Anns Burg

A Solemn Alaskan Newcomer, Riding Mother's Back, Peers from a Fur-hooded Parka

Along 2,000 miles of bleak Arctic and subarctic shores, from the Aleutians to Point Barrow, the author voyaged in the Alaska Native Service vessel *North Star*, making its annual freight-and-passenger haul to Eskimo outposts. This mother and daughter live at Gambell, St. Lawrence Island, 40 miles from Siberia.



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Fifty-five Miles of Chilly Atmosphere and Icy Water Separate Alaska from East Cape, Siberia (Right, Background)

Directly above the rock cairn, Little Diomede (U. S.) is silhouetted against Big Diomede (U.S.S.R.). The islands are 1 1/2 miles apart. A rare fog-free summer day made possible this picture of North America and Asia at the point of their closest approach. Below Cape Prince of Wales lie the *North Star* and the village of Wales.

Lightering Barges, Moving Supplies from Ship to Shore, Slap and Buck in Gale-whipped Seas

Wind-blung Arctic spray strikes longshoremen's faces with the sting of sand. The nearer barge, already loaded, is moored to the *North Star*; a launch tows the other alongside. The scene is 15 miles off Kotzebue. Shallow seas along Alaska's west coast compel larger ships to unload far offshore.

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Photographs by Anson Berg





Drying Red Salmon Resemble Huge Racks of Neckties

- ♣ At Deering, where wind and sun cure these split fish, hundreds of Eskimos gather every summer from coast and inland settlements to put up salmon (page 66). A cheap and nutritious food for men and dogs, it needs neither salt nor preservative. The boy untangles a salmon net. In western Alaska the sea's rich harvest contrasts sharply with the poverty of the land.
- ♣ Leo Schafer, an Eskimo, builds his log dream house—a tedious job on the treeless tundra at Kotzebue. Today's houses, successors to sod huts and skin tents, usually are constructed of sawed lumber. Schafer, depending on driftwood logs, may take four years to complete his home. Driftwood, once plentiful, has grown scarce since Eskimos took to beating with wood instead of whale oil or seal fat.
- ♣ Frank Knapp cultivates his turnip patch at Kotzebue, where he has spent 20 of his 48 Alaskan years.

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Kachibromus by Anson Burg





Lonely Deering, Clustered on a Sandspit Between Innachuk River and Kotzebue Sound, Is a Mining Town Without Mines

Placer gold mining occupies many Eskimo residents; the hydraulic "diggings" lie from 10 to 50 miles from Deering. Alaska, purchased from Russia for \$7,200,000, already has yielded more than \$900,000,000 in mineral wealth alone. Natives here also preserve tundra blueberries—in seal oil—and cure salmon (page 64).

24-hour Sunlight Clears Ice and Lets the Supply Ship In

Some 15,000 Eskimos and a few hundred whites live along Alaska's Bering Sea and Arctic Ocean coasts. Ships and airplanes have altered mightily the Eskimo's way of life. Many hire out to do white man's work, as in the Navy's oil explorations near Barrow. Others remain hunters of walrus and seal, catchers of birds and salmon.

The adaptable Eskimo has mastered outboard motors, bulldozers, concrete mixers, radios, musical instruments, and cash registers. He has acquired tastes for candy, chewing gum, canned foods, store-bought clothing, and jerry-built homes of scrap. Civilization also has brought him schools, hospitals, greenhouses, and greatly improved communications.

Above: Three Eskimos hustle past the cooperative store at Kivalina, bound for the beach to help unload supplies barged ashore from the *North Star*. Rolled seal-skins stacked against the store resemble cordwood. Near oil drums (right) stands a neglected dog sled; beyond it rises a survey marker's framework. Tents (left) are crowded summer quarters.

Below: At Point Hope, boys unload food, lumber, and fuel from barges. Airplanes bring passengers, mail, and news, but only ships, during summer's brief open-water season, can deliver bulk cargo in quantity.

Eskimos by Anos Burg





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Kodachromes by Anna Burg

♣ **Men Shoulder Rolls of Sealskins,
Future *Mukluks* and Kayaks**

Hair-seal hides, surplus here at Kivalina, will travel in the *North Star* to Little Diomedé Island to make waterproof Eskimo footwear and kayak covers. The seal is the aboriginal Eskimo's "staff of life," providing meat, fuel, clothing, and fishing floats.

✧ **An Eskimo Bow Drill Carves Ivory
Held in the White Man's Vise**

Oscar Ahkanza, Eskimo carver from Little Diomedé Island, steadies the drill with a mouth grip. In summer, Oscar sails to Kotzebue to fish, trade, and carve walrus tusks into cribbage boards, boxes, cigarette holders, bracelets, and umbrella handles.



the town, with its assortment of wooden buildings and cabins, finally took shape. Tents of the thousand visiting Eskimos, who gather here every summer from Cape Prince of Wales, Little Diomedé, coastal villages, and inland rivers to visit, trade, catch seals, and put up dried salmon, extended the village at each end.

The entire water front was lined with racks of drying salmon and strips of black, stringy meat that I mistook for eels.

"Beluga whale meat," an Eskimo informed me. "This is Eskimo chocolate."

Scores of morose-looking dogs were staked under the racks. A ventilating sea wind swept the village.

Many of the dogs were suffering what could only be described as a dog's life. Some were fed only every other day, and I saw few water cans set out for the wretched creatures.

An old miner left stranded on an Arctic stream when the tide of gold seekers ebbed, beckoned me into his tiny neat cabin. He had turned his hand to many jobs since he went over Chilkat Pass in '98.

"Interested in dogs, eh? Well, I'm an old dogteam musher. . . I always found it paid to treat dogs squarely, just like you'd treat any partner. When these ill-treated Eskimo dogs get tired, they'll quit; mine always carried on through a sense of loyalty and duty."

Good Times or Bad, Eskimos Smile

Straddling a stool in "Alaska's farthest-north cafe," I found prices about 220 percent higher than in Seattle. For dessert I strolled out into the tundra and picked blueberries.

Wandering along Kotzebue's water front, I could view the life of the town and acknowledge the heart-warming smiles of the Eskimos. These happy people baffled the airborne tourists arriving on Wien Alaska Airlines planes. The natives' cheerfulness especially confounds those who share the common belief that happiness stems from security, material possessions, and a kindly climate, none of which the Eskimos count among their dependable assets.

When a plane arrives, little girls grab up baby sister or brother or borrow a neighbor's child. Stuffing the infants into their mothers' oversized parka hoods, the enterprising girls promenade up and down the main street. Tourists all want to film the "little mother." The take of candy and gum is considerable.

Exploring the town, I found the editor of a new weekly newspaper, the *Mukluk Telegraph*, down on his hands and knees actually manicuring his tiny lawn with small scissors.

"This is the most northerly lawn in Alaska," he said proudly as he clipped another blade of grass.

The *Mukluk Telegraph* carries the Eskimo

version of a society page—belugas (white whales) harpooned, salmon netted, *umiaks* (large open skin boats) arriving and departing, berries picked, also all the scandal about the whites.

To maintain a steady flow of news from all points north to Barrow and south to Nome, the editor pays his Eskimo correspondents in precious dried salmon.

Beauty Contests, Eskimo Style

On July 4 the *Mukluk Telegraph* held a beauty show modeled after a Florida bathing beauty contest seen in a newsreel at the Midnight Sun Theater. Ninety-eight percent of the spectators were Eskimos. Whistling, smirks, and nudging were nil, for all the judges could see of most of the 21 contestants was pretty heads peeking out of the hoods of full-length fur parkas; so they judged the parkas, too. A full-blooded Eskimo girl in a reindeer parka won.

The Fourth of July fireworks at midnight were not a success. The sun was shining.

From Kotzebue our staunch vessel headed northward around Point Hope and Cape Lisburne for Wainwright and Point Barrow.

As we cruised along the open coast, Captain Salenjus kept a weather eye to seaward for the Arctic ice pack, which is never far off. The restless, grinding mass of billions of tons of ice, averaging 10 feet thick, covers 2,000,000 square miles of the Arctic Ocean at the top of the world like a white skullcap. Shifting constantly with winds and currents, the ice pack has trapped and crushed many ships.

"I don't want to see any more ice than will tinkle in a highball glass," one officer remarked.

"One of the secrets of ice navigation," the captain said, "is to keep the ice on the offshore side; then the worst the ice can do is shove you up on the mud."

Northernmost Town Under U. S. Flag

After a short stop at Wainwright we anchored off Barrow, northernmost town in Alaska. I counted 80 buildings on the low shore; they gave Barrow an impressive skyline for an Arctic community. Since the war, work on a U. S. Navy oil project has swelled the population from 363 to nearly a thousand.

Scores of Eskimos crowded up our gangway from launches, searching for the "cook's steward" to buy gum and candy. Looking down into one launch, I saw eager, upturned faces of 50 Eskimo girls, framed prettily in the fur ruffs of their parkas.

Navigation ashore was almost as precarious as at sea. Walking the town streets, I skirted numerous mud holes where the treads of giant tractors hauling freight on sledges to the hospital, school, and store had chewed down to



Eskimos at Barrow Swear to Defend Alaska Against Surprise Invasion

Aluts, Indians, and Eskimos in the Alaska National Guard form a human radar screen to scout and harass attackers until defenses are mobilized (page 86). "You don't have to teach these fellows much about using a rifle," says the Guard's Lt. Col. Marvin Marston (left). "They've been hunters all their lives."

the permafrost. Ruts were full of water. Only a little over four inches of rain fall annually at Barrow, but there is no runoff, evaporation is slow, and permanent frost prevents underground drainage.

I passed a lady balanced storklike on one leg while an amused Eskimo dug into the mud for her shoe and a galosh.

"Oh, this is nothing," he said. "In October we sink to neck."

Money Burns Holes in Parkas

The village cooperative store was crowded with Eskimo mothers carrying babies in their parka hoods. Store shelves were displacing the Arctic Ocean and the tundra as the source of Eskimo provisions. Inhabitants of Eskimo villages have been lured to Barrow by a modern version of a "gold rush," until the Arctic coast is practically abandoned.

At the Navy oil project just northeast of

Barrow, a number of Eskimos are employed at white man's wages. They operate tractors, bulldozers, cranes, and drilling equipment as expertly as if born to the work.

"We take in \$400,000 a year," the Eskimo store manager told me. "Our people spend their money as quickly as they get it."

A traveling saleswoman representing knitting mills in Logan, Utah, had struck it rich. Exhibiting her samples in a "fashion show" with Eskimo models after a gangster movie at the local cinema, she viewed without enthusiasm a circle of unresponsive fur-clad feminine customers.

Suddenly one of them pointed and said, "I take that, and that, and that." The Eskimo woman had purchased a three-piece knitted ensemble costing \$135 without bothering to feel the cloth. The sales were on.

"But how will you clean your suit?" I asked the Eskimo.



Junior Swigs Canned Milk from a Bottle; His Beady Eyes Follow the Photographer

Eskimo babies ride on backs because mothers must keep hands free for chores. Wives cure skins taken by the hunters, tailor clothing and boots, do the cooking, and tend children. These *North Star* passengers return to King Island after a summer at Nome (pages 76 and 80-81).

"Oh, I send him to Fairbanks by plane," she said.*

Aside from a casual social note in the *Mukluk Telegraph*, no one in Barrow gives it a second thought when a group of Eskimo women charter a plane and fly to Wainwright for afternoon tea.

Every noon I ate muktuk with trader Tommy Brower, son of Charlie Brower, old-time whaler who left his ship, married an Eskimo, and lived for more than half a century at Barrow. Until his death in 1945, Charlie was known as "King of the Arctic."

"The younger generation is losing the slowly evolved culture based on hunting that enabled our people to survive in the Arctic," Tommy said sadly. "Why, our young people don't even know how to dress warmly! And they ridicule as old-fashioned the older people who could advise them wisely."

To round out my northern voyage, I cruised

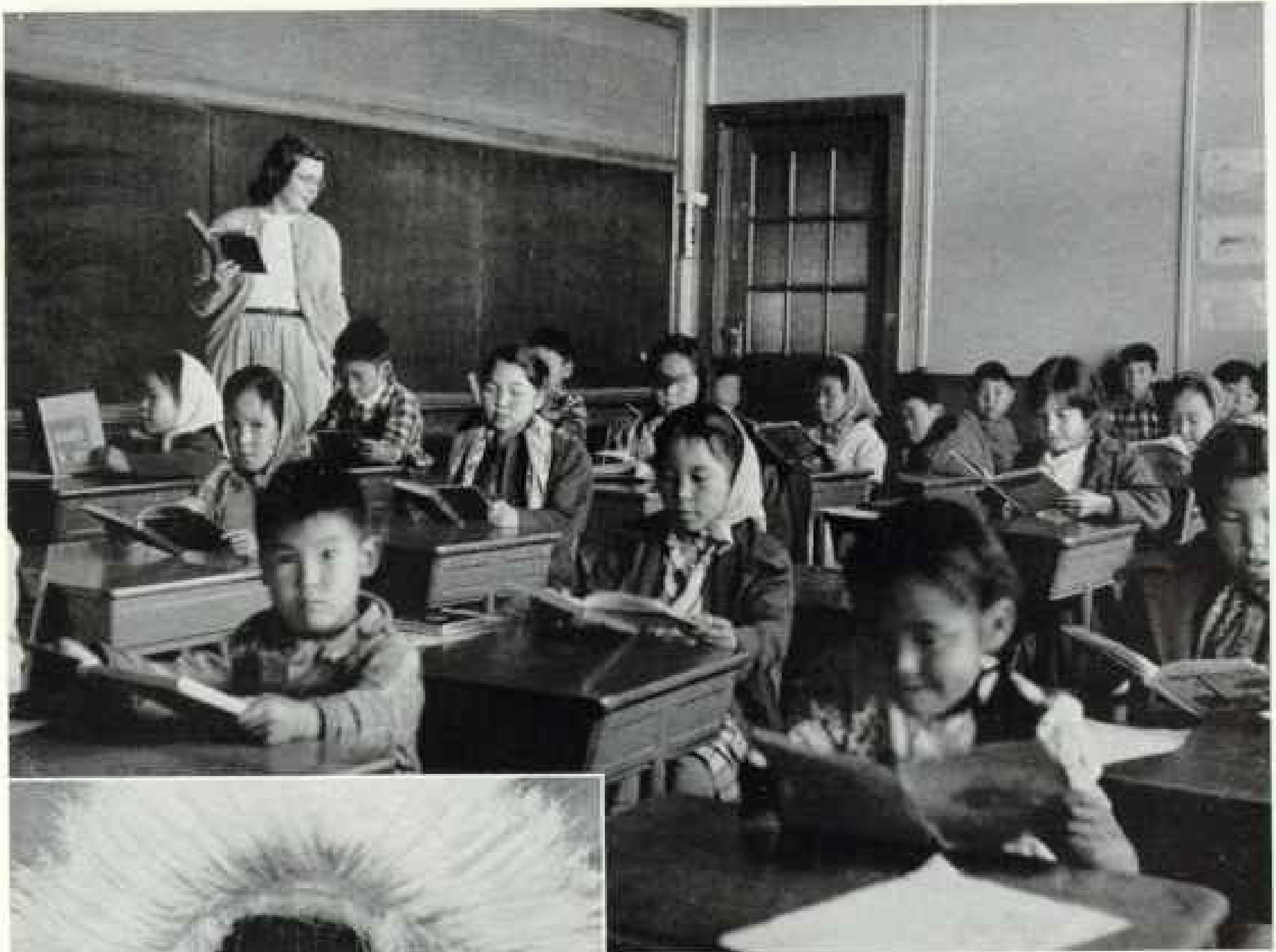
poleward in a chartered Eskimo launch. After bucking a chill Arctic wind, we landed on the low, curving sand spit that marks the northernmost reach of Alaska. A snowy owl rose noiselessly from scattered bones of huge bowhead whales that suggested to me some battleground of prehistoric monsters.

Eleven Weeks of Midnight Sun

Sole occupant of that lonely spit was an old Eskimo sitting on the sand behind a cloth blind, scanning the sky for ducks. I walked over and received a big Eskimo smile for some cigarettes and gum, an exchange in which I always felt I came out ahead.

For about 80 days in the summer the sun at this latitude circles continuously above the

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, October, 1949: "Nomads of the Far North," by Matthew W. Stirling, and "Busy Fairbanks Sets Alaska's Pace," by Bruce A. Wilson.



Books and Bubble Gum Spread New Ideas

Doris Anderson teaches 6- to 8-year-olds in the Unalakleet day school, one of 96 operated by the Alaska Native Service, a branch of the Bureau of Indian Affairs, U. S. Department of the Interior. The same agency owns and operates the *North Star*.

Forever blowing bubbles, this Nuniyak Island boy demonstrates that gum remains an irresistible novelty.

horizon. The stars are extinguished and the days undivided by darkness. Now late summer had given back the stars that sparkled in the arching vault of heaven. Northern lights danced in bewitching loveliness above the empty, silent tundra.

Ice Cake Serves as Water Fount

After discharging 3,500 tons of freight at Barrow, we began our southbound journey on September 6.

At Wainwright I saw the school's water supply—300 huge cakes of ice stored in a cellar dug deep in the frozen ground. Drinking water in the Arctic, instead of flowing from a faucet, trickles from an ice cake melting behind the stove.

When the schoolteacher asked his pretty wife if she was going out to visit the ship, she felt of her hair, glanced in the mirror, and replied, "I'm not ready; I'll go out next year," a contemplated visit just 12 months away.

At Tigara on Point Hope, 30 men of the village were away, working elsewhere, so the women and children did most of the longshoring (page 67). Teams of women toiled up the beach from the barges under 100-pound bags. One sack appeared to move on six legs as three little girls hustled it ashore.

When I went squishing off across the wet tundra, I found that early summer's exotic quilt of flowering plants was gone. But gone also were the clouds of hardy mosquitoes that incubate in fantastic abundance in the many tundra lakes and the round-the-clock sunshine of summer.

A strange sight here is the whalebone graveyard, fenced entirely with whalebone ribs; large bowhead jawbones mark graves of the greatest hunters. People who die during the winter are kept in unused cabins or caches and interred about the Fourth of July, when the thawed ground permits grave digging.

In a one-room house I visited, whalebone ribs formed the 25-foot-long entrance tunnel. Halfway in, a dog greeted me with an inhospitable snarl. A little boy of eight booted my toothy antagonist into a yelping retreat and invited me in.

I sat by the seal-oil stove in anticipation of a hot cup of tea. But the Eskimo woman who was my hostess, assuming all tourists to be antique collectors, ambled out and soon returned with a handful of the artifacts that natives are always scratching out of the ruins of the ancient village on Point Hope.*

On the beach, where 21 dog teams were now sledging supplies up from the shore, I noticed two Eskimo girls in finely tailored parkas of imported white rabbitskin. They watched the toilers like privileged aristocrats. There are no clothes-cleaning shops along the coast north of Nome, so I asked one of the girls how she kept her parka so white.

"I roll my parkas in oatmeal," she replied.

Possessions Pose Storage Problem

We anchored next off Kivalina, 65 miles southeast of Point Hope (pages 67, 68). Kivalina is a poor village, laid out as if somebody threw a handful of stones, then built a cabin where each stone fell.

When the ice breaks up about June 1, the natives move to summer camps along the beach, where they hunt ducks and seals, including the bearded seal, or square-flipper. They crowd into small tents, using the ubiquitous primus stove for cooking.

The Eskimo doubtless stored the simple implements of his primitive state with a semblance of order. Civilization, however, has so swamped him with gadgets and clothes that he usually solves the stowage problem by throwing everything into a miscellaneous heap at one end of his tent. The overflow is strewn, junk-yard fashion, outdoors.

Looking out over the bleak sea, soon to be covered by the returning ice pack, and upon the treeless, barren tundra, all seemingly bereft of any living creature, I marveled at the ingenuity and fortitude of the Eskimo, who

has wrested a livelihood for centuries from this grim setting. The Eskimo works with Nature, adheres to her laws, and is harmoniously adjusted. Above all, he possesses faith, believing as he burns his last stick of driftwood that there is more where that came from.

From Kivalina the *North Star* voyaged southeast to Deering, on the south shore of Kotzebue Sound (pages 66, 77). Many local Eskimos work in the gold-mining operations along the rivers that flow down the northern slopes of Seward Peninsula.

There were no gardens; Arctic Eskimos are food gatherers, not food producers. Racks red with drying salmon resembled immense necktie stands (page 64).

My young Eskimo guides munched constantly on candy bars; their teeth were badly decayed. When Eskimos lived on a meat diet, tooth cavities were almost unknown.

Two Continents in Sight

During the evening of September 14 the *North Star* coasted along Seward Peninsula toward Bering Strait, and early next morning I was roused for a sight that anyone would be lucky to see once in 20 voyages. A spectacular panorama of the 53-mile-wide strait lay before us: far to the right, the tip of Asia at East Cape, and to the left the westernmost reach of North America, Cape Prince of Wales. The Diomedede Islands lay between.

From the masthead I gazed for an hour on this scene, as our ship crawled over the dark waters toward Little Diomedede. The rugged headland of East Cape still held snow patches. All the visible land was barren of discernible vegetation. An Arctic tern flew down the chilly wind, and scoters threshed the sea.

This was the scene the great English explorer, Capt. James Cook, saw in 1778 on his third world voyage, when he became the first white man on record to sight the two continents at once. A year later, after Cook's death in Hawaii, one of his captains returned to this region and described the scene:

"The weather becoming clear, we had an opportunity of seeing, at the same moment, the remarkable peaked hill, near Cape Prince of Wales, on the coast of America, and the East Cape of Asia, with the two connecting islands of Saint Diomedede between them."

Sweeping wide of shoal waters, we steered for Cape Prince of Wales. We anchored off Wales at noon. Here 35 tar-papered shacks, a few government buildings, and an airfield make up the westernmost mainland settlement in the Americas. Wales sits under

* See "Discovering Alaska's Oldest Arctic Town (Ipiutak)," by Froelich G. Rainey, NATIONAL GEOGRAPHIC MAGAZINE, September, 1942.



A Ride on *North Star's* Elevator Is Never Dull; the Air Is Always Fresh

Lacking good docking facilities north of Dutch Harbor, the ship usually anchors out beyond the shallows to transfer cargo. Three crewmen (standing) here ride the sling board up from the tug *Lucille* off Golovin. Eyes tightly closed, their seasick Eskimo passengers crouch (page 60).

a hill that allows it only one and a half hours of sunlight daily during midwinter.

Once ashore, I enlisted the company of an Eskimo and a Veterans' Administration employee, Bob Andrus, for a climb up Cape Prince of Wales. After two hours of rugged hiking we reached its summit, 2,300 feet above the sea. Far below lay the *North Star*, dwarfed by distance, and beyond reached out that remarkable view of Bering Strait, the Diomedes, and the snow-mottled slopes of Siberia, with North America's western tip under our feet (page 62).

Back on the beach, I noticed a bearded old Eskimo, with long hair sweeping his shoulders, contentedly puffing his pipe.

"What do you do?" I asked him.

"I play in M.G.M. film, *Eskimo*," he replied, squinting at me out of his one good eye. "I hunt walrus and polar bear here in Arctic for picture, then I go Hollywood and act, but very hot in fur parka. I see picture three times and watch me and hear my noise, too."

Modern Ways a Threat to Youth

Landing at Teller, I struck up a conversation with the tall young Lutheran missionary, the Reverend Otis A. Lee, who was hauling a fish net.

"Hunting and fishing," he observed, "called up the Eskimos' greatest energies. Their way of life developed an exceptionally fine people;



King Island's Stevedores Use *Umiaks* as Barges and Boulders as Piers

North Star's 300,000-odd items of cargo are so vital to isolated Arctic villages that she never fails to deliver them, no matter what the weather. Driven by outboard motors, two skin-covered umiaks here make the passage. Each 40-foot boat can hold 35 passengers or 26 oil drums.

its demands kept them from sinking into the lethargy afflicting some of the younger generation today. Relieve too much the toughness of Eskimo life and you break the strength and fabric of their culture."

