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Idaho Made the Desert Bloom

With 21 Illustrations and Map
20 Natural Color Photographs

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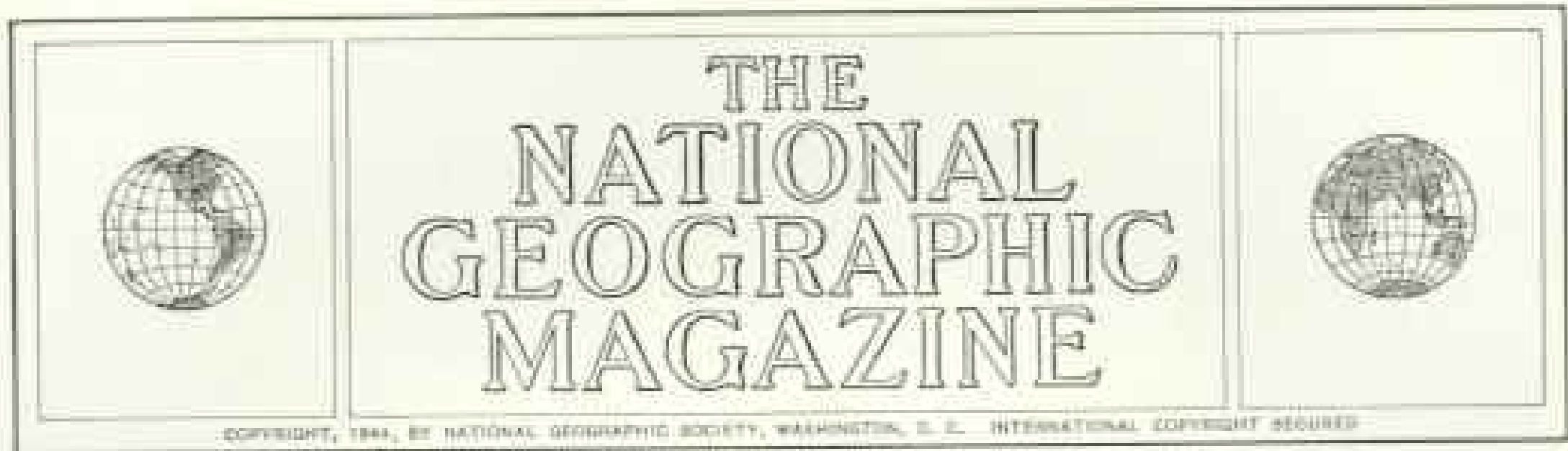
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Idaho Made the Desert Bloom

BY D. WORTH CLARK

United States Senator from Idaho, Member of the National Geographic Society's Salmon River Expedition, 1935

With Illustrations from Photographs by Dr. Maynard Owen Williams

WAR IS teaching Idaho the real strength of its mighty sinews.

Intent upon victory for the Allied cause, this State, mountainous land of twenty national forests and three vast Primitive Areas, has turned from the free and easy ways of peace to the grim business of winning battles.

Sun Valley, our unique year-around recreation resort, developed by W. Averell Harriman and the Union Pacific Railroad for the pleasure both of wealthy patrons and of vacationers of more modest means, has become a Naval Convalescent Hospital where hundreds of young fighters, back from the wars because of malaria, fatigue, or rheumatic fever, are being restored to health under ideal conditions of care and climate (Plate XIV).

Sailors Train on a Mountain Lake

In the clear skies above Boise, our capital, and over Pocatello, our second city, Army Air Force bombers learn their deadly routine.

Farragut Naval Training Station in the northern Panhandle beside fresh-water Pend Oreille, our largest lake, is headquarters for U. S. Navy recruits—45,000 when I was last there—preparing for service on the Seven Seas (pages 671-2).

At the Naval Ordnance Plant at Pocatello worn big guns are relined and rifled for further action against the foe.

In every war-crowded Idaho city, Army and Navy uniforms are a common sight, as are Idaho's sons on every front in this global war. Freedom is something we know—and cherish.

We have no big munitions factories, though our rushing mountain rivers are potential sources of tremendous power; but our saw-mills are roaring 24 hours a day cutting from the finest stand of white pine in the United States lumber for shell cases, armament crates, and matches.