Teller felt a flurry of excitement in 1926 when the dirigible *Norge*, built and piloted by Umberto Nobile, landed here after a flight over the North Pole with Lincoln Ellsworth and Roald Amundsen.

Under brilliant stars we sailed southward to Nunivak Island, lying off the coast between the Kuskokwim and Yukon Deltas.

An Eskimo launch came out to guide our tug and barge into the village of Mekoryok over a shallow, breaking bar. Its difficult ap-

proach kept Mekoryok primitive longer than most Eskimo villages.

Here, nine years before, I had made a film called *Eskimo Children*. I found my Eskimo actors quite grown up. Little Annie was now a rosy-cheeked girl of 16 (page 83). Her little brother Daniel became my guide.

Wood Replacing Sod for Dwellings

"When you here before, bring plenty gums," Daniel reminded me. "Mekoryok different. Now few barabaras, plenty lumbers."

This village of 156 persons indeed had many new wooden houses, but they had been jammed in between the underground barabaras and storehouses. Any empty space was turned over

to staked dogs, which offered a trying challenge to my long-established policy of keeping beyond biting range of all Eskimo Huskies.

Jack Oversize and Luke Shrimp

On a tour of the village I shook hands with David Sea Cucumber, Jack Oversize, Selma Small Kayak, Luke Shrimp, Moses Baby Seal, Nellie Smooth Work, and Zacheus Rising-with-Hand-Support. Since my visit the school-teachers had simplified many names, and I found myself being introduced to Smith, Jones, Brown, and Adams. However, each also retains his Eskimo name.

The men of the village were loading 898 reindeer carcasses aboard the *North Star's* barges from the new local freezing plant. The Nunivak herd is maintained at about 4,000 head.

The 76 Greenland musk oxen on 70-mile-long Nunivak present a hazard to Eskimos traveling afoot over the island.

"These musk oxen sometimes charge, and there are no trees to climb," I was told.

The musk oxen, at present roaming Nunivak undisturbed, reached the island in the mid-1930's after a 14,000-mile trip from Greenland via Norway, New York, Seattle, Fairbanks, and the Tanana and Yukon Rivers. They were introduced to form the nucleus of several herds to provide meat for the natives.

From Mekoryok we headed north to Nome, dropping anchor in its open roadstead.

This Bering Sea metropolis was born in 1899 amid boisterous and lusty goings-on, when gold seekers poured ashore by the hundreds and tents and buildings popped up like mushrooms. Saloons, dance halls, and gambling casinos ran wide open 24 hours a day. The stampede started when soldiers, wading barefoot in pools along the Nome beach, found yellow nuggets they recognized as gold.

Each fall the *North Star* transports King Island natives from Nome back to the cliff dwellings of their ancestral home in Bering Sea. From their summer encampment on the Nome beach the umiaks streamed out to the ship with cargo. Eskimo women were commuting back and forth to town in taxis, both for the ride and for last-minute shopping.

King Island Deserted in Summer

At sailing time, 147 Eskimos—men, women, and children—crowded aboard the *North Star* in number 3 hold and settled down with a nomad's adaptability (page 71). At 10 p.m. we lifted anchor and headed for King Island, 85 miles northwest of Nome.

Early next morning we dropped anchor off King Island, a mountain peak rising abruptly out of the sea. Its tiny village of Ukivok

perched at a 45° angle part way up the 700-foot cliff (pages 80-81).

This cliffside village had been deserted since June, when spring had unlocked the ice pack's wintry blockade and the Eskimos had left for Nome. Now the returning inhabitants were eager to get freight ashore and set up house-keeping again in their precarious dwellings.

Forgetting breakfast, I jumped into an umiak crowded with 25 natives and propelled by three outboard motors (page 75).

Bob McKay, area placement assistant of the Alaska Native Service, and I climbed to the edge of the cliff overlooking Ukivok. There a statue had been erected in 1938, representing Christ calming the waters. King Island appeared to be protruding its peak out of the bottom of a blue saucer edged by the horizon.

Siren Warns of Shifting Ice

Soon ice would close in and maroon the little colony for nine months. In winter, when the men are hunting walrus and seal out on the ice, a lookout is posted on the cliff. If the ice starts to break away, he sounds a siren warning the hunters to make for the island.

In a recent winter, ice carried three Eskimos out to sea. Two froze to death. Frozen toes of the third had to be amputated.

Down below, the umiaks shuttled back and forth between the toy-size *North Star* and shore. The village fast took on the appearance of a city tenement as clothes were strung out on the lines for airing and new radio antennas began to crisscross each other above the tiny houses.

A half-dozen dogs joined us. Although they had shifted for themselves all summer, they were sleek and fat from feasting on the gulls, auklets, puffins, murrets, and kittiwakes that nest on the cliffs. We watched them catch birds flushed out of the rocks and devour them, feathers and all.

The village houses, rising one above the other, were perched ingeniously and precariously on long poles. Two hazards menace the village—fire and the huge threatening rocks poised on the cliffs above that may loosen and come crashing down on the fragile dwellings.

For two days the Eskimos back-packed supplies up the steep, rocky paths to their homes, over a route that would have made a Tibetan nervous (page 82).

The young teachers we left behind here were graduates of Harvard and Vassar. Like many of the loyal teachers in the Alaska Native Service, their ideal was to be of real service to this Eskimo community. This, their second year on the island, promised to be both joyous and trying. Sometime after New Year's,



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Kodachrome by Anne Berg

♣ **Eskimo Youngsters "Go Un-Native"
in Boots, Jeans, and Plaid Shirts**

Caps round out the "new look" beside the Inmachuk River at Deering. Pure water is at a premium along such low-lying, ill-drained shores. Settlements contaminate local wells and streams. Safe water often is at an inconvenient distance—six miles from one town.

♣ **Alaska's Long Summer Days Grow
Cabbages Big as Boys**

Gardeners at Unalakleet also raise potatoes, carrots, turnips, and lettuce. Soil made fertile by years of improvements makes the town a truck-garden center. Traditionally food gatherers rather than growers, the Eskimos formerly lived chiefly on the sea's yield.





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To the Airplane—As to Two of Its Victims—Alaska Pays Fervent Homage

In remote reaches of the Territory, natives who have never seen automobile, ship, train, or even a horse, accept the airplane with nonchalance bred of familiarity. Eskimo women, momentarily affluent, think nothing of a short air hop to a neighboring town for tea.

The airplane has compressed Alaska's vast distances. Regular airlines link areas once served only by pioneer bush pilots.

Perhaps nowhere else on earth is internal travel and shipping so preponderantly airborne as in underdeveloped Alaska. For colorful dog teams, long-distance hauling is a thing of the past.

Thomas A. White, a bush pilot, here refuels his plane beside an Arctic lagoon near Point Hope.

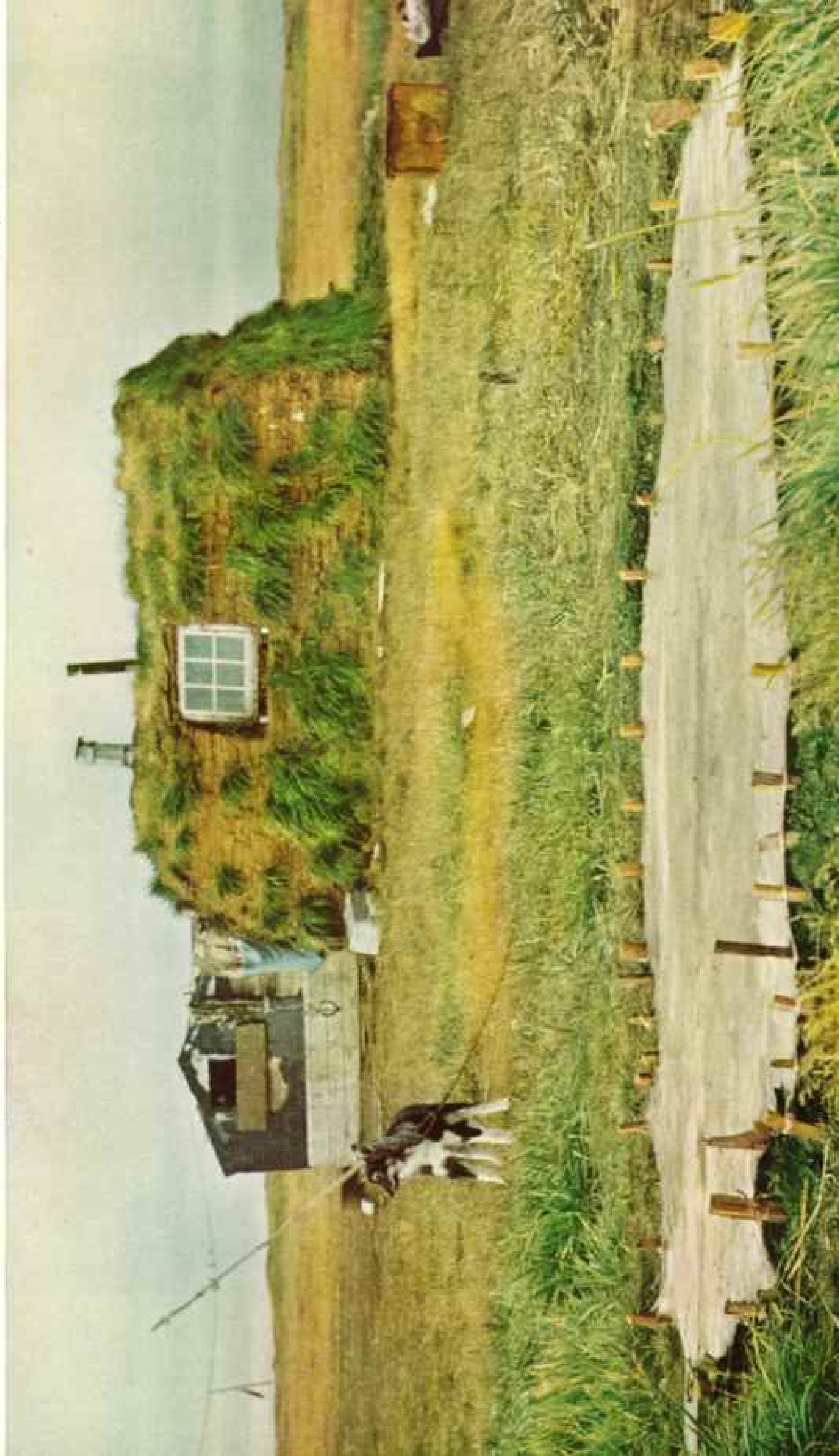
← Eleven miles southwest of Barrow stands this monument to the American humorist Will Rogers and the famous flyer Wiley Post, killed in a crash near this spot on August 15, 1935.

Where the Arctic Circle Is "Down South," the Grass-grown Sod House Provides Snug Shelter.

Most of the thick earthen blocks that shield this Eskimo's wood-frame house at Point Lay came from the pit that drops the interior partly below ground surface. Storage wing needs no turf overcoat. Skins of bearded seals, like the one pegged out to dry, cover *umiaq* (skin boats) or make fine mukluks, the native boots.

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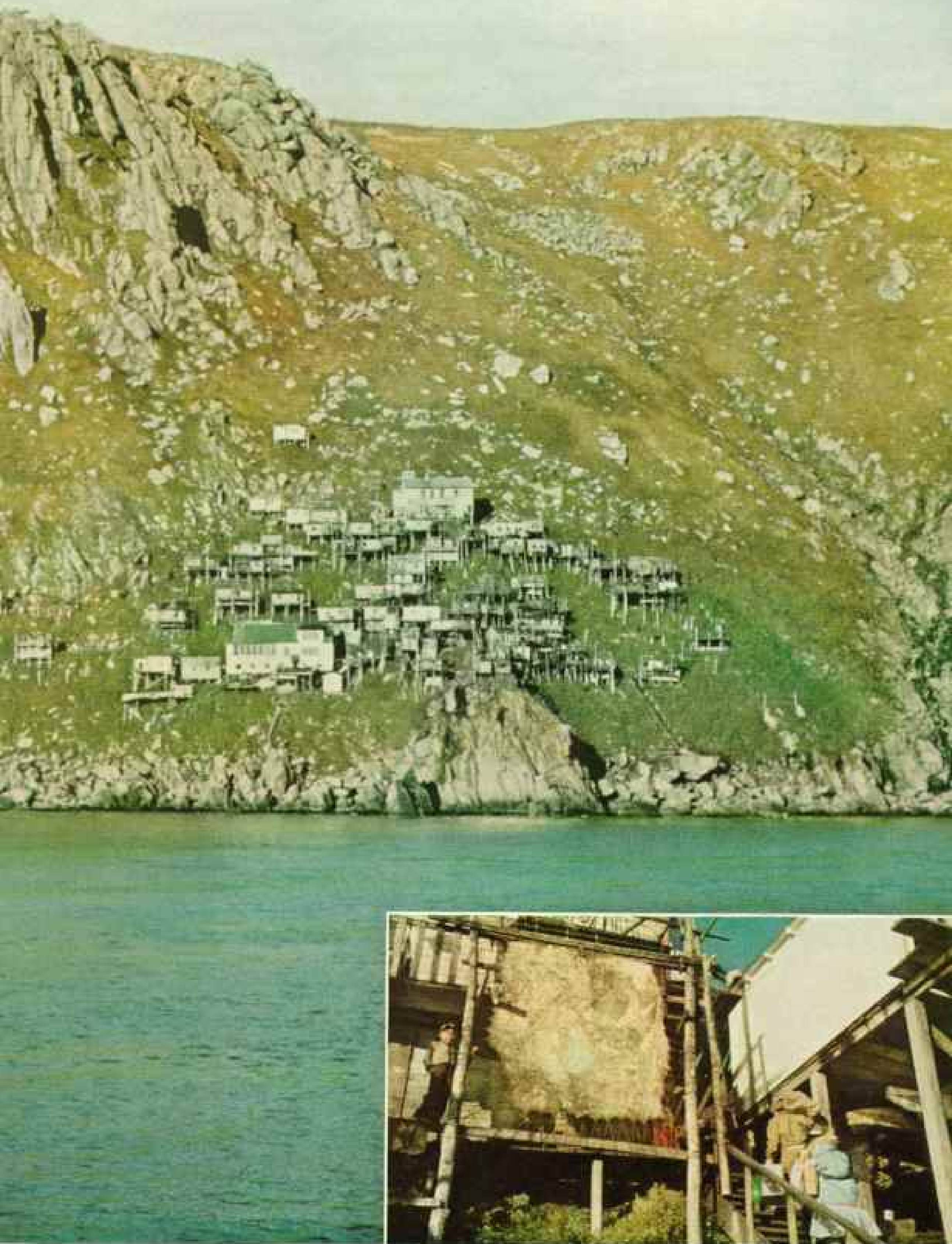
Reservations for Arctic Barge





Fractured Granite Ribs Thrust Raw Ends Through the Steep Flanks of King Island

A clear day is a lucky freak in the mile-long rock's usual weather cycle—four months of fog and eight of ice. King Island lies off Seward Peninsula, near the south end of Bering Strait. An umiak heads for the landing place below the left edge of the village.



Ulkivok Village Perches Precariously, Stiff Legs Braced to Keep from Falling

About 150 Eskimos accept an uncomfortable living angle, and the threat of fire and tumbling boulders, to take advantage of excellent walrus hunting on winter's surrounding ice. The upper large building is the town's church, the lower its school. Inset: A walrus skin dries beside a staircase "street."



© National Geographic Society

Happy Confusion Reigns as King Islanders Receive Their Rugged Home

Bags, boxes, and youngsters crowd the bouldery beachhead (pages 80-81). Each fall the *North Star* brings island folk back from a summer spent at Nome selling ivory carvings, fishing, trading, and longshoring. The dogs, left behind at the summer exodus, grow sleek and fat on abundant birds and their eggs.

A woman totes a heavy box up to her cliff dwelling on stilts. All poles and lumber come from the mainland; King Island is treeless.

A lookout, posted on the cliffs, blows a siren to warn walrus hunters off the ice when it starts to break away from the shore. Lacking other fuel, islanders burn seal and walrus fat. At the time of the author's visit, King Island's man-and-wife teacher team were Harvard and Vassar graduates. They expected their first child, without benefit of doctor, in midwinter.



★ Annie (Left), a Cover Girl at Seven, Enjoys Reading about Herself at 16

In 1941 the author filmed the life of an Eskimo family at Mekoryok, Nunivak Island, Anaghlook (Annie), then seven years old, was the heroine; she appeared on the cover of the book made from the film, sucking a peppermint stick. Mr. Burg brought copies of the book to Mekoryok in 1953.

Wolf and wolverine fur forms neck ruffs of the girls' parkas. Native fashion dictates two parkas—an outer parka of bright cloth over the fur or bird-skin parka, which for greater warmth is worn with the fur side next to the body. Jests the author: "Maybe Eskimos laugh so much because they're tickled all the time!" Actually, the modern Eskimo girl usually wears additional fabric underclothing.

★ Great-grandmother Mrs. Lee Antonio of Elim, past 90, faces life with a grin. Chin tattoo marks, no longer fashionable, used to indicate maturity. Her utility basket is made of woven beach grass.





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Photographs by Ann Dora

♣ **City-bound Students Cheerfully Face
One to Four Years Away from Home**

These Eskimo pupils, flanked by teachers, are ready to sail from Gambell, St. Lawrence Island. At the Mt. Edgecumbe School near Sitka they will learn high-school subjects and acquire special skills useful in earning a living in the Far North.

♣ **Their Pay Is Peanuts, but What
More Could Hungry Youngsters Ask?**

Cecil Cole, second officer of the *North Star*, hands out the delicacies to Eskimo lads and lasses who fetched and carried for him while erecting fuel-oil tanks for the school at Point Lay. Eskimo children, though seldom disciplined, are helpful and enthusiastic.



although cut off from all medical aid, they expected to welcome their first child.

Late in the evening of October 5 we left King Island, reaching Little Diomedede Island early the next morning.*

Lying in my bunk, I felt the heavy shaking as the *North Star* went astern, then heard a short whistle blast and the muffled rumble as the ship disgorged her anchor and chain. In the sudden silence that followed, crewmen's shouts echoed faintly.

I hurried on deck. Siberian Big Diomedede could be plainly seen across the 2½-mile-wide strait through which runs the U. S.-U. S. S. R. boundary along the International Date Line. The day was Friday, but a few hundred yards to the west, in Soviet territory, it was Saturday.

Slingloads of Eskimos were dropping over the ship's side into waiting umiaks. I piled into one which was already packed with chattering natives. We cast off, but the motor wouldn't start and a cold north wind began to blow the umiak through the Iron Curtain from Friday into Saturday. Fortunately, just as we reached Russian waters, we got the outboard started.

As we landed in rough breakers on Little Diomedede, all the Eskimos worked with enthusiasm—except one. This individual had been "outside" to Texas and California where he had acquired some very un-Eskimo ideas.

"I won't help with personal baggage," he smirked. "I wait for freight. Money paid, haul freight."

Seal-oil Lamps with Moss Wicks

The steep village paths were paved with flagstones. Ugly, snarling, wolfish-looking dogs disputed every trail.

An Eskimo invited me to visit his underground barabara home, and I crawled after my host through a two-foot-square hole. It led into a snug room heated by two seal-oil stone lamps burning brightly from moss wicks. Walrus gut, stretched thin, covered an overhead skylight 14 inches square. I had shivered in too many frame houses in the north not to appreciate this cozy Eskimo home.

I was eager to meet some of the natives held captive by the Russians on Big Diomedede in 1948. Seventeen Eskimos from Little Diomedede had sailed over to Big Diomedede to visit relatives and friends and trade as they had done since time immemorial.

Russian officials met the group and kept them captive in a small, cold, poorly ventilated room for 50 days. Fed twice daily on soggy bread and fish soup, each Eskimo lost 15 to 20 pounds. Some were forced to stand all day answering questions asked by relays of interrogators.

I spoke to one of five old women in the party. "After many days they let us go," she said, "and we came home weak and sick and very tired. We did not like visit and never want go back again."

Last summer the natives observed a Russian supply ship visiting Big Diomedede. They said the Russians kept lookouts on the island in summer and on the ice in winter.

As the King and Diomedede islanders have not been lured elsewhere by steady employment, they have developed into fine artists as ivory carvers (page 68). The walrus, source of their ivory, has been reduced in numbers almost everywhere in the Arctic, but here, luckily enough, it is still plentiful.

The total income from Alaskan native arts and crafts was only \$39,000 annually before the war; now it amounts to about \$150,000 every year. This increase is due largely to the efforts of the Alaska Native Arts and Crafts division of the Alaska Native Service.

Siberian Eskimos Come No More

From Little Diomedede we chugged southwest to Gambell on St. Lawrence Island. The great white mountains of Siberia loomed in wintry desolation 40 miles to the north.

Bound shoreward in a whaleboat, I noticed an Eskimo climbing over the cargo toward me. He asked me if I was a member of the National Geographic Society; he wanted to be recommended for membership. While flying spray beat a tattoo on the sealskin he held over me, I wrote down Simon Tatoowi as a nominee for membership in The Society.

Most of Gambell's population was on the beach watching the freight being landed (opposite page). I asked an Eskimo if he knew my friend Otto Geist, who had spent three years on St. Lawrence Island as archeologist for the University of Alaska.

"Otto, he live like us and eat our food," the Eskimo said with a note of pride.

I asked another native the same question. "Otto live with my family for two years," came the answer. "He hunt with us and eat walrus just like native."

Plainly, Otto had learned how to make friends and influence the Eskimos.

John Apangalook, secretary of the local council, told me about contacts with Siberia.

"Before the war we were friendly. Both peoples visited back and forth many times. Last time Siberians come was 1947, when they stay five days and help Gambell people celebrate Fourth of July.

"We had racing, jumping, and wrestling contests. Gambell people win all the time.

* See "Alaska's Russian Frontier: Little Diomedede," 18 photographs by Audrey and Frank Morgan, NATIONAL GEOGRAPHIC MAGAZINE, April, 1951.



A Doctor from *North Star* Makes the Rounds at Each Port of Call

Mary S. Sherman, an orthopedic surgeon from University of Chicago, examined this patient on St. Lawrence Island. Clara Gaddie, the ship's nurse on the 9,000-mile voyage, packed 200 teeth with temporary fillings, extracted 50, and made X-ray examinations. Eskimos marveled at nurse's ability to see everything "inside."

We speak with them little, because we think their Russian officers had taught them bad feeling for our country."

Last Fourth of July, John told me, the Eskimos won the tug-of-war against the Army and Coast Guard boys stationed in Gambell.

"The soldiers tell Eskimos we win because we eat blubber," John said. "Natives tell soldier and Coast Guard boys they must eat more Wheaties and build up to beat Eskimos."

During the war, Joe E. Brown, the comedian, while on a USO tour, was stormbound in Gambell overnight and entertained the natives. Because he plainly liked them, they took an instant liking to him. The Gambell council thereafter proclaimed March 18 "Joe E. Brown Day" and a public holiday. There is no school that day; the men lay aside their sealing guns, and the children get bubble gum.

"We, the council of Gambell, St. Lawrence Island," reads the islanders' proclamation, "say and make rule that every March 18 must be holiday called Mr. Joe E. Brown Day, because he make happy this day. All works

should stop and we think about March 18, 1942, when Joe E. Brown and many very good men came to this island."

Guns for Eskimo Guardsmen

Unloading in Gambell took several days, because of rough weather. Once, as a long wooden box was lowered into a whaleboat, the Eskimos bubbled with excitement.

"Our guns!" they shouted. Then one turned to me, explaining, "We are all members of Alaska National Guard."

Here, at one of the northern outposts of our continent, alert Eskimos stand watch at our first line of defense (page 70).

As we plunged southward toward the Aleutian passes, the Pacific Ocean, and home, I stood at the *North Star's* rail, recalling the adventures, encounters, and comic relief of two months and 9,000 miles of cruising amid northern mists and gales. Above all, I felt deep appreciation for the opportunity I had enjoyed to witness the courage, skill, and cheerful willingness of Uncle Sam's Eskimo citizens.

Over the Sea to Scotland's Skye

Bagpipes Welcome Devoted Highlanders Home to the Moors
and Hills of the Hebrides' "Misty Isle"

BY ROBERT J. REYNOLDS *

THE MAN at my right was having trouble with his eyes. It was a high and handsome day, and the water curled back from the bow of the boat with no spray whatever. Yet he dabbed at his lids now and then with the sleeve of his tartan jacket, as if some mist had formed between him and the rocky cliffs ahead.

"That will be Skye," he said gruffly. "A good sight."

It was, surely. We were crossing from Kyle of Lochalsh on Scotland's west shore, and the sun glowed on the heather-clad upland moors of the Hebrides and on the cobbled streets above Kyleakin, the nearest port. Benign and fair, Skye bid the wanderer welcome.

On such a day it was not hard to understand the devotion that Skye breeds in its inhabitants and the longing that it instills in its exiles. Yet I knew that if we had been approaching *Eilean a Cheo*—the "Misty Isle"—in winter, we could have expected a greeting far different, wild gusts of rain hurtling down from the mountains or wind-driven sleet flailing the pitch-black waves around us.

Even in summer we might more confidently have expected a drizzle or a sudden squall than this bland and cheerful weather.

I knew, too, that life ashore on Skye was not something easily sentimentalized. Here, if one looked at it coldly, were only weary wastes of mountain and moor, the ceaseless noise of an inhospitable sea, starved crops that the winter may find half ripe, a perpetual struggle with a niggard soil.

Nevertheless, I could read in the moist eye of my companion, and in the island's history, evidence that its attraction embraced and overcame all these shortcomings. The sons of the Hebrides are scattered the world over; their memories hold fast to these hills. As one man of Skye, far off in Canada, once phrased it:

From the lone shieling of the misty island
Mountains divide us, and the waste of seas;
Yet still the blood is strong, the heart is Highland,
And we in dreams behold the Hebrides.

The MacLeod of MacLeod

For some, of course, dreams are not always enough. Returning with me this day on the ferry to Kyleakin were Scots from the farthest parts of the globe, gathering to celebrate Skye Week with piping and dancing and a deal of palaver (page 99).

I myself came with a cherished invitation

from a most remarkable woman, Flora, Mrs. MacLeod of MacLeod. The 28th chief of her clan, Mrs. MacLeod is the first woman to head this great feudal family, which traces its descent back to the Norsemen (pages 93 and 94).

I was to visit her at the clan's ancient fortress, Dunvegan Castle, "the hearth of the race." But first, through arrangements made by Mr. and Mrs. Donald Ross, National Geographic Society members in Skye, I would stay with the Sutherlands of Broadford.

Three buses were drawn up at the pier. I climbed into one marked Portree.

Bus Attuned to Island's Tempo

The bus was in no hurry to be off. A few passengers got aboard, but the driver only surveyed with calm detachment the unloading of the boat. Daily newspapers from Inverness, luggage, cartons of food, and sacks of mail slowly accumulated on the wharf.

A lady across the aisle took pity on my impatience. "I can see you're a stranger," said she. "You'll not be knowing the Gaelic *mo thogair*. It means, 'I don't care,' or 'It makes no difference to me.' And that's the operating principle of the buses of Skye, *mo thogair!*"

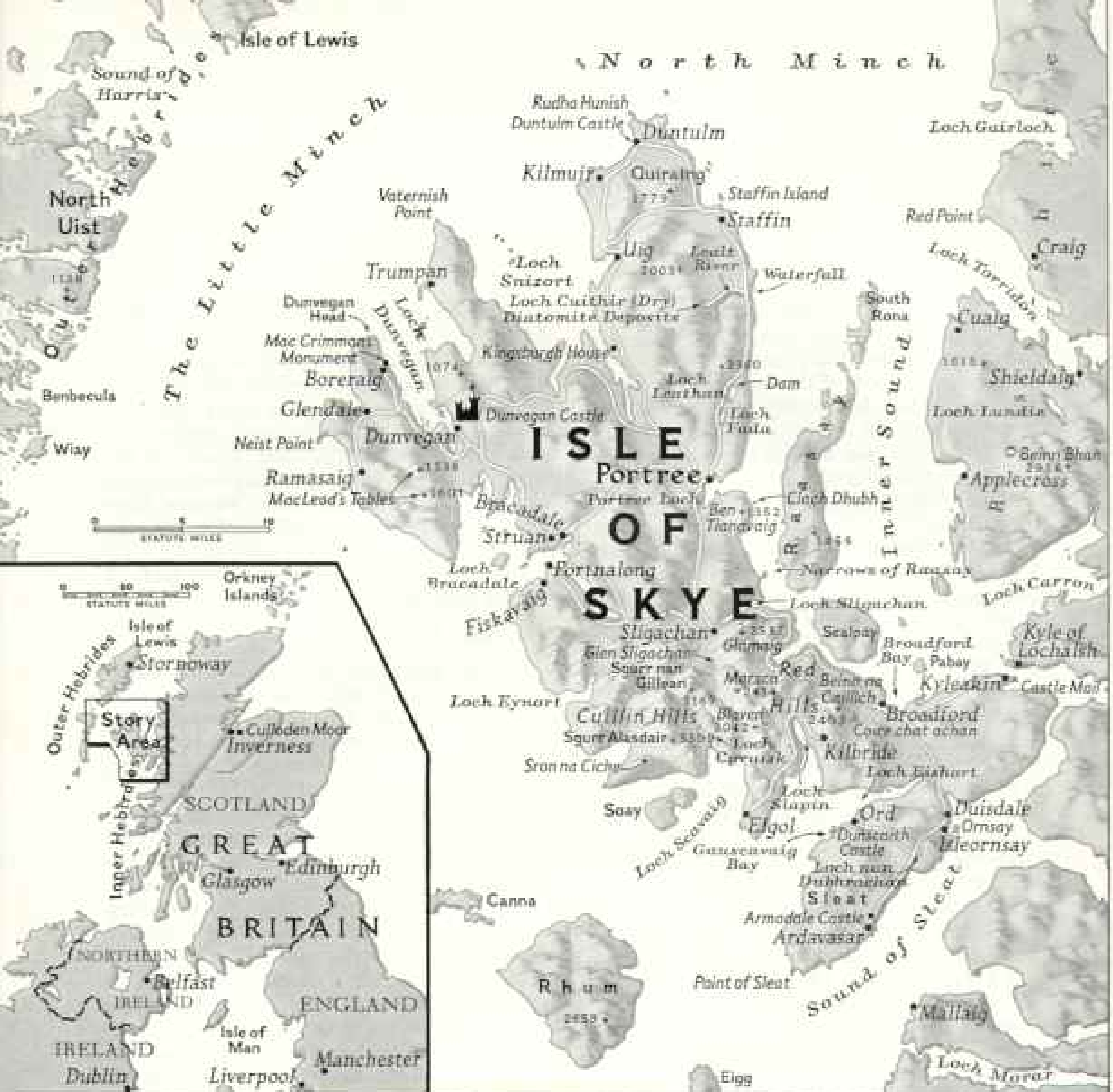
Finally, however, the driver, having assured himself that he had a quorum and that the cargo's discharge no longer needed his expert surveillance, climbed behind the wheel.

Jouncing along the shore, the bus took us past clean white cottages, some of them newly imported prefabs from Sweden. Above us we could make out the ruins of a citadel more in tune with Skye's romantic past, Castle Moil. Within its battlements—if you'll credit the legend—lived a Norse princess who levied toll on passing ships by means of a chain stretched across to the mainland.

She had reason to scan the sea; but no one in Skye can keep his eyes from it for long. The Atlantic's rough arms probe deep into the island's coast line at a hundred coves. Only 50 miles long, Skye has a shore line that measures well over 300 miles, and no place on the isle is more than five miles from the shingle (map, page 88).

I was favored with many a quiet view on this trip alone, for the bus ambled over the

* In the preparation of this article, the author has drawn with gratitude upon an account written for the NATIONAL GEOGRAPHIC MAGAZINE by George D. Valentine, late Sheriff-substitute of Skye and the Outer Isles of Inverness-shire.



Skye Dips a Dozen Jagged Arms into the Sea; One Almost Touches Mother Scotland

Infertile moors and hills support about nine head of stock for every human. Population has dwindled to below 9,000 (opposite page). Most residents speak both Gaelic and English.

countryside with the unhurried pace of a browsing cow. A dozen times the driver pulled up at some little cottage, got out, opened the rear compartment, and fished out some package for delivery to the door. At other spots, when the parcel was less fragile, he would slow down, sound the horn, and skim the bundle deftly over the gate.

Skye's the Limit in Hospitality

We came at last, however, to Broadford and the crag that surmounts it, Beinn na Caillich, "Mountain of the Old Woman." By the road near Park House stood my host, in clan kilt and tweed jacket, young Alasdair Sutherland. "Welcome to Skye," he said. "We thought

you'd be earlier, but the driver must have had more parcels than usual. Come along."

I had been told on the mainland that "Highland hospitality originated in Skye"; the Sutherlands convinced me it was no myth. They established me in a guest room with a glimpse of the sea, and, over tea and scones, they made me one of themselves.

The late-afternoon sun still lay warm on the heather, and I took off for a walk before supper. Across Broadford Bay stood the hills of Ross-shire on the mainland, and in the sound itself floated the flat island of Pabay, like a great green pancake. The scent of wild bracken filled the air, mingling with the pleasant smell of the peat stacks (page 110).



Visiting Dignitaries, Robed in Ermine, Lead Skye Week Marchers in Portree

Skye Week marks the annual home-coming celebration. Here the Lords Provost of Glasgow (left) and Stornoway head the opening-day parade. Clan Chief Flora MacLeod walks in the third rank (pages 93 and 94).

From where I stood, apart from the little cluster of stores and houses and churches which is Broadford, the land seemed quite empty. I recalled the time when statesman Joseph Chamberlain, aroused by talk in Parliament of overcrowding on Skye, came to see for himself. From Dunvegan he was driven toward Glendale, and for nine miles he passed neither a house nor a human being. Said Mr. Chamberlain dryly: "I fail to observe the congestion of which complaint is made."

For all that, I knew Skye was congested then, and it's congested now. Wherever there's a bit of arable land, cottages huddle together, each with its sparse plot, a few ridges of potatoes, some thin oats, a little field of hay.

It's not an easy life they lead, the crofters. On only about 30 square miles of cleared land and 540 square miles of rough pasture live some 2,500 of these farmers and their families. The typical crofter tills a plot which often comprises only two acres and rarely more than 25. His livestock feeds on moors owned by the community, supervised by a common shepherd.

Young Men and Women Drift Away

It's not odd, then, that Skye's population should have been slowly dropping. Since 1841 it has slipped from some 25,000 to fewer than 9,000. The sad saying in Skye is this: "Our imports are various; our exports are young men and young women."

Walking home again to a Highland supper of bacon and eggs, hot tea and cakes, however, I had no eye for hardship and no ear for anything but the liquid note of the cuckoo. The birds seemed all about me.

"Do they come each year like this?" I asked a friend of the Sutherlands at dinner.

"Always. That's how we know that spring is here."

"I suppose," said another guest, "that Wordsworth had Skye in mind when he wrote those lines. Remember them?"

... the Cuckoo-bird,
Breaking the silence of the seas
Amongst the furthest Hebrides . . ."

We talked of the birds a while, and then the conversation veered around to the *ceilidh* (pronounced "kaylee"), which is Gaelic for a sort of social evening among neighbors. I was to go to a *ceilidh* after supper, down at Broadford's Community Hall, and I wanted to know what to expect.

"Oh, it will be grand," said a friend up from Edinburgh. "But not like the old *ceilidhs*, the ones that used to be held, just as a matter of course, in one cottage or another. The neighbors would drift in to gather about the hearth, you know, and the peat fire would be smoking, and the stories and jokes and riddles would go round, until everyone was gay and sleepy and then gay again."

We went down anyway to the *ceilidh*. Perhaps it was not as it had been, but it was lively beyond a doubt. For three hours, to the thump and tootle of Broadford's *ceilidh* band, MacLeods, MacKinnons, MacDonalds, and Campbells danced and sang.

I stumbled back to the Sutherlands' by the midnight sun. I raised my hand to knock, and then remembered that neither locking nor knocking are done in Skye. To friend or stranger, Skye's doors are open, literally as well as figuratively.

The MacDonalds Move South

From Broadford I sallied out to inspect the region of Sleat, the Garden of Skye, as it is called. Here, on the southern end of the island, the grass is greener, the flowers more profuse (page 111).

I could sympathize with the MacDonalds. They had had a castle on the northern cape of Skye—Duntulm—where, as Lords of the Isles, they had lived for generations. On the rocks below they had drawn up their galleys by keel-fitting grooves cut in the stone, and in the great house on the cliff's brink they had feasted and fought, well into the 18th century. But Duntulm faces the winds of the Arctic Ocean. The MacDonalds moved south.

Near the new castle which they built on the Sound of Sleat at Armadale is a village called

Ardavasar. It is typical of Skye that the origins of the first town's name should be Norse and of the second Celtic. For the Norsemen held Skye for many years, and it was a Celtic warrior, Somerled, who captured it from them. Both groups have left their mark on Skye and its people.

According to one of several theories, the name of Skye itself may be derived from the Norse *sky*, meaning "cloud," and *ey*, meaning "island." Islanders speaking the name seem to give the lightest flick of an accent to the final "e"—so faint that it is hard to tell whether one really hears it or not.

Lair of the Kelpies

Eloquent of Skye's past is Dunscaith Castle, on the wild bay of Gauscavaig. Here came the legendary Cuchullin of Ireland, to learn the arts of war from its chatelaine, the doughty Queen Scathach.

Dunscaith is in ruins now. We drove past it by a body of water that seemed dark and foreboding.

"That," said young Sutherland, "is Loch nan Dubhrachan, 'Lake of Darkness.' Of all the haunted lochs of Skye, I think this was the most feared."

"Just because of its color?"

"No," he said. "Because a kelpie used to come out of the water and drown passers-by."

"And it doesn't any more?"

"I believe the statistics show a marked decline in kelpie casualties!"

Downhill from this lair of the wicked water-horse lay the little settlement of Isleornsay.

"The Norse," said Sutherland, "called it Ebbtide Island."

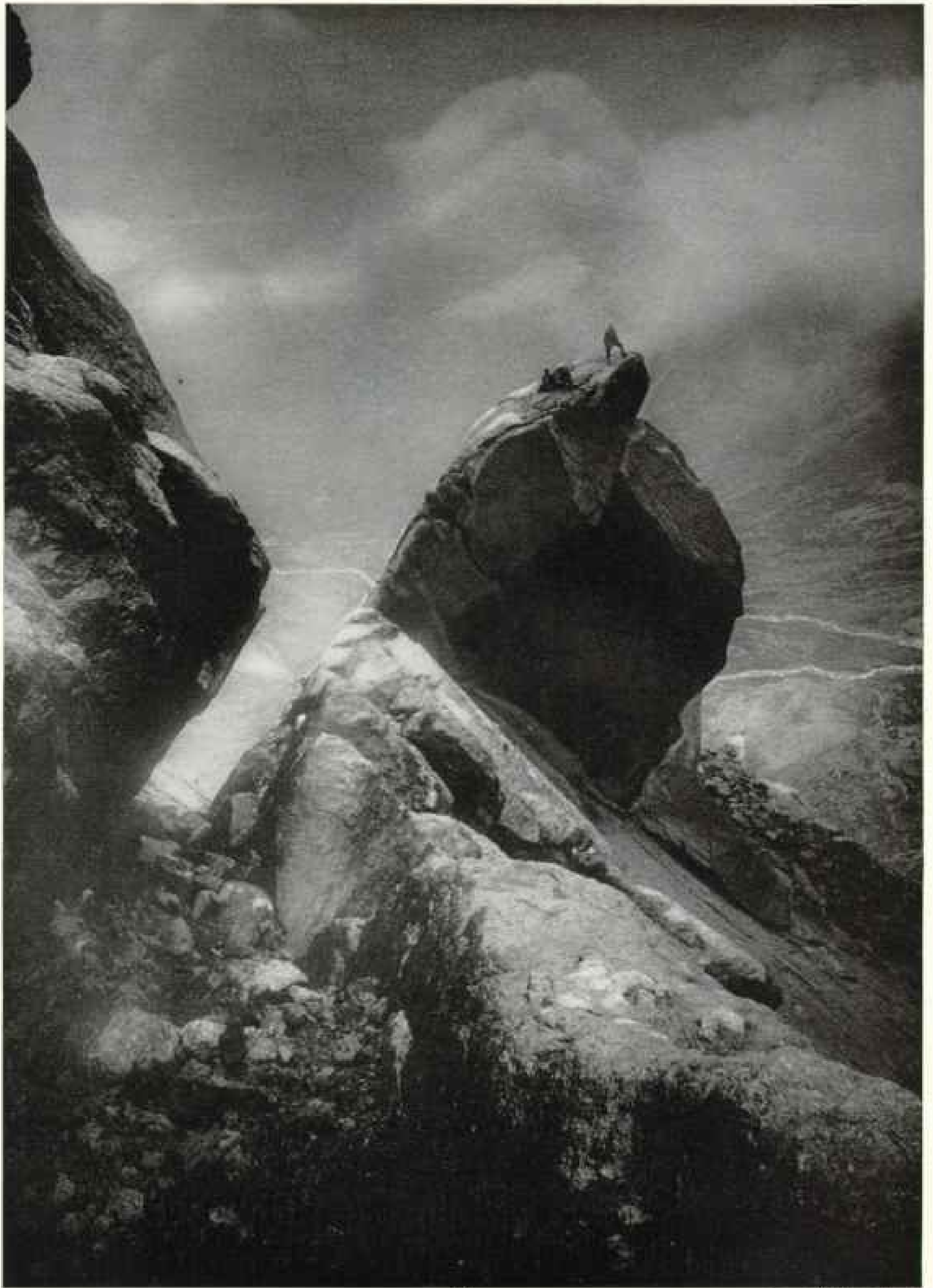
It wasn't hard to see why—at low water a causeway joins it to the mainland. Against the green countryside, its white-walled lighthouse stood out sharply, a reassuring sight, I suppose, for craft navigating the tricky tide-waters of the sound.

Next day the Sutherlands showed me more sea and mountains. A special concession it was, too, for this was the Sabbath and not lightly broken or even bent in the Highlands. Other Skyemen were trudging off to church at the sound of the parish bell. Dual services awaited them, one in English at 11 and another in Gaelic an hour later.

Boswell's "Morning After"

In the name of hospitality, however, I was taken for an outing by car to Loch Slapin.

On the way we saw the MacKinnons' ancient farmstead, Coire chat achan, or "Caldron of the Wild Cats." In ruins now, the farm gave welcome in 1773 to a pair of distinguished travelers, Dr. Samuel Johnson and his Boswell. The doctor, it appears, got a decent



Climbers on Skye's Rocky Thumb Watch Dark Mists Roll By

Rugged Cuillin Hills attract many climbing parties (page 106). This pinnacle rises from the face of Sron na Ciche, a precipice famed for its difficult ascents.

night's rest, but Boswell occupied himself with the drinking of four bowls of punch and didn't reach his bed till 5 A.M. Reproved by Dr. Johnson next day, Boswell replied somewhat stiffly, "Sir, they kept me up."

But for the macadam, I doubt our road had changed much since Boswell's day; it still roamed through fenced pastures and belonged more to the sheep than to mere machines.

On Loch Slapin's rocky shore we found a bit of green turf here and there upon which to spread our blankets, and, while the Sutherland children skipped stones across the water and ran foot races, Alasdair talked to me of mountain climbing in Skye.

The island's mountains are not phenomenally high, he pointed out, but they are so rugged that climbers come from all over the world to test their skill (pages 100 and 104).

"You've climbed a lot of these peaks?" I asked Alasdair.

"A fair number."

"Wouldn't it be a good idea to put a notch in your walking stick for each of them?"

He laughed. "I'm afraid there'd be some of us with sticks whittled down to the size of a lead pencil."

We sipped our tea. Somewhere a lamb bleated for its ewe. Lake water lapped against the shore. Before us the green and peat-brown folds of the land stretched like a checkered carpet to the hills, and the sun danced on the children at play. Yet, already, mist was creeping around the great crag of Blaven.

"That's the danger," said Alasdair, pointing to the lofty, tattered fog. "A chap gets up on a cliff like that, and then the mist rolls in, and it's no joke whatever to get down. Still, you must give it a try. Go up to Sligachan."

"And what's Sligachan?"

He told me. Sligachan, it appears, is a village set in a glen that separates the Cuillin from the Red Hills, and in it stands an inn known to every mountaineer in Great Britain, and beyond. From this hotel, cragsmen can assault the Red Hills, Glamaig, and Marsco, and the jagged walls and spires of the Cuillin themselves (pages 91, 99, and 106).

Up Goes the Caber at Portree Loch

But the Highland Games to be held next day at Portree were more to my taste. Alasdair drove me over to the island's "capital," and we initiated Skye Week together.

A parade of tartans was forming in Somerled Square when we arrived (page 98). Heading the line of march were the Lords Provost of Glasgow and Stornoway in their robes of scarlet (page 89). Behind them came the clan chiefs and other dignitaries, to the skirl of hundreds of pipes, and after them rank upon rank of townspeople and home-coming Scots.

The procession set out shortly for the natural amphitheater on the cliff which rises from Portree Loch. There would be Highland dancing, contests among the pipers, foot races, and the traditional tossing of the caber—the big Gaelic beam which only a brawny man can handle at all (page 107).

The games had all the fun and informality of a Sunday-school picnic. For hours they went at it, children and adults, tartans flashing on the greensward, hammers and cabers thudding into the turf, pipers marching up and down with the apparent intention of deafening their competitors and stunning the audience (page 108).

At any other time but Skye Week, the little harbor town of Portree comprises only about 1,000 souls. To the islanders, however, it is a metropolis. Typical of their respect for the "Port of the King," which they named it after James V's visit in 1540, is the stubborn assertion of the old lady who had left Skye to marry a diplomat and live in all the great cities of Europe. Not one of them, said she, impressed her half so much as her first sight of Portree as a girl.

Whole Town Meets the Mainland Boat

To the more callous mainlander, Portree consists of a row of whitewashed houses along the shore, another at the top of a steep bank, and behind it a few streets, a courthouse, some banks, and hotels (page 101).

Yet, if its "Main Street" lacks magnificence, it does not lack influence. To the crofters round about, the counsel and advice of a shopkeeper of Portree, and such comments as he may care to throw in about the state of the world, are to be listened to with respect.

To crofter and shopkeeper alike, the big event of Portree's day is the arrival of the steamer from the mainland. Down at the pier gathers the whole town, the boys in front. In the great rift between the headlands, the red and green lights of the steamer appear as it creeps round the base of Ben Tianavaig and past Clach Dhubh, the "Black Stone." Splashing and panting and sweeping about in a huge circle, the little boat finally gets itself attached to the jetty.

Off come the passengers. If there are sheep aboard, they take precedence, scampering onto the wharf with a soft patter of frightened feet. Then come the tourists, who matter only to the hotels, and the natives, whose affairs are matters of intense and public concern.