Not only in the white pine area, which stretches north from the Salmon River toward the Bitterroot Range, but in our more southerly forests of yellow pine (ponderosa), Douglas fir and larch, lodgepole pine, white and alpine fir, Engelmann spruce, hemlock, and whitebark pine, tractors with caterpillar treads and trucks with lugs are crashing among the trees and over the roads with logs to help win the war.

Midway in the Idaho Panhandle fighting minerals such as lead and zinc, cadmium and antimony are being mobilized as never before.

A single mine tossed aside gold ore for one month and extracted enough tungsten to toughen 75 million pounds of steel. Because tungsten from mines in China must now fly the deadly Himalaya hump to reach Allied mills, the value of our domestic tungsten is measured not in gold but in blood.

Idaho mountains hold untold reserves of tungsten, antimony, mercury, lead, zinc, copper, and silver as well as gold. In normal times much of their amazing wealth is hardly worth the digging; but war discovers and multiplies uses, and new processes reduce the cost of production (page 673).

Pea fields of the rolling Palouse country are providing food for armies and navies and



Set in a Forest of Engelmann Spruce, Upper Mesa Falls Retains Its Primitive Beauty

But for irrigation and water-power development, the Snake River Valley would still be a desert. This 114-foot waterfall in the Targhee National Forest shows the full force of Henry's Fork of the Snake. In the foreground are United States Senator D. Worth Clark and United States Marshal Ed Bryan (page 643).

at the same time trapping nitrogen to enrich the soil. Throughout the State irrigated valleys, cornucopialike, are pouring forth, even more abundantly than before the war, our famous baking potatoes, sugar beets, beans, peas, onions, grain, garden truck, vegetable seeds, and fruit (Plates X, XII, XIII, XVI, and pages 647, 653, 670).

Millions of high-grade sheep and hundreds of herds of beef and dairy cattle fatten in the grassy uplands and watered valleys (Plates IV, V, VII, and IX, and pages 669, 676). In the northern part of the State, where the Bitterroot Range squeezes from the clouds as much as 40 inches of annual rainfall, fine crops of wheat are grown without irrigation.

Less than 8 percent of the land in Idaho is cultivated; yet agriculture, coupled with

dairying, has been thus far the leading industry in dollars earned. Livestock raising has been second and lumbering third. Despite the fabulous mineral resources of the State, mining in peacetime has ranked only fourth.

A new undertaking, now interrupted by the war, bids fair, when peace is restored, to surpass all usual industries as a source of wealth for Idaho. It is the development of lake-gemmed, river-laced mountain fastnesses as national playgrounds.

Primitive Areas Are Play Places

For Americans weary of the bustle of city life, Idaho will always offer a place of escape in its more than three million acres of Primitive Areas set aside forever as wilderness inviolate. No roads have been or will be built

into the Primitive Areas, but resorts around the borders will afford accommodations to visitors and provide outfits for pack-train excursions into the natural wonderlands.

In the Primitive Areas still lives one of the largest aggregations of wild life in the United States. Deer, wild goats, bears, mountain sheep, elk, moose, cougars, bobcats, lynx, red and gray foxes, wolves, coyotes, wild horses, beavers, mink, otters, squirrels, porcupines, and all manner of game fish from rainbow trout to sturgeon make the region a paradise for naturalist and sportsman (Plates VIII and XV and page 675).

To lovers of mountain forests, lakes, streams, and waterfalls, the road that enters Idaho over 7,078-foot Targhee Pass, ten miles from the western gateway of Yellowstone National Park, is especially alluring.

It reveals a cross section of the eastern and southeastern part of the State, first cutting south for nearly 50 miles through the dense timber of Targhee National Forest and then breaking out into the valley of Henrys Fork, down which it goes southwest to power- and irrigation-prosperous Idaho Falls, our third city. The road continues southwest toward Pocatello and thence bends a little eastward and south toward the Utah line (map, page 644).

When Dr. Maynard Owen Williams, of the NATIONAL GEOGRAPHIC staff, came out to join me last August in a survey of Idaho, we began our journeying at Upper Mesa Falls, south of Henrys Lake. Williams wanted a good waterfall picture, and I knew that the 114-foot cascade at Upper Mesa would please him (page 642).

"The Targhee Forest country is not so rough and hazardous as the Salmon River canyon," I told him, "but it's still wild."