Mail is disgorged next in amazing quantity. Huge hampers of bread skid down the plank; carbonated drinks; sheep dip; the new minister's furniture; the Department of Agriculture's stallion—everything and anything but a hog. The Skyeman is firm on this. He



Clan Chief Flora MacLeod Lands at Borerraig for a Skye Week Ceremony

Each summer Scotland's "Misty Isle" calls its sons and daughters back for a home-coming celebration, festive Skye Week. Open house is the rule as families welcome returning kinsmen and friends. Many of the visitors are descendants of Skye emigrants. Islanders schedule a busy round of fairs, Highland games, and clan reunions.

Annually during Skye Week officials pay a memorial visit to the site of a long-vanished piping school at Borerraig. There, centuries ago, the MacCrimmon family taught Highland youths to play the bagpipe, Scotland's national instrument. MacCrimmon sons served as hereditary pipers to the MacLeods, a clan which traces its ancestry back 1,000 years to the island's Norse settlers. Flora, Mrs. MacLeod of MacLeod, succeeded to the clan chieftainship after the death of her father in 1935. She is the first woman to hold the office.

Here island leaders greet Mrs. MacLeod before marching to the school site. Bagpipers skirl a welcome. The launch brought the chief from her near-by ancestral home, Dunvegan Castle (page 96).

A Piper Leads Clan Chief MacLeod and Her Party to the School Site

Clan chiefs, though honored by custom, have lost some of their old-time power in Scotland. Their jurisdictions were abolished by King George II in 1747. Prior to that time, many large clans had hereditary bards, armorers, and pipers—men trained from infancy to follow their fathers in the service of a chief.

The MacCrimmons, retainers of the MacLeods, were Scotland's most celebrated pipers. They composed many classic bagpipe melodies during the 16th and 17th centuries. Their school at Boreraig offered a seven-year course of study. Each pupil memorized 195 compositions.

Legend says the MacCrimmons were descended from Irish royalty. A MacLeod chief gave them the use of rent-free lands at Boreraig early in the 16th century. There this musical family lived and worked until 1770, when they ended their tenure and returned the estate to the MacLeods. Iain Dubh (Black John), the last hereditary MacCrimmon piper, died about 1800.

Donald MacLean, heading this procession, is the official teacher of piping to the youth of Skye. Clan Chief Flora wears a family tartan of ancient design.

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Kilted Clansmen Stand Beside a Monument to the MacCrimmons While a Piper (Left) Plays a Lament

This wind-swept headland is hallowed ground to bagpipe enthusiasts. Here the MacCrimmons established their piping school. As master musicians, they scorned common marches and reels. Students were taught *Céol Mór*, or "Great Music," a term applied to classic compositions for the bagpipe. Skye legend says the MacCrimmons received the gift of music from a fairy. When composing they retired to a cave and fasted. "MacCrimmon's Sweetheart," a famous tune, was composed by one of the sons with the help of an ancestral ghost, the story goes. Scottish clan societies all over the world contributed funds for the memorial cairn, built in 1933.

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Contributions by Robert J. Reynolds





Placid Waters Mirror Ancient Walls and Turrets of Dunvegan Castle, Home of MacLeod Chiefs Since Medieval Times

Dunvegan is one of the oldest continuously inhabited residences in Great Britain. Part of the castle dates back to the 13th century. Many additions and alterations have been made. In older times the MacLeod lair had but one entrance, a sea gate. The first landward door opened in 1748.

A Highland Brigade Pipe and Drum Band Salutes the MacLeod Clan on "Overseas Day" at Dunvegan Castle

Hundreds of guests toured the castle during the MacLeod reunion, a feature of Skye Week. They viewed relics of the clan's early history—portraits, armor, weapons, drinking cups, and the famous Fairy Flag. This tattered bit of silk is the MacLeods' most cherished possession. Legend asserts it was given to the clan by a fairy queen. Unfurled in battle, the flag multiplied the MacLeods many times in the eyes of an enemy. It could be used three times, prophecy warned. History records two such uses.

Right: Guests at a Dunvegan garden party wear *filleadh-bòrag* (kilt), *sporran* (purse), and *brecan* (tartan). Seton Gordon (center), author and naturalist, chats with Iain Hilleary (left) and Col. John (Jock) MacDonald. The colonel, an authority on the bagpipe, judges many Highland piping contests.

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Photographs by Robert J. Beaulieu



Skye Week Celebrants Parade in Portree on Somerled Square

Portree, with approximately 1,000 residents, is the island's shopping center and largest town. It hugs the shore of a deep bay where, six days a week, a steamer arrives from the Scottish mainland. Practically everyone in town troops down to the quay to watch the passengers disembark.

Somerled Square takes its name from a 12th-century chieftain who ruled the Hebrides. He was the progenitor of the MacDonnells, ancient rivals of the MacLeods. Although the two families battled frequently, they sometimes intermarried—hence the Hebridean saying, "They were forever putting rings on one another's fingers and dirks at one another's throats."

Portree staged this parade on the opening day of Skye Week. Marchers climbed to a natural amphitheater above the town where young Scots competed in Highland games. A war memorial stands in the square.

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← Snow Mantles the
Cuillin Hills Though
Blossoms Say It's June

Skye's sharp-toothed Cuillin resemble diminutive Alps. Jagged pinnacles soaring above ridges and cliffs give the hills an appearance of great height, although the top-most peak is only 3,109 feet. Ice Age glaciers carved the range from a mass of hard fire-born rock.

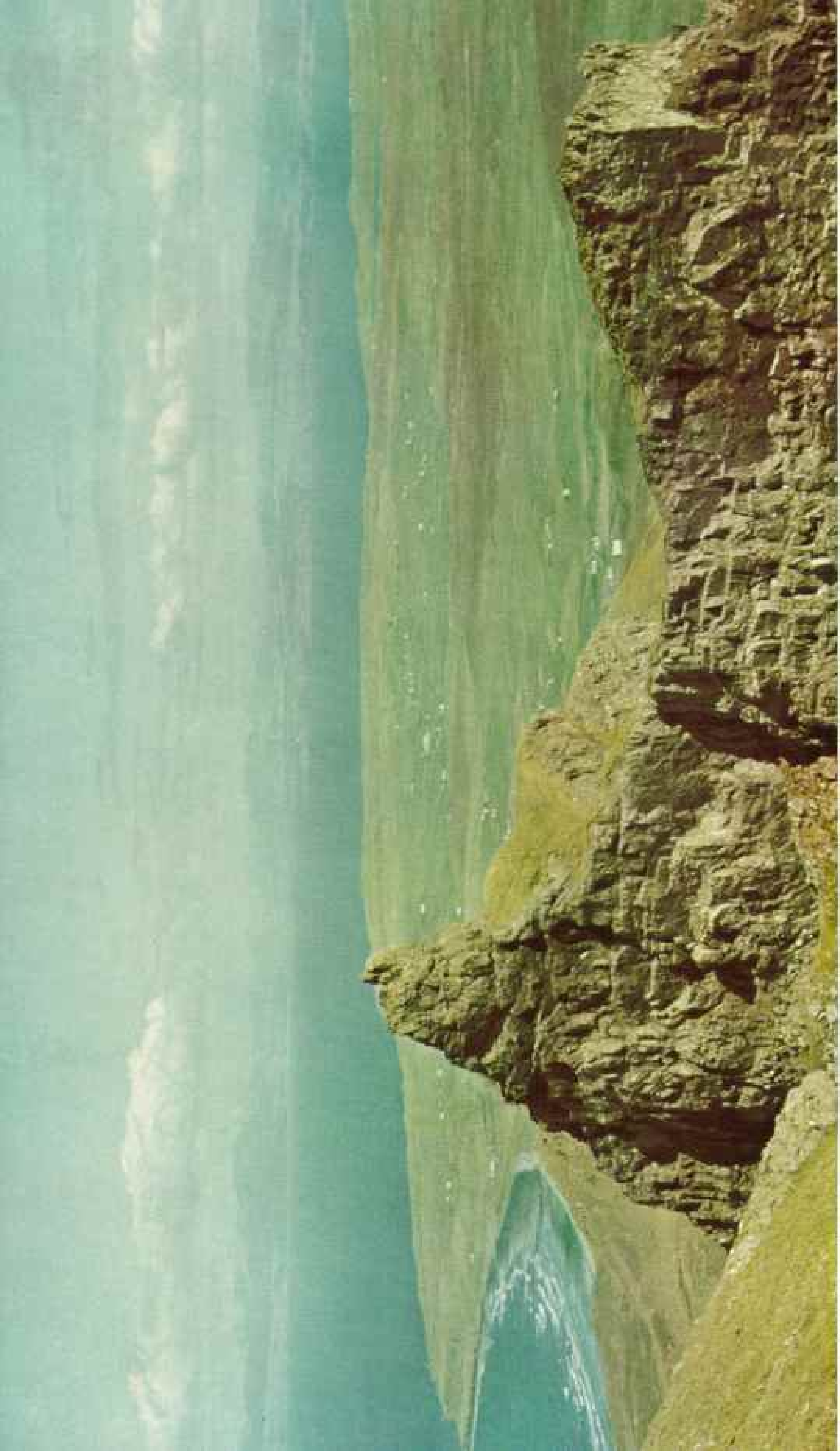
Some authorities believe the word Cuillin is derived from the name of the ancient Irish hero Cuchullin, who studied the art of war in Skye. Skye residents always refer to the Cuillin as hills rather than mountains.

Peaks shown here rise on the estate of the MacLeods, who own a large part of the island. Blooming hawthorn lines the shore of Portree Harbour.

← Buses await a launch bringing Skye Week visitors to Kyleskuin from Ross-shire (background) on the mainland.

Photographs by Robert J. Herricks





Wind-swept Crags, Once the Refuge of Embattled Clansmen, Keep Endless Vigil over the Moors and Crofts of Staffin

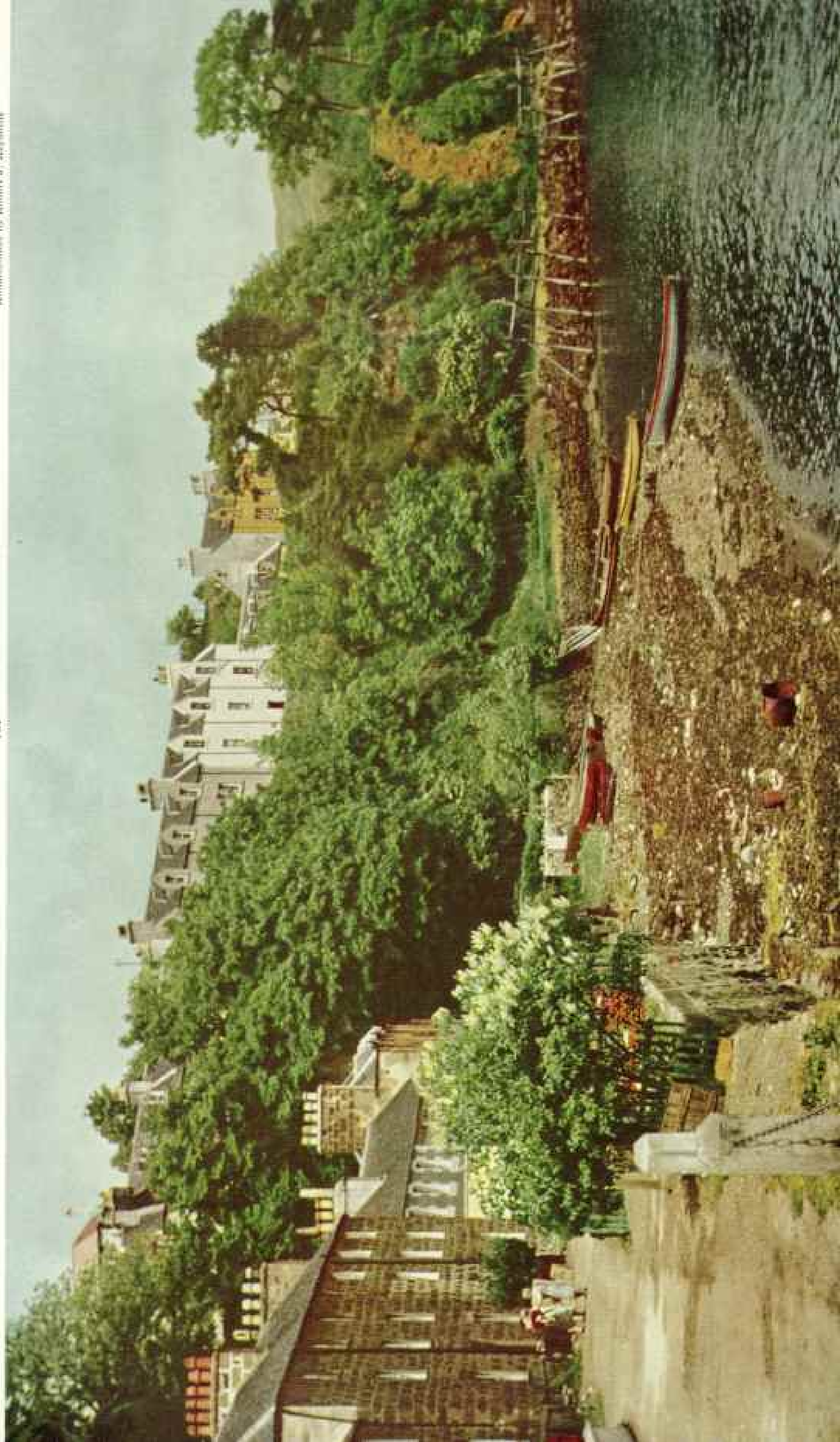
In the cliffside near this promontory is a grass-covered hollow called the Quiraing. Though accessible to hikers, it is screened by a maze of rocks. There, centuries ago, clansmen hid their families and livestock when raiders pillaged the countryside.

Lilacs Bloom Along a Water-front Street in Portree. Gabled Hillside Homes Look Down upon the Quiet Harbor.

Portree is an Anglicized form of the Gaelic *Port-an-Rìgh*, or King's Port. The name commemorates a landing in 1540 by James V, who took hostages from among the turbulent clansmen. Portree maintains a hostel where boys from the Hebrides receive college preparatory training.

101

Photographs by Robert J. Reynolds





← Flora MacLeod Opens
a Fair in Portnalong

Scotland's Department of Agriculture has sponsored a revival of tweed making in Skye. Today Portnalong is a center of the ancient craft. During Skye Week the town holds a *feill*, or fair, to sell its handmade woollens.

Above: Vegetable dyes, such as heather and bog myrtle, brew over a peat fire, coloring raw wool.

© National Geographic Society



✧ Portnalong Women "Waulk the Tweed" to the Rhythm of Gaelic Songs

Waulking, or shrinking, is the final operation in tweed production. Workers soak the cloth, then pound and knead it vigorously. They time their movements to the beat of ancient waulking songs. Each woman sings a verse; all join in the chorus.

✧ While spinning the wool, workers pass the time with gossip and banter.





Grass and Heather Carpet Somber Moors and Shadowed Hills Beneath Quirning Heights

**A Future Chief
of the MacLeod Clan
Pipes a Tune for His
Nova Scotia Kinsmen**

Thousands of Scots, including many from Skye, migrated to Nova Scotia's Cape Breton Island in the 19th century. Their descendants preserve the customs and traditions of the homeland. Families gather each summer at St. Anna for the Gaelic Mod, or clan rally. MacLeods and MacDonalds renew their age-old rivalry in Highland games, piping competitions, and Gaelic songfests.

This kilted piper is John MacLeod, Yr. (the Younger) of MacLeod. He is a grandson of Clan Chief Flora and heir to her title. Both journeyed from Skye to attend last year's Mod.

In preparation for his inheritance, John's surname was legally changed from Weirige-Gordon to MacLeod.

Chief Flora (right), wearing a scarf of yellow tartan, watches her grandson as he competes for the piping award. John A. D. McCurdy, Lieutenant Governor of Nova Scotia, sits behind the microphone. Donald D. B. MacLeod (bareheaded, third from left) is head of Nova Scotia's 4,000 MacLeods.

Endowment by
MetLife Bell Government



Girls and Terriers Share a Lunch at Sligachan

Glen Sligachan runs through the heart of Skye's Highlands, dividing the Cuillin Hills, often called the Black Cuillin, from the ochre-tinted Red Hills. Sligachan village and its inn, a mecca for mountaineers, stand in the plain.

From Sligachan, climbers may choose easy or difficult routes into the craggy fastness. The most venturesome climbs lead to the peaks of the Black Cuillin, so named for their dark gabbro rock. Though the hills are rugged, they have a reputation for safety because the footing is generally sound.

Peaks behind these campers stand in the main Cuillin group. Cloud-capped Sgurr nan Gillean, 5,167 feet high, was first climbed in 1856. Commando units learned mountaineering on its crags during World War II.

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Endorsement by J. Allen Cash

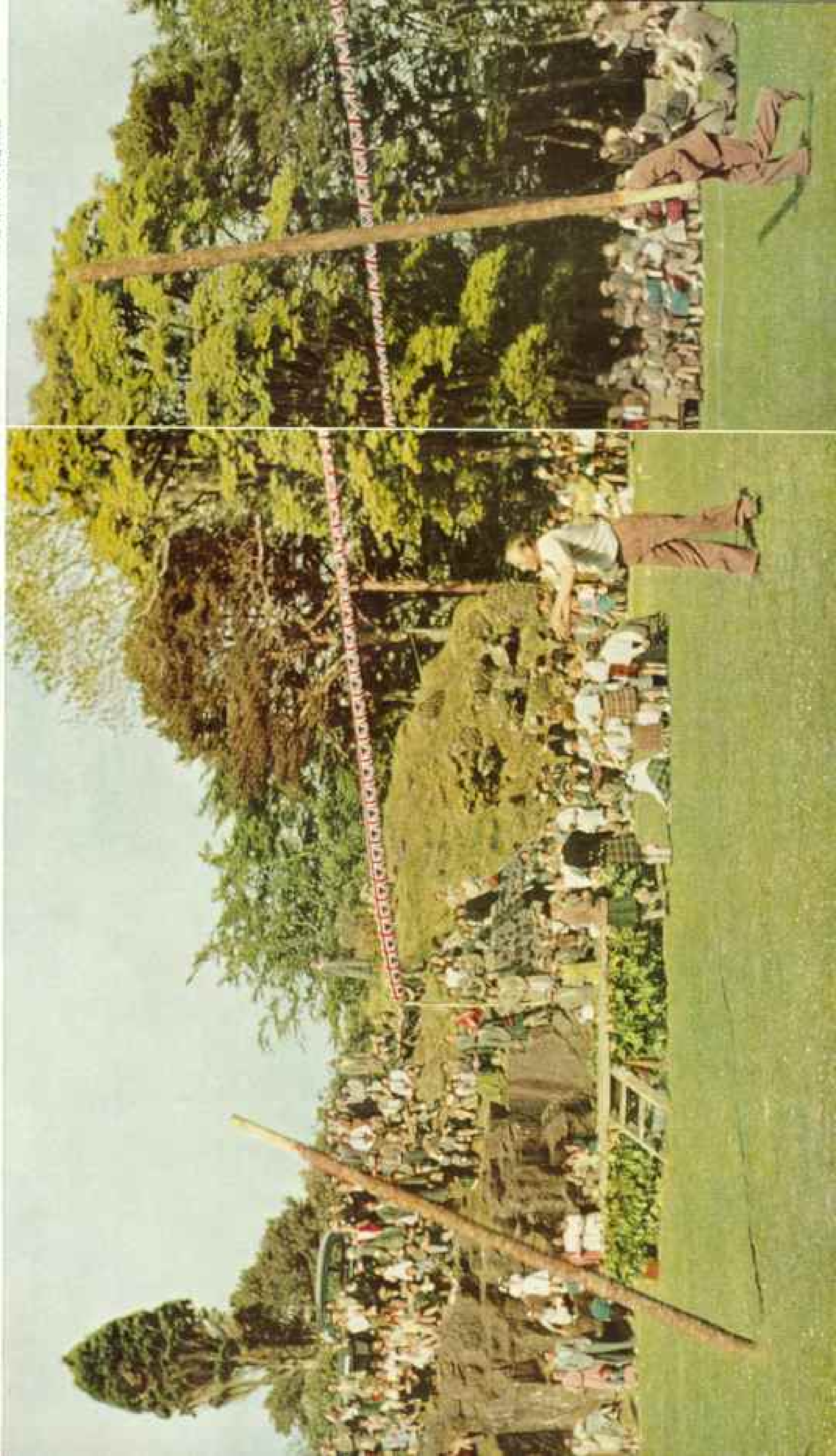


A Scot Competing in Portree's Highland Games Tosses the Caber—No Sport for Weaklings

Rules for caber tossing are simple. Judges select a sturdy tree trunk of no specific weight or dimension. Stripped of branches and shaved at one end, it becomes the caber. Entrants balance the pole against a shoulder, run a few steps, then heave with both hands. If the throw is successful, the unshaved end strikes the ground and the pole falls forward, making a three-quarter turn. This contestant kept his coat on for the first toss (right). Breaking into a sweat, he removed it (left).

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McCathomas by Robert J. Maguire





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Illustrations by Robert J. Reynolds

▲ **Bonnie Highland Lassies Dance to a Piper's Tune**

These girls, a group entry in a contest at Duisdale, will be judged by how well they conform to the traditional movements of their Highland reel. Improvisation is not permitted. Ankle-laced shoes are similar to ballet slippers but sturdier.

▼ **Too Serious to Smile, These Girls Work for a Prize**

Hand position is important in Highland dancing. In this number (and above) the back of the wrist faces forward while the knuckles rest on the hips. Other dances may require hands to be raised overhead. These youngsters competed at Portree.



will not, he says, "be walking about, waiting on a pig."

Life in Portree follows time-honored grooves. But new ways are coming, spurred by such innovations as the hydroelectric project a few miles to the north.

Here, at a cost of about \$1,120,000, the level of Loch Fada is being raised to that of Loch Leathan. The combined waters tumbling through turbines will create for the first time enough electricity for Skye's needs.

New Industry for Old Skye

These aren't the only lochs around Portree with a new look and a new future to them. Mr. D. F. F. Forbes, manager of Scottish Diatomite, Ltd., took me out to see one that had been dried up on purpose, Loch Cuithir.

"We get diatomite," he explained, "from a flint-colored sort of clay, diatomaceous earth, that a couple of fishermen turned up at the loch here many years ago. One of them noticed this odd stuff clinging to his boots, figured it wasn't ordinary mud, and had it analyzed. When we knew what we had, we drained the loch."

Workmen with tined forks and spades were taking out about 16 wet tons a day. Dried in a near-by kiln till it became a fine, soft, dry powder, the earth lost about two-thirds of its weight. It was then sacked and hauled by ship from Uig to the mainland and thence to Britain's industrial centers.

"What do they use it for?" I asked.

"Oh, they combine it with asbestos for insulation or use it as a filter in making sugar and malt products. They even put it in cosmetics and tooth powder and tooth paste."

An odd industry for old Skye, it seemed to me. Others, more traditional, I found still flourishing: the Skye Woolen Mills of Portree, which turn out tartans, tweeds, rugs, blankets, and knitting yarns; the woolen-making cooperative at Portnalong (pages 102 and 103); the Skye Hand Loom Company, which specializes in Cochillin Tweeds; and, up in the treeless little town of Kilmuir, the Highland Home Industries workshop. Some of its tweed has been bought by Queen Mother Elizabeth, and its carpets by the Cunard Line.

North of Kilmuir, I came to Duntulm and the home of Seton Gordon, author of many books on Skye and the Hebrides (page 97). Over tea he told me the Skye weather was being uncommonly kind to me.

"I've been going over sun records I keep for the Air Ministry," he said. "We've had 136 hours of sunshine these first 10 days of June, with no rainfall whatever. That's the best weather we've had in Skye since 1931."

We gazed out for a while from Gordon's living-room window at one of Skye's astound-

ing sunsets. Across the broad water spread the long chain of the Outer Isles, granting here and there a glimpse of the gray Atlantic. Against the clouds, burning in their brilliancy, the isles looked almost black.

Later we strolled down the road to the graveyard of Skye's heroine, Flora MacDonald. Seton brought his bagpipes and blew a lament over the resting place of the girl who, by ferrying Bonnie Prince Charlie over to Portree after his defeat at Culloden, had brought imprisonment on herself.

Flora's granite tombstone bears as an epitaph Dr. Samuel Johnson's noble comment: "Her name will be mentioned in history, and if courage and fidelity be virtues, mentioned with honour."

I went on from Duntulm to Boreraig, which is classic ground indeed to all who play and love the bagpipes. This is the bailiwick of the MacCrimmons, hereditary pipers to the MacLeods and renowned for generations as masters in that art (page 95).

After the festivities there, I was privileged to take up, at long last, the invitation which Mrs. MacLeod had so kindly extended to join her house party at Dunvegan Castle.

In the Castle of the MacLeods

As we skimmed by motor launch over Loch Dunvegan, Mrs. MacLeod pointed out the castle's sea entrance, a doorway set in the courtyard wall, 20 feet above the ocean.

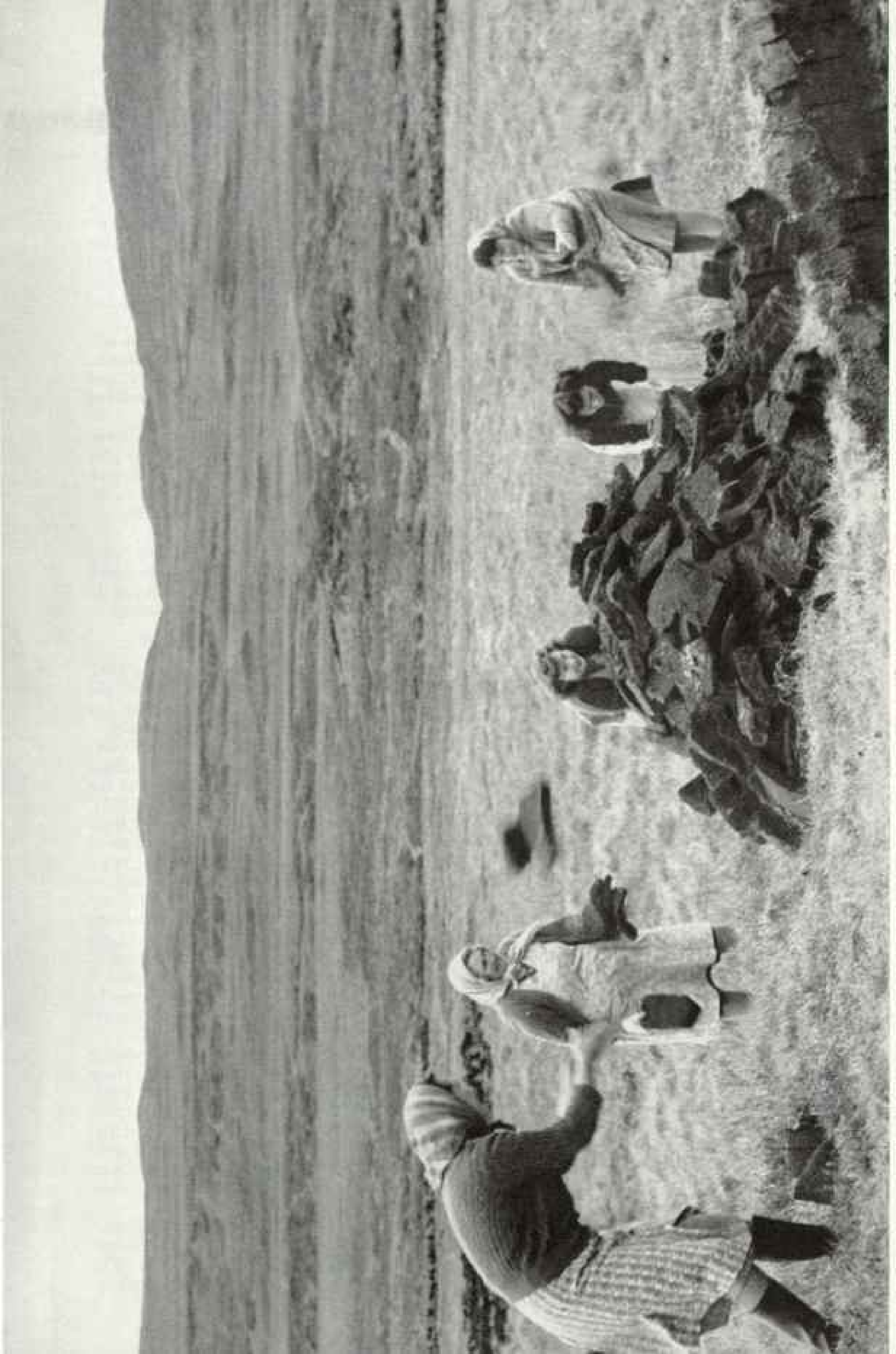
With its crenelated walls, its pepperbox turrets, and its central tower, this Hebridean stronghold looked like all the castles of all the fairy legends of my youth (pages 96 and 112).

When I passed through the massive front door, I found myself in an entrance hall three times the size of an ordinary room and twice as tall. Along the walls hung ancient weapons and trophies of African hunting expeditions; from balconies fluttered the MacLeod banners of the Napoleonic Wars and the MacLeod flag, embroidered in black, white, and red.

The windows of my room, when once I reached it, proved to be set in walls nearly nine feet thick; they looked over the courtyard and, below and beyond it, the sea.

Dinner that evening was served on a dining table fit for a convention. Flanking the room stood a magnificent oak sideboard dated 1603. Over the fireplace was carved the family crest, a bull's head between two banners, and the motto, "Hold fast!" MacLeods of other generations, caught by such artists as Raeburn and Ramsay, looked down sternly from their frames above us.

I went to bed in their castle with some misgivings, prompted by the casual farewell counsel of the chief's daughter. Said she, "The clothespress in your bedroom is haunted by



▲ Desolate Moors Hold No Trees to Burn, but Lots of Peat

Skye's rolling moors are veined with peat bogs. Farm families visit them each summer to reap a fuel crop.

Good peat, composed of semi-carbonized vegetation, is hard and black, but most of Skye's is brown and stringy.

These women used a special spade to remove the fuel. Later they will spread the blocks to dry.

◀ Lush and Dreamy Is Skye's "Garden"

Strong winds and poor soil make much of the island treeless. But trees and shrubs flourish in the so-called Garden of Skye, in Skye's southernmost peninsula.

These fat cattle leave their native home forever. Sold at auction, they march to a port for shipment to the mainland.

National Geographic Photographer
Margaret Owen Williams





Dunvegan Castle's Weathered Walls and Turrets Bear the Stains of Centuries

This medieval stronghold has housed many famous visitors, among them Dr. Samuel Johnson and his Boswell (page 96). Dunvegan chiefs struggled long and painfully to make these trees take root on an open moor. Skye calls the flat-topped mountains MacLeod's Tables.

one of our ghosts. Just ring the servants' bell, if you need to."

I slept soundly enough until shortly before dawn. Then a loud rattle of chains brought me bolt upright. Summoning all my courage, I leaped to my feet and flung open the closet. Nothing. I crossed to the window and stared out. There was my ghost—two minesweepers dropping anchor in the harbor below.

They had come, I learned later, to honor the Clan MacLeod in Skye Week. I found their two captains, who shortly joined us in the castle, good company.

Clan Gathers from Round the World

Together we walked the ramparts, looked to sea, and stared down at the airless dungeon, complete with iron weights and shackles, where earlier MacLeods kept those with whom they had a difference of opinion. It was enough to make a man uneasy—particularly a man like myself with no drop of MacLeod in him.

It was a lack I sensed the more on Overseas Day at the Castle. From all over the globe—Austria, Canada, South Africa, England, Bermuda, Poland, Germany—loyal MacLeods gathered in tartan and kilt to

celebrate and live again, if only for a day, as members of one clan.

From every corner came the skirl of pipes and the martial sound of Highland bands (page 97). In circuslike tents tea was served to all comers. Swords glittered on the lawn, laid out like compass points for the traditional dancers who would perform intricate steps over them. And through all the melee wove the stalwart plaid-draped figure of Mrs. MacLeod of MacLeod, clad in what she wryly described as "my uniform."

Too soon, the festivities came to an end, and with them Skye Week. The next morning at dawn I boarded the MacBrayne steamer from Portree, bound for the mainland. The raven-haunted cliffs dropped astern, and we headed out through the Narrows of Raasay.

From somewhere over the moors I seemed to hear a piper playing softly the Gaelic lament of Donald MacCrimmon:

*Cha till, cha till, cha till Mac Crìonain
An cogadh no aith cha till e tuille . . .*

No more, no more, no more forever,
In war or peace, shall return MacCrimmon . . .

But, by all the hills of Skye, *I* will.

Playing 3,000 Golf Courses in Fourteen Lands

Tramping 27,000 Miles of Fairway in 42 Years, a Globe-trotting Businessman Explores the Varied Geography of Golf

BY RALPH A. KENNEDY

IF THE voice had been that of the Archangel Gabriel, it could hardly have stirred me more. The official starter at Scotland's Royal and Ancient Golf Club of St. Andrews was bellowing my name:

"Mr. Kennedy!"

With my partner I faltered to the tee. I stood now on awesome ground: the First Hole of the Old Course, Mecca and spiritual home of golfers the world over.

Behind me loomed the dour, gray-stone bulk of the clubhouse; and in its shadow a crowd studded with newsmen and photographers had gathered. I stared at them, then back at my partner.

"Never mind them," he said. "They're just waiting around to see an important player."

"Oh! Then hadn't we better step aside and let the fellow tee off?"

"No. You see, they've come to watch a chap named Ralph Kennedy play his 3,000th course."

If my knees had been shaking before, they were now clicking like clubs in a bag. Dimly I heard the starter give his age-old signal:

"Play away, please!"

Automatically I cocked my club, hoping that, if I topped my drive, the force of my swing would blow me out of sight. Whisssh! Down came my driver—and off went the prettiest drive I've ever hit, 180 yards straight down the fairway.

I grinned. In fact, in the wave of relief that engulfed me, I almost laughed, which would surely have shocked that solemn aggregation of Scots, to whom golf is no laughing matter.

For me this was the culmination of the hobby of half a lifetime. I had walked more than 27,000 miles, traipsed through 13 countries and all 48 States, dreamed and planned for years—just to hit that shot on September 17, 1951 (page 115).

From Van Cortlandt to St. Andrews

It all began in 1919 when a British music-hall actor named Charles Leonard Fletcher came over to the United States and started playing golf up at my first home course, Van Cortlandt Park in New York. Lots of other people from the literary, artistic, and entertainment world used to tee off there—Rex Beach, Clare Briggs, Heywood Broun, Frank Craven, Leo Carillo, Bud Fisher, who created Mutt and Jeff.

Well, one day Fletcher informed us that he probably had played more golf courses than anyone in the world and had the score cards to prove it—240 of them.

That made me wonder. I had been playing since 1910, here and there. My job with a big pencil company took me all over the country, and I used to drop in to shoot the local course wherever I went. I walked home and counted up my cards. I had 176.

The next time I saw Fletcher I told him frankly, "Charlie, I'm going after your record."

"More power to you," said he.

It took me seven years to tie Fletcher. By 1926 we had both played 445 different courses; then I barged ahead. In 1932, on my 50th birthday, I had hit the 1,000 mark. Fletcher, his health failing, quit at 658.

Rattlers Guard One Course

That's a lot of courses, for anyone. But setting a record (mine now stands at 3,035) is only half the fun. The real reward comes from the opportunity it gives one to play all manner of courses, to test one's skill against every conceivable kind of natural and man-made hazard, to explore the byways as well as the highways of the golfing world.

Most players are content to stick to their own country clubs, with an occasional fling at some vacation course. Even circuit-riding professionals tend to follow the beaten path of major championship links. I had played these; but I had also played courses made of pure sand, one under water six months of the year, another with cottonseed greens, a course pockmarked by gopher holes and guarded by rattlers. I had played, I think, America's highest and lowest, its best and worst, its shortest and longest, its oddest and its loveliest courses.

Such a long and varied menu had only whetted my appetite for the main dish: St. Andrews. It isn't the oldest golf club in the world. Scots had been knocking a feather ball around their heather-clad dunes since the 15th century; and a club, the Royal Blackheath, tradition says, had been established by 1608, although no written record supports this date. The Royal and Ancient was not actually founded by its "twenty-two noblemen and gentlemen" until 1754.

It was the men of St. Andrews, however, who drew up the oldest surviving rules of



In Memory, the Author Tours 3,035 Golf Courses

In 42 years of spare-time golfing, amateur Ralph A. Kennedy has covered more than 27,000 miles playing courses in 13 countries and all 48 states (page 113). His treasured score cards, each signed by a club's professional, rarely leave his safety deposit box.

"gowff" and laid their indelible stamp upon the character of the game.

Golf Born on Scotland's Shores

Like many a golfer, I had often asked myself why the sport had originated upon the bleak shores of Scotland, rather than in some gentler land of lush meadows and fair glades.

As I gazed now from the first tee of the Old Course, I could see the answer before me: Here were golf's God-given, natural obstacles—wind-scooped bunkers, rumpled hillocks, tough clumps of whin and heather, gusty breezes from the sea, a meandering burn, and ocean inlets.

Other places might boast better turf or easier terrain. But golf without hazards is only an inferior form of outdoor billiards. A good course, as the Scots say, should be "aye fechtin' against ye," and the links land of such sea towns as St. Andrews furnished then, and still furnishes today, all the "fight" a true golfer could wish. To a Scot, indeed, the only

real "links" are these lay-outs amid the dunes, for which Nature has been the chief architect; all the rest are mere "inland courses."

Certainly St. Andrews has taken the measure of many a proud golfer. I took 20 strokes over par and felt no disgrace.

There's Hell Bunker, for instance. They tell of a man who was trapped there, and had used every club in his bag.

"What should I take now?" he called up to his caddie.

Said the caddie dourly: "If I were ye, I'd tak' the 9:40 train."

I had my own troubles with Hell Bunker. But the ordinary rough at St. Andrews is bad enough. When my ball sailed into the marram grass, as it often did, I soon learned better than to play it out for distance: it took my heaviest club just to get back on the fairway.

After 18 holes, I was ready to relax in the pine-paneled lounge. Over a cottage pie, Lord Teviot and Sir George Cunningham told me of the ceremony which would take place two days from then

—"playing in" the new captain of the club, in this case the American veteran, Francis Ouimet (page 117).

By immemorial tradition, they said, on Wednesday of the third week in September the incoming captain must "drive himself into office." He strides onto the first tee. Lining the fairway before him are the caddies, each eager to retrieve the ball and claim as reward a gold sovereign. At dinner that night the Queen Adelaide Medal is ceremoniously hung around the new captain's neck.

Even Streets Bear Golfing Names

St. Andrews itself, I found, is golfdom's golf-mad capital. One street is "The Scores"; another, "Golf Place." Even the bus stops are called "stances." And everybody, old and young, rich and poor, plays.

Tens of thousands of pilgrims come each year to visit St. Andrews's four courses. The 9,450 townfolk welcome them, but go right on playing. For a few dollars a year a tax-



For His 3,000th Course, Mr. Kennedy Chose Golf's Mecca: Historic St. Andrews

Scotsmen, who were knocking leather balls about their heather-clad dunes as early as 1457, organized the Royal and Ancient Golf Club of St. Andrews in 1754. Thousands of courses the world over today follow the 13 basic principles of "gowff" laid down by the "22 noblemen and gentlemen" who founded St. Andrews. Kennedy, shown at the first tee of the Old Course, scored 93 for 18 holes, or 20 over par (pages 114 and 117).

payer can play all the golf he wants. Professionals teach the game to children still in school, and members of the Royal and Ancient periodically donate their old clubs to youngsters whose game looks promising.

The long summer evenings (twilight lasts till 11:00) permit citizens to put in a good eight- or nine-hour day's work and still have time for nine holes or more after supper. Only the coming of Sunday curbs their ardor. As old Tom Morris, celebrated St. Andrews greenkeeper, used to say: "If you gentlemen dinna need a rest on the Sabbath, the links does."

The rest of the week most St. Andrews citizens would rather putt than prosper. They told me that one golfer, finishing a round, proposed a return match for the following day.

"Well, it might be arranged," said his companion. "I was to be married tomorrow, but nae doot that can be postponed."

St. Andrews may be the fountainhead of Scottish golf, but there are plenty of reflecting pools. I set out to see them.

At Edinburgh's Barnton, course of the Royal Burgess Golfing Society, I was assigned for a caddie a most remarkably dignified fellow with a waxed mustache and a string of medals on his coat.

Caddies Can Be Granddads

"What war might they represent?" I asked.

"Boer War, sir. Been a caddie here for 52 years. I won't be able to help you very much for the first few holes, sir, until I've studied your style. After that, perhaps, I can advise you as to which club to use."

He did, too, and very sensibly. Caddying in Scotland and many parts of England is virtually a profession; I should judge the average age of my various caddies in Great Britain was over 50.

All in all, during my 24-day trip, I played 26 courses in Scotland, seven in England and two in Ireland. They included such classical ones as Muirfield, North Berwick, Glen Eagles, Prestwick, and Carnoustie in Scotland; Sun-

**Costumes Change;
the Game Endures**

The determined golfer about to play for the 18th green at St. Andrews from the bridge over Swilken Burn posed for one of golf's earliest action shots. The picture's age is uncertain. It was taken by D. O. Hill, a pioneer photographer, who did most of his work between 1843 and 1848.

The "feather" and the "guttie" have given way to the rubber-cored ball, but the Burn and its bridge still present hazards on the last leg of the Old Course.

Southon Photo Record & Engraving Co., Ltd.



America's Quimet Shows Scots He's Fit to Captain Their St. Andrews

By tradition, the incoming captain of this Royal and Ancient Golf Club must "drive himself into office" on Wednesday of the third week in September. An antique cannon's boom and smoke announce his successful induction.

In 1951 Francis Quimet, former U. S. amateur champion, became the first American to captain the Royal and Ancient. Britons had reason to respect him; back in 1913, at a 20-year-old, he beat their best, Harry Vardon and Edward Ray (page 124).

To Quimet, "this was one of my most thrilling moments."

Customary reward for the caddy who retrieves the new captain's ball has always been a gold sovereign. Last year caddies scrambled for an American \$5 gold piece.

Here, with gloved hand, the club's venerable professional, Willie Auchterlonie (right), has just teed up the ball and stepped back with the words, "Play away, please!"

© G. M. Coote



El Morro's Walls Make Grim Bankers in Puerto Rico

English sea captains operating on the Spanish Main attacked this bastion in 1595. Informed that the Spaniards had cached loot in San Juan, Sir Francis Drake and Sir John Hawkins besieged the city's protecting forts, El Morro and La Fortaleza.

Their venture proved ill-advised. Hawkins, mortally wounded, fell in the assault. Drake, his seamen nearly annihilated, broke off the engagement and set sail for South America. He died en route.

In El Morro's peaceful old age, golfers play their approach shots through the arch (lower center), hole out, and then tee off from the rampart on the left.

Purists may complain that El Morro is more of an obstacle course than a true links, but no one can deny that it brings history close to the golfer.

Don Julia

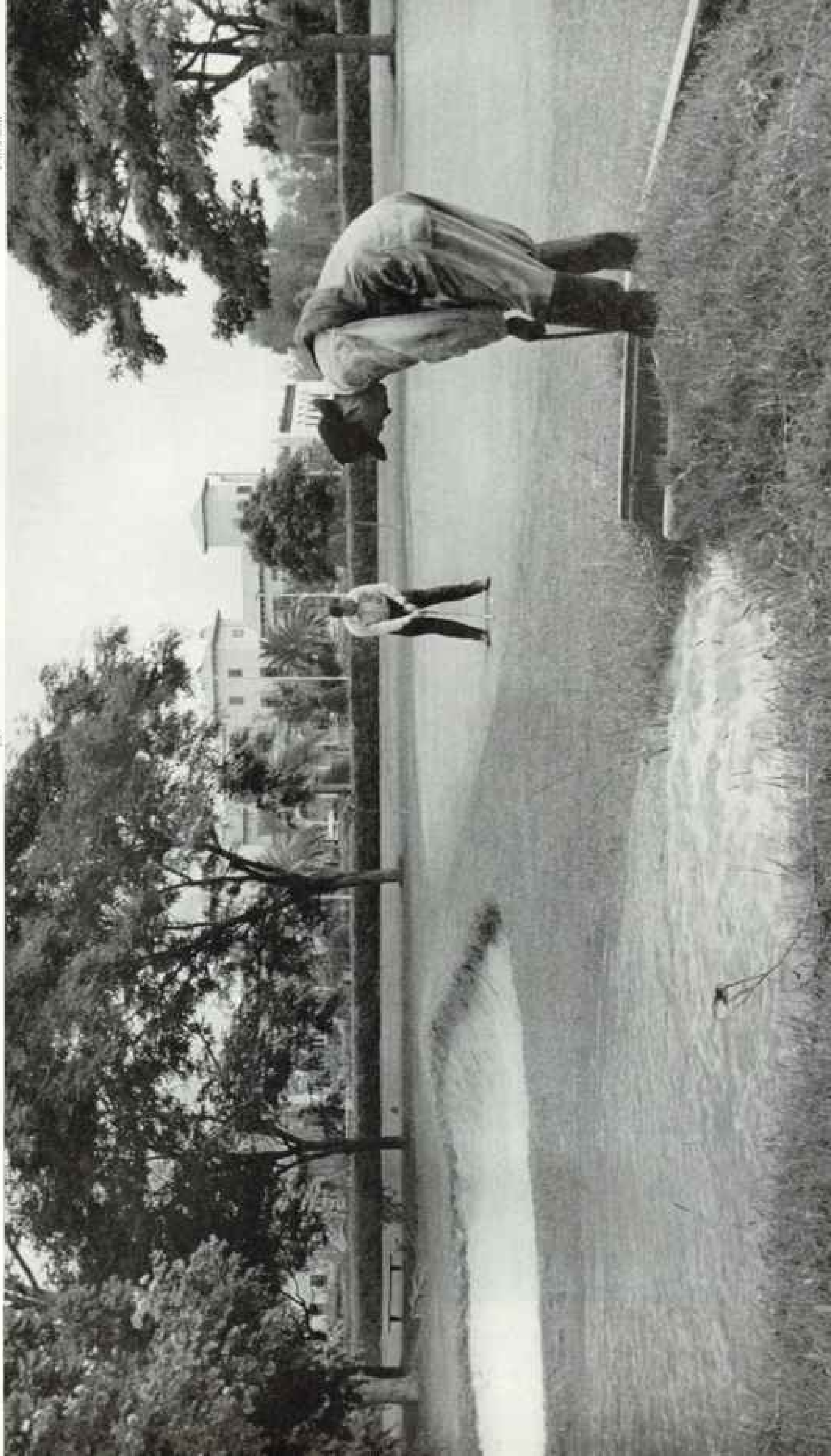


Irrigation Water from the Rimac River Converts Lima's San Isidro Course into a Lake Once a Week

Author Kennedy played many an amazing course in South America. At Guayaquil, Ecuador, he encountered baked-clay fairways and oil-sand greens. On Peru's Neperitos and Talara links, he found the fairways one continuous bunker; balls were painted black (page 121). At Lima, where it seldom rains, the championship course has floodgates which are opened every Monday, in lieu of sprinkling. Its elegant clubhouse, designed for an envisioned Lima boom, stands beyond the hedge.

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Don Justin





A Post-mortem of a Day's Play at Miami Beach

Members of the La Gorce Country Club compete annually for a silver trophy presented by Dr. John Oliver La Gorce, Associate Editor of the NATIONAL GEOGRAPHIC MAGAZINE. The course and club were named in his honor.

ningdale, Wentworth, and Swinley Forest in England; the Royal Dublin and Portmarnock in Ireland.

In the great Redan bunker at North Berwick I learned, as many sadder men before me, that the best way out of this gruesome trap is to shoot *backward*, away from the green.

On the links of Leith I stood where Charles I was leaning on his driver in 1642 when news first came to him of the great Irish Rebellion.

At Prestwick I had reason to marvel once more at the record set there in 1870 by Tom Morris, Jr., and never yet equaled in 36-hole play. Using the gutta-percha ball then in vogue, which was 20 to 30 yards shorter in flight than the modern rubber-core, Morris shot a 149. With holes like the 17th (the Alps) in the way, I felt lucky to go around in 89 for 18.

As I finished a round the chauffeur I had hired stepped forward with my sports coat and, with the glacial dignity of a Jeeves, assisted me into it. This sartorial Man Friday, one Archibald D. Cowan, read me lectures on every cathedral, castle, and loch we passed; he tweaked my coattails whenever I tried to buy something he thought too expensive; he kept over the dashboard a list of Things Mr. Kennedy Should Do Today; he badgered golf clubs into giving me a rubdown room when it rained.

But he had little patience with the inevitable Scotch-and-soda interviews forced on me by congenial golfers or newsmen. His usual comment when I reappeared after one of these sessions was: "Bletherin' again! Just bletherin'!"

Yet Cowan was typical in his way of the kind consideration I encountered everywhere in Scotland. Even the heather flowered two weeks late for my benefit!

Playing "Blind" Golf in Ireland

Ireland, when I managed to land on it, was no less warm in its welcome. But for a time I wondered whether I would actually set foot on its emerald turf. Our plane, bouncing about like a ping-pong ball on an air jet, took three hours to complete a two-hour flight.

From Howth, which was convenient to the two courses I was to play, I took a bus to Dublin. There I asked a policeman how to get a taxi. With a good Irish grin he replied, "I'll get you one, Mr. Kennedy."

My jaw sagged a notch at such recognition.

"You *are* Mr. Kennedy, aren't you? Sure, and your picture was in the morning papers. Now . . . tell me, sir, what did ye think of the Spectacles at Carnoustie? Are they as fearsome as they say?"

They are, and I told him so while he obligingly flagged a cab for me.

Out at the Royal Dublin that day I encountered the most phlegmatic caddie of my career. I was playing a "blind hole," and my caddie stood on a hillock to give me direction. Lifting what I thought a pretty good approach shot, I called out, "Am I on the green?"

"No, sir."

Disappointed, I trudged up the slope, but could see no ball. "Where is it?" I asked.

"In the cup, sir."

Ireland was my last port of call in Europe. I had no time to venture upon the Continent. There are, however, good courses to be seen there (the 12th hole at Biarritz is world-famous), Scandinavia can boast many of note; Sweden alone has 20 courses of good quality.

Many Odd, Exotic Courses

The course which would tempt me most, perhaps, is the one hacked out of the arid uplands of Ankara by our then Ambassador to Turkey, George Wadsworth, three years ago. Begging oil-sand greens from Near East oil companies, borrowing bulldozers, and recruiting local enthusiasts, Wadsworth (topped correctly by a gray Homburg) laid out three tees, three holes, and 13 traps in one afternoon amid thistles, molehills, and sandy scrub.

Today the Ankara Golf Club boasts 18 holes and an attractive clubhouse for its 300 enthusiastic members.

Another links I would give a week's wages to play is the one in British Uganda where ground rules specify: "If a ball comes to rest within dangerous proximity to a crocodile, another ball may be dropped."

Novel, too, are the courses in India where one's fore-caddie rushes to the ball, flaps his arms, and covers it with a red cloth—to keep native birds, kites, from flying off with it.

But though I missed Ankara, Uganda, and India, in other years I saw my quota of curious foreign courses. On one voyage to Central and South America in 1930 I played on fairways at Gatun made of land dredged from the Panama Canal; and, in Ecuador, I putted on oil-sand greens.

Because this Guayaquil course is flooded during the rainy season, it has to be renovated annually. Its fairways are baked clay; once they have dried out, fissures open up from a few inches to a few feet wide. You don't lose a stroke when your ball rolls into one of these crevasses, but you do lose your ball.

Two courses I played in Peru were almost as odd. At Negritos and Talara the fairways are nothing but one continuous bunker; you sink into sand at each step. The balls are painted black, don't roll at all, and must be lifted to the surface after each shot. On one hole you have to carry a green 150 yards away which is 75 feet above the tee.

Some day I shall go farther south and play the fantastic Andean course at La Paz, more than 12,000 feet high, where the chief hazards are ambulatory: shaggy llamas and pipe-playing Indians. And I should like to take in the celebrated layout at Viña del Mar, near Valparaíso, and Los Leones and the Prince of Wales Country Club courses at Santiago.

They must wait. But I'm glad to have had, already, the chance to play Bermuda's beautiful courses—the amazing Mid-Ocean which golf architect Charles Blair Macdonald created from sand, coral, and little coves; Castle Harbour, with its inclined railway to the first tee and its elevator back from the 18th through solid rock to the hotel; Belmont Manor, Riddell's Bay, Frascati, Devonshire, St. George, and Elbow Beach.

They're spectacular. But one would be hard-pressed to find more spectacular courses than Canada's Banff and Jasper links. Both of these are the work of the Canadian architect, Stanley Thompson, and monuments to his daring and his flair.

Backdrops already built in by Nature are the 10,000-foot peaks of the Rockies (page 125). At Jasper National Park, on 11 out of 18 holes, the direction lines given are crests of individual mountains. At Banff the names Thompson gave some of his holes are significant enough: Goat, Windy, Cauldron, Spray, and Hoodoo.

Canadian Hazards: Breezes and Bears

Cross winds hurtling down at Banff must be felt to be believed. When Edward VIII was Prince of Wales and no student of Banff's breezes, he hooked eight balls into the Bow River, one after the other, before he learned better. To keep down the cost of lost balls a little, Caspar McCullough, Banff's superintendent, has trained a terrier to retrieve shots sliced into the brush.

The Jasper course had been planned to cost some \$500,000. When Thompson had run through this sum and was still by no means through, he boldly confronted his backers, the Canadian National Railways' Board of Directors, and said: "Gentlemen, you wouldn't spoil a ship for a hap'orth of tar, would you?" They decided they wouldn't. Jasper's eventual cost was almost \$1,000,000.

Thompson didn't plan it that way, but one of the chief hazards at Jasper consists of bears (page 127). I looked up after one long drive there to see a baby bear down the fairway nosing my ball with considerable interest.

"What'll I do?" I asked the pro.

"Oh," said he, "the bear won't be there when you are." And he wasn't.

Ground rules, however, specify that balls disturbed by bears must be played where they

are dropped. This, they say, proved of considerable assistance to one lady—who got an eagle two on a mere 90-yard drive: a bear obligingly picked up her ball and carried it to the green.

I went on to play courses in every Province of Canada, from the great Capilano links in Vancouver on the west to the Highland Golf Club on Cape Breton Island, the farthest-east course I have played in North America. I toured the Royal Montreal, oldest chartered club on the continent, and lovely Beinn Bhreagh on Bras d'Or Lakes, home course of the NATIONAL GEOGRAPHIC MAGAZINE's editor, Dr. Gilbert Grosvenor.*

Millions Play Municipal Courses

In the end, however, it must be said that most of my golf wanderings have been concentrated in the United States itself, and for a very good reason: of the world's approximately 7,500 golf courses, we possess 4,926. And among these are surely some of the very best, as well as the worst, some of the oddest, and some of the most challenging.

Municipal courses have sprung up all over the United States. The country now has more than 700 of them, making the game available to millions who otherwise could not afford to play. Costs on these public courses are low, yet among them are some magnificent layouts, like the ones at West Palm Beach, Florida, and Greensboro, North Carolina. From the Nation's public links come many of its leading—and most enthusiastic—players.

Golf in America is, by the standards of St. Andrews, quite young. Golf societies existed in South Carolina as early as 1795, but the Scots were flailing a ball over their links land before Columbus ever set sail.

By 1457, in fact, the Scottish Parliament—worried by the decline in popularity of archery, a militarily useful sport—felt it necessary to pass an ordinance "that the Fute-ball and Golf be utterly cryit doune, and nocht usit."

Neither this nor successive decrees, however, could suppress a passion for the game shared by king and commoner alike. James IV of Scotland scorned it as a childish pursuit—until his nobles persuaded him to take a few swings. Like many a man before and since, James promptly found himself hooked by the twin barbs of despair and ambition.

The ball he tried vainly at first to hit was a type used with scarcely a change till 1848—the feather ball. Made of leather, it was packed tightly with innumerable soft-boiled feathers until hard enough to be hammered into shape. Rarely quite round, and likely to come apart in wet weather, it could never-

* See "Salty Nova Scotia," by Andrew H. Brown, NATIONAL GEOGRAPHIC MAGAZINE, May, 1940.



Great Pyramid of Cheops Stands Out of Bounds on Egypt's Mena House Course

Though rioters have looted European establishments in near-by Cairo, the Mena House Hotel still welcomes Westerners. Water pumped from the Nile keeps the course a green oasis in a dusty land. The camel rider on the tee is not a caddie, but an onlooker.

theless be driven surprisingly far—within about 40 yards of the modern ball.

Golfers, however, were more than glad to welcome its successor, the guttie. White gum from the Malayan gutta-percha tree, molded into a ball and indented with a dull chisel, proved both impervious to rain and longer on the drive. So moved was one poet as to sing: "Hail, gutta percha, precious gum!"

Yet, compared to the feather, the guttie's reign was short—a mere half-century. It ended abruptly with the introduction of the rubber-cored ball, invented by Coburn Haskell of Cleveland. The Haskell used a gutta cover around a center made of evenly wound rubber "string." More lively than the guttie, it delighted American players by giving them a good 20 yards extra on each drive.

While golfers changed readily enough from the feather to the guttie, and from the guttie to the rubber-cored ball, experiments with new kinds of clubs and gadgets were consistently resisted. When Richard Peters in the first Newport tournament in 1894 used a billiard

cue as a putter, the golf world rocked, and the United States Golf Association promptly outlawed such travesties. And when the American champion, Walter J. Travis, brought his mallet-headed "Schenectady" putter to Britain in 1904, he precipitated an international squabble which ended only in 1951; St. Andrews at long last rescinded its ban on clubs whose shafts didn't meet the heels of their heads (in golfers' lingo).

Americans Took to Golf in 1880's

Similarly, well-meaning efforts to popularize the caddie bag, wooden tee, and steel-shafted club encountered the cold shoulder, year after year. Golfers, in short, are a conservative lot—even we Americans whose acquaintance with the game really dates back only to the late 1880's. Within three years three courses appeared at widely separated points.

At Foxburg, Pennsylvania, a course was constructed in 1887, and five holes of it are still in use by the Foxburg Country Club. Its founder, Joseph Mickle Fox, had picked up

the game on a trip to Scotland as a cricketer in 1884. He laid out a short course around his home and, when the game grew popular, donated some of his pasture to make a community links.

In November, 1888, a group gathered at the home of a New Yorker, John Reid, and solemnly formed the St. Andrews Golf Club of Yonkers. A friend of Reid's, Robert Lockhart, had brought from Scotland a set of clubs and some balls. First act of the group was to lay out a 6-hole course in a near-by pasture.

For four years the pioneers practiced here, to the hoots and head-shakings of passers-by; then they moved to a 34-acre orchard with more elbowroom. On its branches they were wont to hang their coats and a few jugs of refreshment, and from this habit they acquired the title which stuck to them, the "Apple Tree Gang." In 1897 this group took over its permanent home at Mount Hope.

Meanwhile, down at Middlesboro, Kentucky, some English settlers, homesick for the game they had left behind, constructed a 9-hole course in 1889. This course, somewhat modified, still serves the Middlesboro club.

Once started, golf caught on like wildfire. In 1894, when the United States Golf Association was formed, it consisted of five clubs—St. Andrews, Newport, Chicago, Shinnecock Hills, and the Country Club of Brookline. By the end of the year, more than a score of other clubs had joined as associates and as allied members. By 1927 the USGA contained 1,012 clubs; now it has more than 1,500.

The laying out of early courses was, to say the least, not very formal. One of the era's foremost "golf architects," for example, was an ex-linotyper of the old New York *Herald*, Tom Bendelow. For \$25 a day Bendelow would "construct" a course for any club, and it rarely took him longer than 24 hours. Striding rapidly over the terrain, he would plant small flags for bunkers, big ones for greens, different ones for tees, and be gone.

All told, Bendelow is believed to have laid out more than 600 courses in this happy-go-lucky fashion. Most of them have since been plowed up. But occasionally in the Midwest I have stumbled across one of his characteristic bunkers placed straight across a fairway or one of his square, flat-as-a-flounder greens.

Ex-Caddie Put Golf in the Headlines

Not even such courses could discourage American golfers, however, and when, in 1913, an unknown 20-year-old ex-caddie from Boston stepped up and coolly dethroned the British professionals Harry Vardon and Edward Ray, enthusiasm for the new game swept the country. Young Francis Ouimet became the hero of every high-school kid and of many a graybeard, too. In one step, golf had been lifted in the public mind from a plaything of



foreigners and "the 400" to a part of the American heritage.

As the game grew, so grew the sophistication of course designers. They did not have the rolling seashore sand hills which the Scots call "links," but the best of them strove at least to make their man-made, inland creations look natural. Greens were allowed to roll a little, protective mounds lovingly sculptured, traps given a deceptively casual air, as if hollowed by the wind, and tees, once abrupt platforms, were made to merge imperceptibly into rough and fairway.

Fruits of this developing capacity to make the most of American terrain can be seen in such magnificent modern courses as Califor-



Nature Traps Banff's Course with Surging River and Mountain Downdrafts

This tricky Canadian course has often cost a golfer his temper and many lost balls. Strangers have hooked as many as eight balls in a row into Bow River. A skyscraper in the wilderness is Banff Springs Hotel (left).

nia's Cypress Point and Pebble Beach, New Jersey's Pine Valley, Connecticut's Yale, New York's National and Winged Foot, North Carolina's Pinehurst, Donald Ross's splendid Mark Twain Golf Course at Elmira, New York, and the new Myrtle Beach links in South Carolina.

At Cypress Point and Pebble Beach, brilliant use has been made of a rocky, indented shore line, with water carries of a daring and beauty unsurpassed, to my mind, anywhere (page 129). At Pine Valley, widely consid-

ered the toughest championship course in the world, the "Jersey barrens" have been carved into some of the most interesting and exacting holes ever devised (page 130). As for Yale, architects succeeded there in coaxing from rock and forest perhaps the best college links in the country.

Macdonald's reputation, however, is enshrined elsewhere, in the National Golf Links of America (page 126). This amazing course, which he laid out in 1907 on dunes near Southampton, Long Island, is actually a deliberate

National Links' 18 Holes Duplicate Europe's Finest

The late Charles Blair Macdonald, an eminent golf architect, took two years and drew on a lifetime of experience to create on the dunes of Long Island a course embodying the outstanding holes of Great Britain and France. Mr. Macdonald helped build other spectacular courses, such as the Mid-Ocean at Bermuda and the Yale at New Haven, but the National Golf Links of America, at Southampton, remains his crowning achievement.

Some think it easier to get into the White House than into the National's club. Prospective candidates may wait a decade or more for admittance. Women apply in vain. As guests, they are allowed to play, but must give way to male foursomes.

Famous foreign holes which Macdonald adroitly duplicated at the National include the Alps from Prestwick, the Redan from North Berwick, the Eden from St. Andrews, the Sahara from Sandwich, and the 12th hole from Biarritz.

This is the par-four, 419-yard 16th hole modeled after one at Leven, Scotland. It is called the Punchbowl.

National Golf Links of America



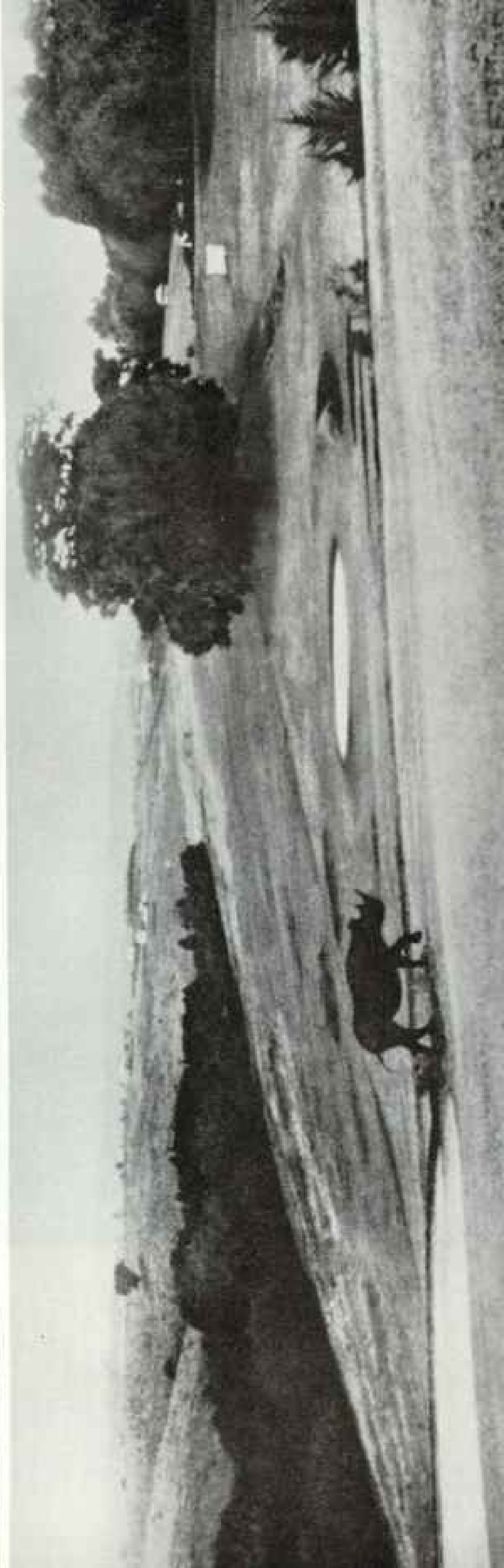
Bears and Rhino Ignore the Cry, "Fore!"

← Golfers at Jasper National Park, in Alberta, Canada, must get used to bears wrestling on the fairway and occasionally absconding with a ball (page 122). A ground rule says the ball may be played without loss if a bear drops it without loss of stroke or distance. This regulation helped one woman convert a 90-yard drive into an eagle two when a bear helpfully carried her ball to the green.

← The rhinoceros, crossing the Nyeri golf course in Kenya, African, is unlikely to help anybody.

Canadian National Railways

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Stone of Gavea Silently Surveys a Putt in Rio

Organized golf, which began on the dunes of Scotland, has been exported to strange settings. A course in California's Death Valley has been laid out below sea level. Golfers at La Paz, Bolivia, can putt around a course more than 12,000 feet high.

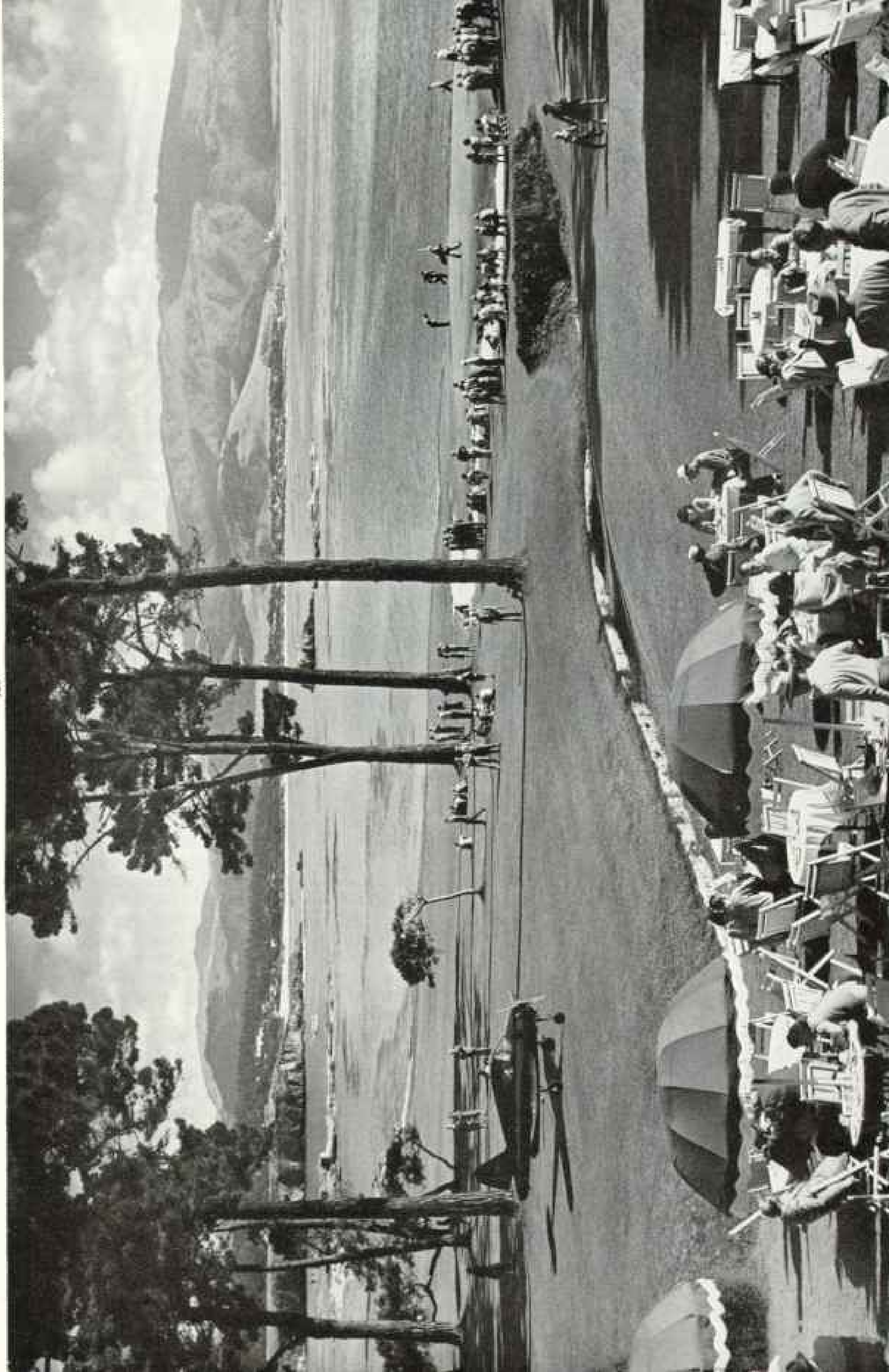
Few courses anywhere can boast a more dramatic site than the Gavea Golf and Country Club's layout above Rio de Janeiro. Nine of its holes lie on the coastal plain; the others climb through tree-ringed hills which offer sudden vistas of the sea.

Don 3-6111

★ Here Bobby Jones Met His Waterloo

The 540-yard, par-five 18th at Pebble Beach, California, has humbled many a top-flight golfer. In the opening round of the 1929 U. S. Amateur championship, obscure young Johnny Goodman led the great Bobby Jones 1 up and 1 to play. After a weak third shot, Jones found himself on this green with a 35-foot putt to sink. His ball stopped short a foot, marking the first time since 1916 that Jones lost a first-round match in the U. S. Amateur.







Odds Favor This Shot's Landing in the Lake

Pine Valley Golf Club's course near Clementon, New Jersey, is so difficult that its par 70 stood unbroken for 24 years of competitive play. Craig Wood finally cracked it in 1938 with a 69. One eminent golfer took 43 strokes on this, the celebrated 14th hole.

duplication of the European holes Macdonald thought finest—the Redan at North Berwick, the Alps at Prestwick, the Twelfth at Biarritz, the Sahara at Sandwich, the Eden, Road, and High holes at St. Andrews; and others.

Macdonald borrowed more than inspiration. He imported tons of heather from Scotland, special grass seed from New Zealand, huckleberry bushes from all over Long Island. On horseback and on foot he loudly supervised each step in the realization of his dream course; sometimes he even jumped down and swung a shovel in a bunker himself.

At the National It's Gentlemen First

Into his 6,639-yard course, Macdonald, who believed that a trap should "punish pride and egotism," crammed some 500 bunkers, and added more later. Some were small and tricky; others were 200 yards long and so deep they needed stepladders. Hazards he didn't have to furnish were wind, fog, vagrant foxes, deer, and quail.

Strict St. Andrews rules are played here. Balls are never lifted, whatever the lie. When one golfer hooked a ball up onto the clubhouse roof, they say he marched upstairs with his caddie, barged through a member's bedroom, and stoically played the shot from the rain gutter.

Other rules are equally tough. Women are barred from membership; even when playing as guests they must give way to male foursomes. No dances or lawn parties are ever held. Men who fail to replace divots face a two-week suspension of playing privileges.

Probably no course anywhere is more exclusive. Golfers from other clubs get no automatic playing privileges at the National. Prospective members must be known to at least two members of the board. The only honorary member is General of the Army Dwight D. Eisenhower.

For a long while the National could claim to be our truest example of the seaside links. Now another, designed by Robert Trent Jones, is the Dunes Beach and Golf Club which opened recently at Myrtle Beach, South Carolina.

Here, where an estuary known as Singleton Swash empties into the Atlantic and where the links land is framed by live oaks, Jones has contrived to work some arm of the water into six of his 18 holes.

In contrast to such a masterpiece was a rugged layout I played in Wyoming. When I first essayed this 9-holer I was assigned an Indian guide as caddie. Nothing could have been more appropriate.

There are, on this curious course, occasional tees and greens; these are to remind you that you are playing golf. The rest of the time you fight your way through waist-deep bear grass and thornbushes.

One can only admire the ingenuity with which Westerners have created such courses under any and all conditions. At El Paso, Texas, where grass faces a fight to survive, greens have been made of cottonseed. Their only drawback is that a cigarette stub can set a blaze which water is helpless to combat.

At Yuma, Arizona, I went around a course when it was 115° in the shade and (I think) 185° on the fairway. Like local members, I tucked wet grape leaves under my hat and refreshed myself with warm water and salt tablets cached at each tee. No one else seemed concerned; yet I had the distinct impression that the day was a trifle sultry for golf.



Bogey, the Four-legged Caddie, Saves Fees and Crops Greens in Sudbury, England

Even without donkey club-carriers, golf can be played far more cheaply in Great Britain than in the United States. Three or four clubs may share and support the same course. Bogey began his golf career when a few months old. Colonel Bogey, an imaginary figure, gave British golfers their word for par.

I was sure of it, the morning I walked onto the Devil's Golf Course in Death Valley, California, the lowest links in the world that I have played. It was refreshing to ascend in a few days to one of the country's highest, the Broadmoor Golf Club at Colorado Springs, with its startling backdrop of Pikes Peak.

The shortest course I ever encountered was "down East" in Maine, on Great Diamond Island. Here I shot the best score of my career, 57 for 18. At that, however, I was still one over par, for the 9-hole layout measured only 1,980 yards!

Chevy Chase, Course of Presidents

Among America's most fascinating courses are those of the Chevy Chase Club, Columbia Country Club, and Army Navy Country Club, outside Washington, D. C. At Chevy Chase, Presidents William Howard Taft and Warren G. Harding played as often as official duties permitted (page 116).

Our presidential bent for golf has been

rather spotty. William McKinley gave it up after a few rounds; he said it required too much walking. Grover Cleveland thought he was too fat to try it, and Theodore Roosevelt abandoned the game as too tame.

A surprisingly strong golfer was President Taft, despite the formidable weight he carried around the course. He played for the most part in the 90's, but on occasion could shoot in the 80's. A frequent partner was the U. S. amateur champion, Walter J. Travis.

Woodrow Wilson had played often at Princeton before coming to the White House, and, if intellect and determination could master the game, he would have been an ace. Unfortunately, he seems to have been a rather fidgety player who addressed the ball as if to reason with it. He seldom broke 100.

Perhaps our best, and surely our most enthusiastic, presidential golfer was Harding. Often utilizing Secret Service men like Col. E. W. Starling as scorekeepers, Harding seized every opportunity to get on the links. A

middle-80's player, Harding was a member of the Executive Committee of the USGA from 1921 till his death. The Harding Cup which he gave is still played for in intercity competition between municipal golf courses.

Calvin Coolidge did not choose to play. He tried it once or twice, but remarked that he thought it a little expensive for the average pocketbook. Herbert Hoover, when he found time for exercise, tossed a medicine ball or went fishing. Franklin D. Roosevelt's favorite sport was sailing; Truman's, swimming.

For my part, I have increasing sympathy with President Coolidge's comment. Golf at most American clubs *is* expensive. I talked of this with golf architect Robert Trent Jones on my trip to St. Andrews. Both of us had been much struck by the way in which the British have kept the game within the means of the ordinary citizen.

Three or four golf clubhouses, as at Carnoustie, may use and help support the same municipal course. Club accommodations, by our standards, are held to a Spartan simplicity. Members rich or poor think nothing of carrying their own bags. Result: dues at even the swankiest club cost a member scarcely \$20 a year.

British and U. S. Courses Compared

As to the courses themselves, the differences are subtler. Said Jones: "These British courses are terribly tough for 170 to 200 yards off the tee and along the edge of the fairways. Those swales, bunkers, burns, and clumps of whin and heather—ghastly! But if you can negotiate these horrors, you can usually play a pitch-and-run shot for the green, which is darned near impossible on most American holes because we trap our greens so tightly."

"True," I replied. "And the British greens, once you get to them, are often a lot bigger. On some of the double greens here at St. Andrews I'll bet you can hit a 120-foot putt."

Jones thought a moment. "Maybe there's one difference that's more important than any of the others, though, and that's this: the British leave their links alone. They're not dead set on low scores; they're more interested in a good fight with the wind and the terrain."

"Couldn't agree with you more," I said. "Take most American championship courses. From the word 'go,' the pressure's on the golf architect to baby the best players, to yank out traps that cause them the most trouble, to keep the rough trimmed like a fairway, and the fairway shaved like a green. Why? Just so that somebody can beat the daylight out of par."

Jones agreed; we seemed to see eye to eye on these important matters. And what could be

a better basis for a long afternoon's conversation? He had much to tell me of golf-course construction, and I could contribute a few anecdotes of my own about layouts he had never seen.

I told him about playing courses in four counties of Arkansas in one day, and then of playing in four States between dawn and dark. Each exploit proved something of an ordeal.

For the four-counties attempt I rose at 5, played a round at Clarksville, and entrained for Russellville, Morrilton, and Conway. The first three hops went off smoothly enough, but on the last lap to Conway the train was half an hour late.

Determined to finish anyway, I rounded up a pro and six caddies and set out. The first six holes I played in twilight, the next two at dusk, the last—a 500-yard, par-five punisher—in almost total darkness. I would hit the ball, and a cry would go up from my far-flung caddies: "Anybody hear it? D'ya see it, Joe?"

Miraculously enough, I was on the green in four and, by the light of a match held over the cup, holed out in five. Trying the same hole by daylight the next morning, I took a seven!

The four-States venture comprised 45 holes in the quadrangle formed by Oklahoma, Kansas, Arkansas, and Missouri. All would have gone nicely if my taxi driver hadn't tried a "short cut" between the last two States. Over the grisly 76-mile stretch he had picked we had to go the whole distance in low.

And Now a Confession

I try that kind of stunt no more. In October, 1943, I shot 72 holes in one day, but I shan't do it again. My wife, with more than 600 courses to her credit, is content with her own record, and I suppose I should be with mine.

Yet, as I told a Scottish reporter once who questioned me about my "hobby":

"It's no hobby, son. It's an obsession."

And perhaps it is. In the early days of golf, a British logic professor disdainfully defined the game as "putting little balls into little holes with instruments very ill-adapted to the purpose." But to me it will always remain the most fascinating, and the most perplexing of all sports.

Confession, they say, is good for the soul. Very well, then, let me confess something:

I have played more than 8,500 rounds of golf; I have talked golf with more pros in more parts of the world than anyone of my acquaintance; I have sallied forth upon the links, winter and summer, fair weather and foul, for 42 years—

And I *still* take my eye off the ball!

The Mohawks Scrape the Sky

BY ROBERT L. CONLY

With Illustrations by Staff Photographer B. Anthony Stewart



ONE of the last places in the world where you might expect to meet a Mohawk Indian is the top of the towering steel skeleton of a New York City skyscraper. Yet that is where many a modern Mohawk brave earns a living, walking narrow steel girders more perilous than any warpath.

On Manhattan's East Side, I watched a gang of them at work. High above my head, they operated with hammers and tongs and red-hot rivets, moving as surefootedly as cats, as calmly as if they were standing on the sidewalk.

What were Mohawks doing in Manhattan? Why, stranger still, should Indians be raising the steel frame for a skyscraper?

I found the answers a few miles away, in the Borough of Brooklyn. There I visited a small but well-settled Indian village, where some 400 of these same Mohawks live as neighbors in comfortable, modern apartments. Almost every man in the community, I learned, earns his living in "high iron."

Working 500 to 1,000 or more feet in the

air, balanced precariously where one misstep means death—this is specialized, skilled work, and most of the Indians who do it have spent their lives at it.

The first Mohawks I saw were putting up steel for the United Nations' new General Assembly building next to the East River (above). But even the lofty UN buildings were dwarfed by some other structures I could see against the horizon. Mohawks had helped erect them too: the Metropolitan Life Tower (700 feet tall), the Woolworth Building (792 feet), the RCA Building (850 feet), and, out-reaching them all, the Empire State Building, which, with its new television tower, soars 1,472 feet, more than a quarter of a mile (pages 136, 137).

Mohawks Once Had Their Own UN

For Mohawks to help build the United Nations was strangely appropriate. More than 300 years ago, the ancestors of these same Mohawks belonged to a United Nations of their own—the mighty Iroquois federation, or



Five Nations (later Six), which controlled the southern Great Lakes region from the Hudson to the Illinois River.* In its councils, delegates of member tribes debated problems surprisingly similar to those of the UN Assembly today. On the issue of war or peace, each tribe had the veto power.

I talked to some of the Mohawks when they stopped riveting to eat a strictly non-Indian lunch of sandwiches and soda pop (page 141). I spoke first to Tom Labache, a tall, dignified Indian with typical high cheekbones, a long, angular face, and deep-set eyes. Tom said he got his first job in high iron 30 years ago, when he was 17.

I asked him what was the tallest building he had ever worked on.

"The tallest? That's hard to remember," he said. "I guess it would be the Metropolitan Life, or maybe the Waldorf-Astoria [625 feet]. The truth is, you don't pay much attention to how tall they are. If you slip, 50 feet is just as bad as 500 feet."

Working with Tom Labache in the four-man riveting gang were Tom Jacobs, Mike Tarbell, and Mickey Snow, all veteran ironworkers, all Mohawks, and all neighbors in Brooklyn. While

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

← Surefooted Mohawks Walk Narrow Beams High over Manhattan

Mohawk Indians, almost totally lacking in fear of heights, are widely employed in structural-steel work. Hundreds of feet aloft, they move as surely and calmly along girders as most men do on the ground. Here, as Rockefeller Center's French Building goes up, the boss of a rising gang signals (arms out, palms down) a crane operator to lower the hook for another steel beam. Behind these two men rises the 70-story RCA Building, which Mohawks also helped to erect.



To Oblige Those Who "Want Us to Look Like Indians," City Mohawks Put On Feathers

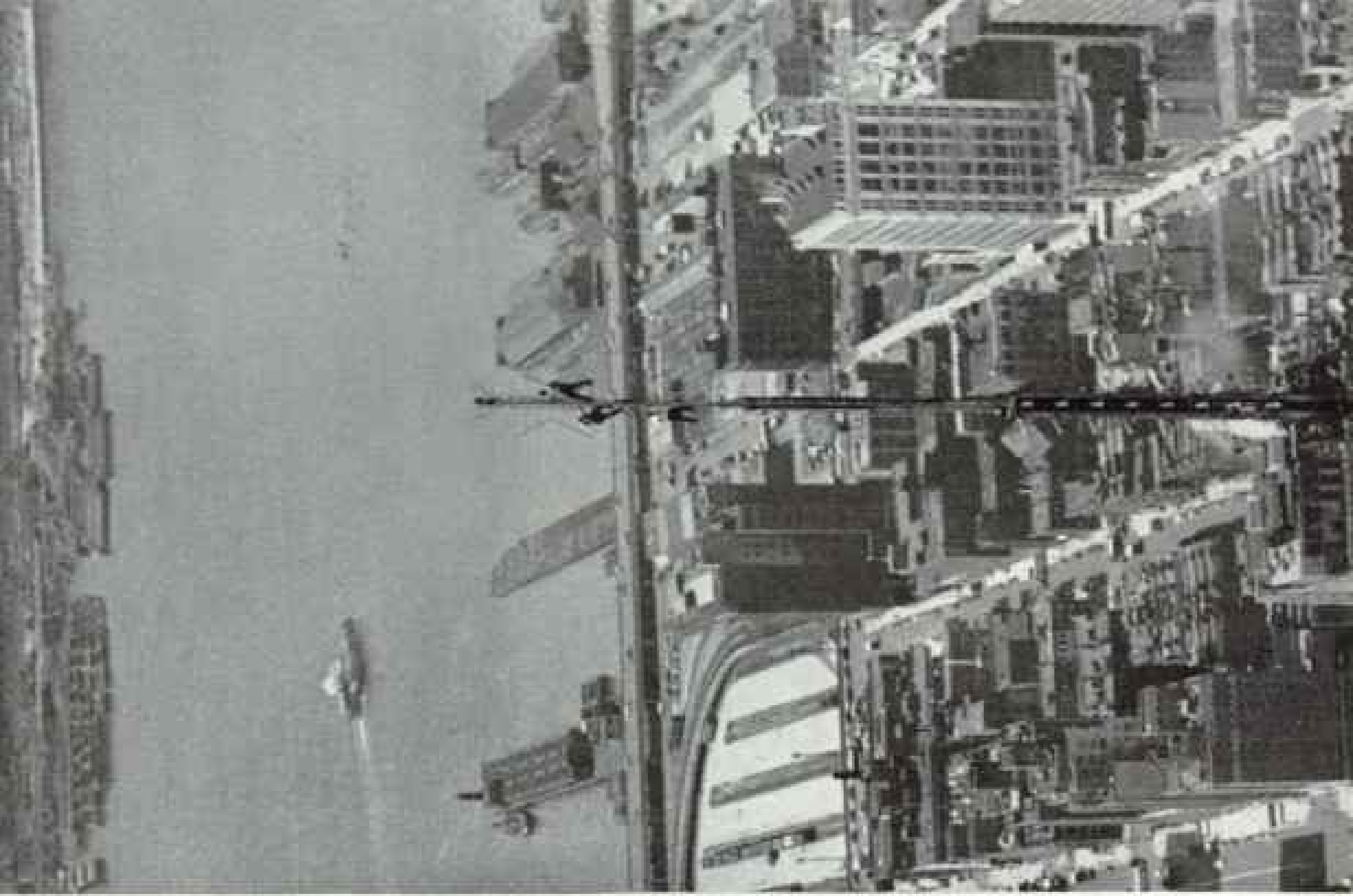
Brooklyn's steel-working Mohawks and their families sometimes stage shows for their neighbors. Songs and dances are authentic, but feather bonnets are borrowed from Plains Indians. For this performance in the Cuyler Presbyterian Church a light-bulb "campfire" lends outdoor atmosphere.

they ate, they explained how a riveting gang operates: when lunch was over, they demonstrated (pages 136, 137).

Mickey heated rivets in a small coal-fired heater set up on planks laid over the bare steel girders. When a rivet was red hot, he tossed it to Mike, who caught it in a bucket,

picked it up with tongs, and thrust it into a hole through two of the steel beams. Tom Labache, using a tool called a dolly bar, held it in place while Tom Jacobs flattened the end with a pneumatic rivet gun.

The whole operation took only a few seconds. It looked simple enough—as long as



Indians Heat and Hammer Rivets for the UN General Assembly Building

✦ Mickey Snow, the heater of an all-Mohawk riveting gang, cranks a small hand blower on his furnace to force air through the glowing coals. Rivets, lying directly on the coals, must become malleable but not melt. When one is ready, Mickey picks it up in the tongs and tosses it (white blur in upper right) to a catcher, who receives it in a metal can.

✦ After the rivet has been thrust into matching holes, Tom Labache (lower right) leans against its head with a heavy steel dolly bar and holds it in place while Tom Jacobs caps the other end with a pneumatic hammer. Hot rivets must be hammered until, on shrinking, they fit tight. Safety helmets bear the initials of United States Steel and its subsidiary, American Bridge Company. Tom Labache (with cigarette) demonstrates another popular use for a hot rivet.

★ From Tower to Street:
1,472 Dizzy Feet

Most spectacular of all high-steel jobs was the erection of a television antenna atop New York City's Empire State Building, the world's tallest. The 102-story, 1,250-foot building was finished in 1931; the 222-foot tower was added in 1951. Mohawks worked on both jobs.

Before the antenna was raised, the steel frame was bolted together experimentally in an American Bridge Company plant to make sure it would fit quickly and easily. As a safety measure, the builders stretched a wire net around the Empire State's dome.

Five television stations now beam programs from the tower. The added height increases their broadcasting radius by as much as 18 miles.

To these men, trucks crowding Manhattan's 34th Street look like beetles, and pedestrians seem mere specks. They enjoy an unrestricted view of the Hudson and the New Jersey shore,

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Three Years Old and Every Inch a Mohawk Is Linda Holding-an-Apple

Linda Lahache was christened with both an ordinary and an Indian name. *Waishawe*, her Mohawk name, means "Holding-an-Apple." She talks glibly in English but "can't speak a word of Mohawk," says her mother.

nobody took a backward step into empty air.

That evening I visited some of the Mohawks at home to hear the story of how they got into high-iron work.

Indian Village in Brooklyn

Most of them live within a few blocks of one another in an old section of Brooklyn not far from the Gowanus Canal. A few own houses; the rest rent walk-up apartments. Some have their own cars, and almost all have television sets, on which they especially like to watch Western programs—about Indians.

Their migration to Brooklyn, they told me, began in the late 1920's. But the beginning of their story goes back further than that.

During the American Revolution the warlike Mohawk tribe moved as a body to Canada and raided the colonists in its old homeland, New York's green Mohawk Valley, from bases north of the border.* When the Colonies won, these exiles settled down on reservations in Canada.

One of the reservations, southwest of Montreal on the St. Lawrence River, is called *Caughnawaga* (meaning "At the Rapids"). It was originally founded by Jesuits in 1667 as a settlement for Indian converts. Almost all the Brooklyn Mohawks were born there.

At first the exiled Mohawks supported them-

* See "Drums to Dynamos on the Mohawk," by Frederick G. Vosburgh, NATIONAL GEOGRAPHIC MAGAZINE, July, 1947.

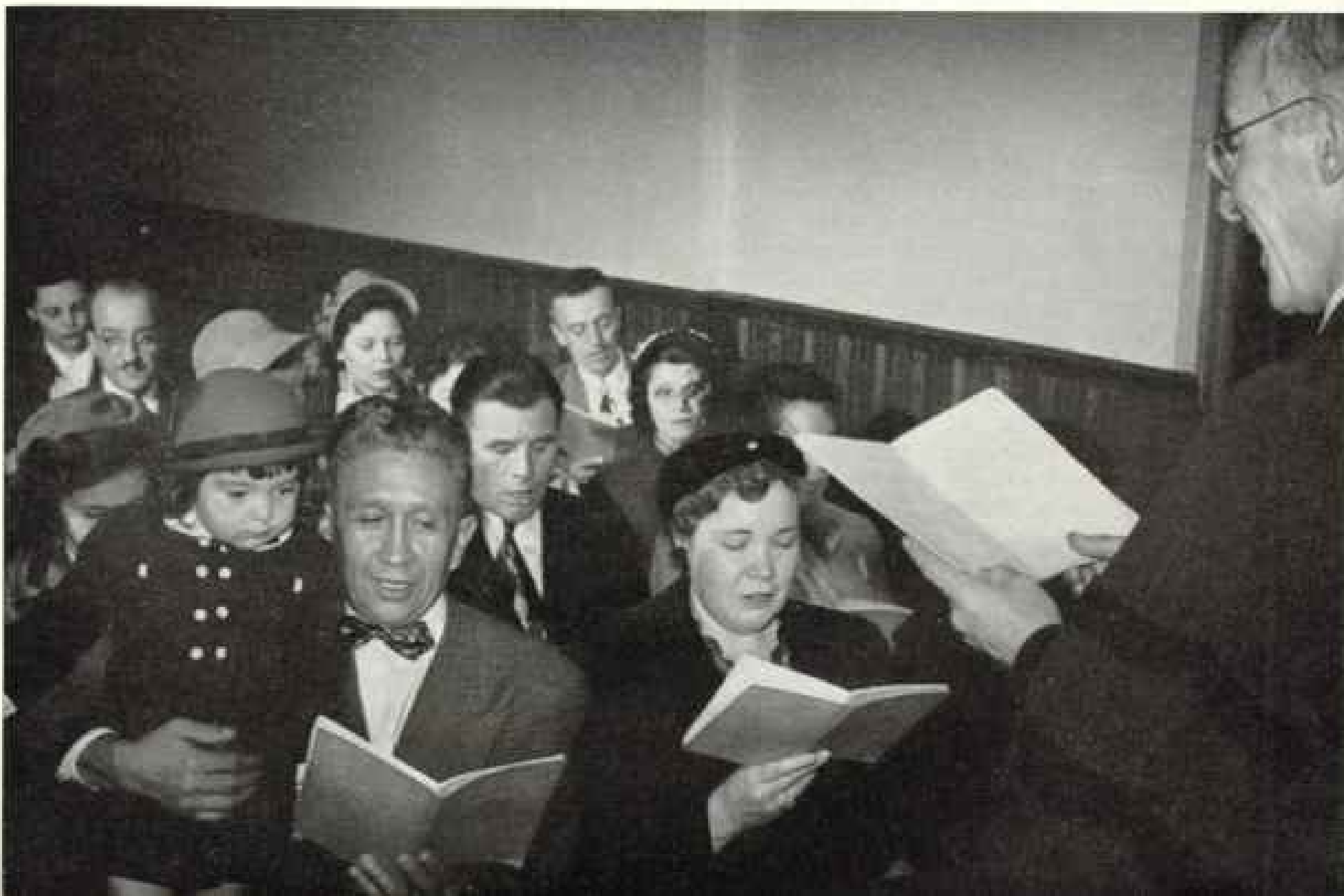


♠ **Mike Tarbell Relaxes on Cushions
After a Day on Hard Steel**

In their neat Brooklyn apartments, Mohawk families live like their neighbors. Here Mike holds his youngest daughter, Shelley, in his lap and helps his oldest, Nancy Ann, with fifth-grade arithmetic. Richard, his son, plays with mother's ball of yarn.

✧ **A Brooklyn Congregation Sings
"Rock of Ages" in Mohawk**

When Iroquois families showed up for services at the Cuyler Presbyterian Church, Pastor David Cory learned their language and had hymnals translated into Mohawk. Now once each month some 50 Indians attend his special all-Mohawk service (page 142).





Indian Boys Climb in Their Grandfathers' Steel Footsteps

Erecting a railway bridge across the St. Lawrence at the Caughnawaga Reservation, Canada, the Mohawks first proved their daring at high-steel work in 1886. The original structure has since been scrapped, but Mohawk boys still play steelworker on two lofty spans which have taken its place.

selves as best they could by farming, trapping, and piloting caneloads of fur over the St. Lawrence rapids. Then in 1886 came the event which was to change their tribal history.

In that year, the Dominion Bridge Company, now Canada's biggest structural-steel firm, began work on a new railway bridge over the St. Lawrence. One end of the bridge was to be in Caughnawaga, the other across the rapids in Lachine. In return for permission to build on their land, the Mohawks were promised jobs on the project—as laborers, however, not as riveters.

In those days, builders had to look hard to find men willing to crawl around high steel girders on a bridge over dangerous rapids. About the only good source was seamen used to working in the rigging of sailing ships. The Mohawks weren't even considered.

It soon became obvious that they should have been. As fast as the bridge went up, so did the Mohawks. They swarmed out on its narrow beams as calmly as if they were walk-

ing on the ground. Hardened riveters, working on the dizzy heights of the span, would find Indians peering curiously over their shoulders to see what was going on.

A company engineer, impressed by the Indians' daring, taught some of them how to rivet. They took to it naturally, and, by the time the bridge was finished, a dozen of them were full-fledged ironworkers. When the construction men moved on to another project, the Mohawks went with them—and took along as apprentices a retinue of brothers, cousins, and friends.

Indians Have Little Fear of Heights

Why did the Caughnawaga Mohawks take so eagerly to this spine-chilling high-iron work? The answer seems to lie in a puzzling characteristic found in many North American Indian tribes, and outstandingly in the Iroquois: they are almost completely lacking in fear of heights.

As early as 1714, John Lawson, an English surveyor and traveler in America, noted:

"They will walk over deep Brooks, and Creeks, on the smallest Poles, and that without any Fear or Concern. Nay, an Indian will walk on the Ridge of a Barn or House and look down the Gable-end, and spit upon the Ground, as unconcerned, as if he was walking on Terra firma."

Scientists who have spent years studying Indians still have no sure explanation for this relative freedom from fear of heights.

Whatever the reason, within two decades Mohawk ironworkers had joined construction gangs all over Canada. In three decades they were drifting into the United States, looking for more work and higher pay.

In Manhattan, in the booming 1920's, skyscrapers were going up like beanstalks, and it didn't take the Caughnawaga Mohawks long to discover that here was a happy hunting ground indeed. The first few to arrive settled across the river in Brooklyn. Rents were cheaper there, and it was only a 5-cent subway ride to the island of steel towers.



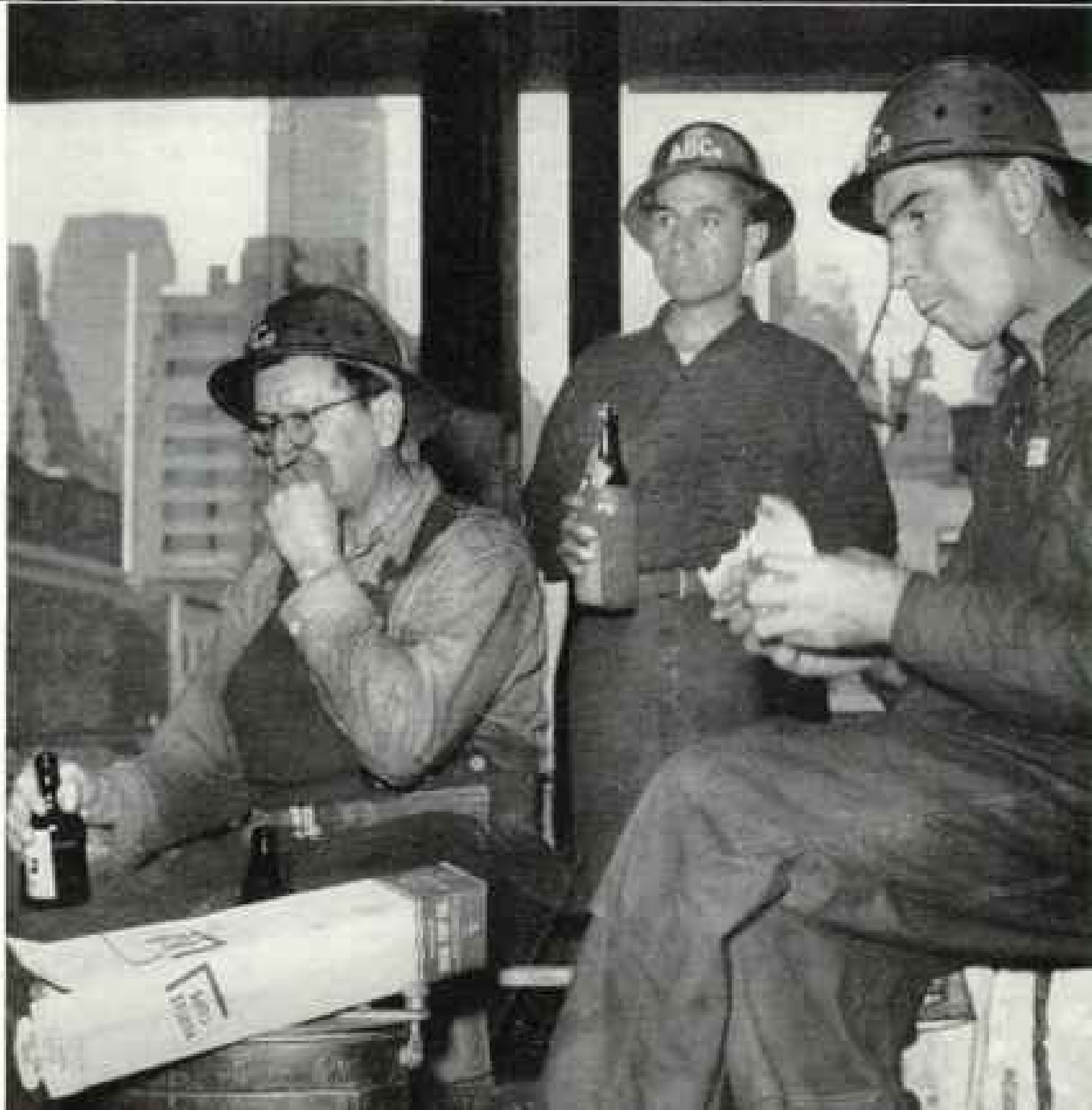
↑ Squaw Fixes Bonnet as Chief Watches TV

Mike Diabo, like many other Mohawks, earns spare-time money at home by making and selling Indian craft objects—tom-toms, totem poles, bonnets, and beaded moccasins. He gets \$40 for a fancy turkey-feather headdress, 50 cents for a wooden tomahawk. In trade, Mike calls himself Chief Flying Leaf. Here Mrs. Diabo sews the final heads on the bonnet while Flying Leaf admires a television cowboy.

➤ Lunch in the Sky

A high-iron worker spends an 8-hour day aloft, takes a half-hour rest at lunchtime. He gets \$5.25 an hour, plus extra for overtime, and can earn up to \$7,000 a year. But as one sidewalk engineer remarked on watching a riveting gang 30 stories up: "Whatever they get, it isn't worth it!"

This gang of Mohawks, working on the United Nations project, lunches on sandwiches and soda pop.



Among the first of the Caughnawagas to migrate to New York was Tom Jacobs, one of my friends from the UN General Assembly job. Tom, short and bespectacled, looks more like a grocer or a bank clerk than a daredevil high-iron worker. In his apartment on Pacific Street I sank into an overstuffed armchair and listened while he told me about it. He had had two years of high-iron work in Toronto, he said, before he headed for New York.

First Job Almost the Last

"I got to Brooklyn about 1923 or '24; I can't remember which it was. But I'll always remember my first job here, because it was almost my last.

"It was a big apartment building uptown in Manhattan, on Fifth Avenue. I was working on a corner 200, maybe 300, feet up. My foot slipped, and all of a sudden there was nothing under me but the ground, so far away I could hardly see it.

"When I felt myself falling, I stuck out my arm, and it caught a beam. I just hung there, swinging in the wind. When the other men saw me, they all began to shout: 'Tom, what are you going to do?' What a question!

"There was only one thing I *could* do. I got my other hand up on that beam, and then I chinned myself and got a leg over it and climbed up. I sat there for a while, to get my breath, and then I went back to work."

After Tom and a few other pioneers got settled in Brooklyn, they wrote letters back to Caughnawaga telling their friends and relatives to come on down and join them. Then the migration began in earnest.

"One thing you should get straight," Tom Jacobs warned me. "Don't say that all high-iron workers are Mohawks. There are plenty of others—Irishmen, Poles, Swedes, all kinds.

"What you should say is that all the Mohawks here are high-iron workers. That's the important part."

Actually, Tom exaggerated, but only slightly. During an extended visit with the Brooklyn Mohawks I did find two who had quit skyscraper building. One had switched to a railroad job. "Steadier pay," he said. The other, a World War II veteran, had contracted malaria and suffered from dizzy spells. So he changed to "safer" employment—as a roofing contractor!

Pocahontas in Bobby Socks

In most ways, the Mohawks have adapted themselves remarkably well to life in Brooklyn, though they tend to be clannish, and the elders frown on marriages between Indians and non-Indians (which happen anyway). On the job, too, the Mohawks usually work together in gangs of four.

Almost all are bilingual; they speak Mohawk in their homes and English outside. Their children go to the Brooklyn public schools. The teen-age girls wear bobby socks; the boys play baseball in the streets and parks.

In some respects, however, it is Brooklyn which has adapted itself to the Mohawks. A restaurant in the neighborhood has so many Indian customers that local Brooklynites call it the Wigwam. Around the corner another restaurant, the Spar, advertises a "Special Indian Dinner" every Sunday. To be sure the cooking is authentic, two Mohawk women take over the kitchen for the day.

On Pacific Street, in the heart of the Mohawk community, stands a small yellow-brick church. Its proper name is the Cuyler Presbyterian, but the Mohawks sometimes refer to it as "o-non-sa-to-ken-ti-wa-ten-ros-hens"—"the church that makes friends."

Its pastor is Dr. David Munroe Cory, a scholarly gray-haired man who is an accomplished linguist. In the 1930's, when Dr. Cory noticed more and more Mohawks showing up at his church services, he accepted the challenge. He already knew eight languages; now he set out to learn a ninth.

This year there is a special Caughnawaga service in the Cuyler church on the first Sunday evening of each month. Dr. Cory holds it entirely in Mohawk, including Bible readings, prayers, and even the hymns (page 139).

With the help of two Mohawk parishioners he translated and had printed a 40-page book, the *Kanawake Teeriwakwata* (the *Caughnawaga Hymnal*). It includes such old standbys as *Ni-ia ta-tia-ta-nons-tat* ("Rock of Ages") and *Ie-sos ra-ke-na-ron-kwa* ("Jesus, Lover of My Soul").

Campfire on a Church Floor

About 50 Protestant Caughnawagas attend Dr. Cory's services regularly. Most of the rest are Catholics; but they, too, have come to regard him as a good friend and advisor.

Though they are well settled in Brooklyn, most of the Mohawks still think of "home" as Caughnawaga. They return to it as often as they can; and when an ironworker gets too old for skyscraping, he usually goes back to the reservation and to Indian ways.

In the Cuyler church the Mohawks sometimes put on an "Indian show," complete with tom-toms, tepees, and tomahawks, for the rest of the congregation (page 135). They dress up in feathers and blankets, sit on the church floor around a "campfire" made of sticks and an electric-light bulb, and sing old Mohawk songs. Their favorite, and always the concluding number, is *Ka-na-wa-ke te-tsi-te-we*. It means "Let's Go Back to Caughnawaga."

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Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

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

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

In Mexico The Society and the Smithsonian Institution, January 16, 1930, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 201 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1931, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,292 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

A notable undertaking in the history of astronomy was launched in 1929 by The Society in cooperation with the Palomar Observatory of the California Institute of Technology. This project will require four years to photomap the vast reaches of space, and will provide the first sky atlas for observatories all over the world.

In 1928 The Society sent out seven expeditions to study the eclipse of the sun along a 5,370-mile arc from Burma to the Aleutians. The fruitful results helped link geodetic surveys of North America and Asia.

The Society granted \$25,000, and in addition \$75,000 was contributed by individual members, to help preserve for the American people the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

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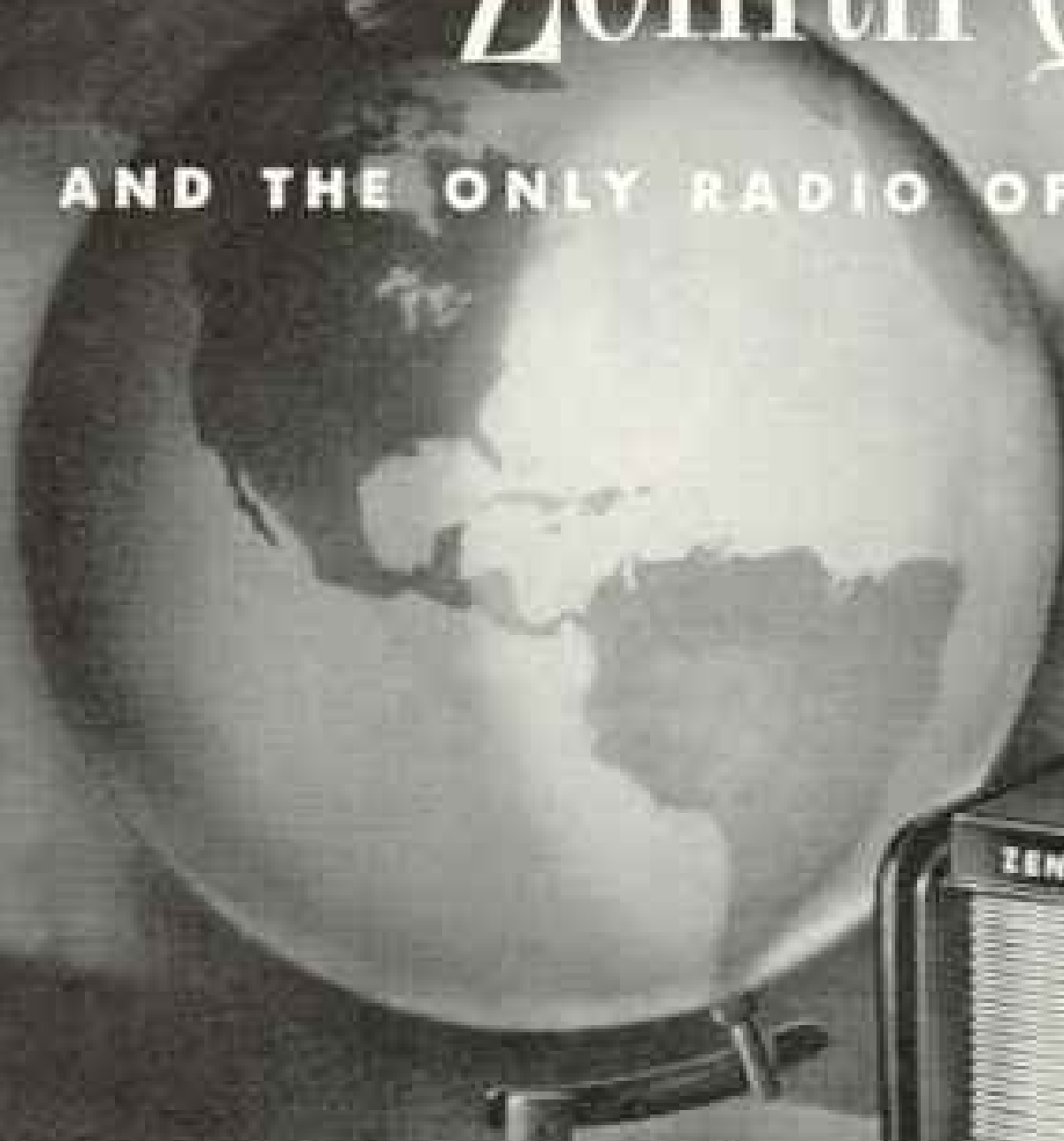
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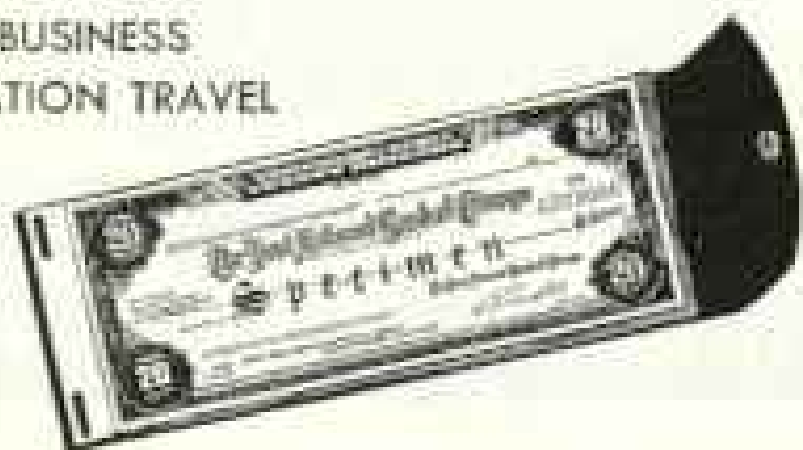


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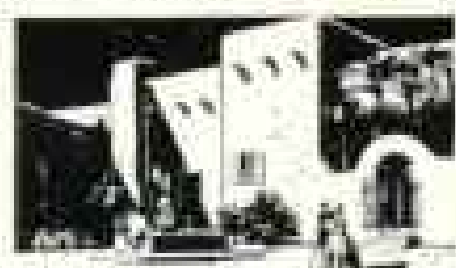
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According to National Safety Council data, motor vehicle accidents accounted for 40 percent of all deaths from accidental causes, and injured more than a million people last year. Safety authorities say that a good way to make your summer trips more pleasant as well as safer is to follow such motoring precautions as these:

1. Always drive at a safe and sane speed. Reports of state and city traffic authorities show that in 2 out of every 5 fatal accidents, a speed violation was involved. That is why it is so important to drive at a speed which gives you complete control of your car at all times.

2. Follow other cars at a safe distance. According to the National Safety Council, even when going only 30 miles per hour, under normal conditions, it would take you about 80 feet to come to a complete stop. This emphasizes the need of allowing ample stopping room between your car and the car ahead. A safe margin is one car length for every 10 miles of speed. Of

course, this distance should be increased at night, and when driving on slippery roads or in bad weather.

3. Keep constantly alert to other cars on the road. This may help you avoid an accident, even if their drivers do something wrong. For example, by watching traffic coming from both left and right when nearing an intersection, you may be able to anticipate and avert possible danger. For the same reason, it is wise to pay attention to traffic coming toward you at all times, and especially on hills and curves.

4. Have your car's condition checked regularly. Traffic reports show that vehicle defects are contributing causes in about 1 out of every 9 fatal accidents. Defective brakes, lights, tires and steering mechanisms are most frequently at fault. Every part of your car should be periodically checked to make sure it is in safe operating condition. Such inspection is especially important before taking a trip.

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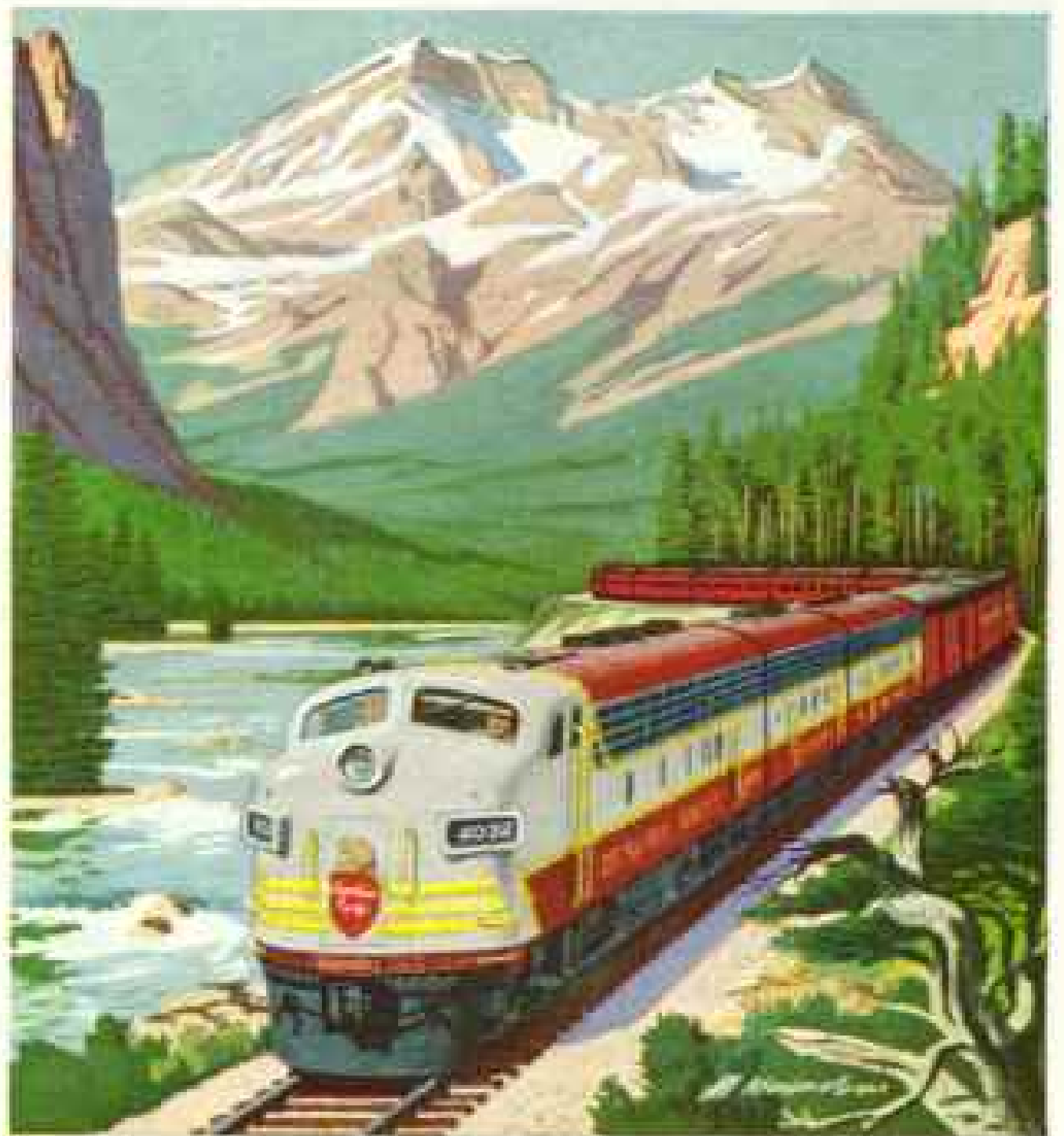
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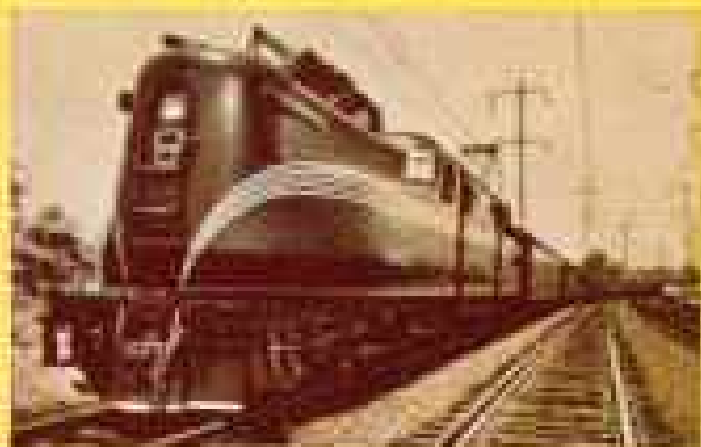




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