Dr. Williams and I, with Shenon, Reed, Flint, Fahrenwald, Hancock, Cunningham, and Chard had run the Salmon, the "River of No Return," in a scow back in 1935 when the National Geographic Society and the United States Geological Survey joined hands in an expedition to obtain scientific data.*

Nowadays diversion of rivers for water power and for irrigation has robbed some of our once-spectacular Idaho falls of their glory save during spring floods, but Upper Mesa remains always a sparkling curtain of turbulent water. The full flow of Henrys Fork plunges over its wide escarpment. Not far below the upper falls the river takes another drop in Lower Mesa Falls, this time only

65 feet. The mists of the upper falls are visible from the lower.

While Williams climbed about Upper Mesa, seeking a vantage point from which he could capture the grandeur of sunlit water glittering against the dark forest, Ed Bryan and I sat on the warm rocks and took selfish satisfaction in the thought that Idaho still has mile-high wilderness retreats unexploited and unspoiled, where simple things can be enjoyed. We care little for sophisticated entertainment, but derive pleasure from the rugged beauty of our State and cling to many of our frontier customs.

Ashton's Dog Derby

Even festivals in our cities feature sports and frolics that were popular with our pioneer grandfathers. Ashton, a thriving town only a few miles from Upper Mesa, celebrates Washington's Birthday and recalls early days by holding a dog derby.

When this annual event was begun in 1917, the race was from West Yellowstone to Ashton, 64 miles; but because a blizzard well-nigh buried the drivers and none reached the finish until the day following the start, the distance has been cut to three laps around an 8½-mile course.

In that first race one driver had a bulldog in the lead, and the winner of second place drove a team of farmyard mongrels, a far cry from the sledge dogs that used to haul the mail over snow-covered mountains. Of late Irish setters have been favorites with the drivers.

Teton Basin, south of Ashton, is now an irrigated garden spot prolific in peas, cauliflower, and berries. In the early days of the fur trade, more than a century ago, it was the Montreal of the Rockies, where beaver trappers sold pelts, bought new supplies, and drank and gambled.

Pierre's Hole, as it was then called, was a rough-and-tumble rendezvous for adventurers of the Wild West. However, as our party wandered among the mild-eyed dairy herds, or feasted our eyes on the vast fields of vegetables, we saw little to remind us that the country was once untamed frontier.

St. Anthony, too, savors more of seed peas than of early adventure. War-spurred seed production has outrun statistics, but even in normal times this riverside county seat was the largest shipper of pea seeds in the United States (page 653).

A few miles southwest of St. Anthony is the long-forgotten site of Fort Henry, named for the factor of the Missouri Fur Company who first explored the site in 1810. Wilson Price

* See "Down Idaho's River of No Return," by Philip J. Shenon and John C. Reed, NATIONAL GEOGRAPHIC MAGAZINE, July, 1936.



C A N A D A

W A S H I N G T O N

O R E G O N

N E V A D A

U T A H

GLACIER NATIONAL PARK

YELLOWSTONE NATIONAL PARK

WYOMING

O R

S N

R

O

G

N

C

Railroads Highways
0 10 20 30 40
MILES

Drawn by Theodora Price and Irwin E. Allen



Straining Muscles of Covered-wagon Days Are Commemorated on the Oregon Trail

This marker at Hagerman honors Marcus Whitman, devoted missionary to the Indians in the Oregon country. Each marker has the shape of the State of Idaho, and most of the portion covered by the bronze medallion represents primeval forest (page 654).

Hunt's Astoria-bound party stopped here in 1811, long enough to build cottonwood canoes for a run down the Snake River—*La Maudite Rivière Kuragée*—the accursed, rabid river, French *voyageurs* called it (page 653). Now the once-dreaded Snake has been transformed into a benefactor which has caused its desert valley to bloom.

In southern Idaho, where farmers straddle a ditch but have their heads in the sun, umbrellas are rarer than rubbers, for Idaho "did something about the weather."

As Dr. Williams and I rode along under a rainless sky, between stream-lined fields, I asked, "In all your travels, did you ever see anything like this?"

"Sorry," he replied. "But I have. This fertile area between mountain and desert reminds me of Russian Turkistan.

"If you called Boise Merv, Twin Falls Bukhara, and Idaho Falls Samarkand, you'd add Old World romance to the area.

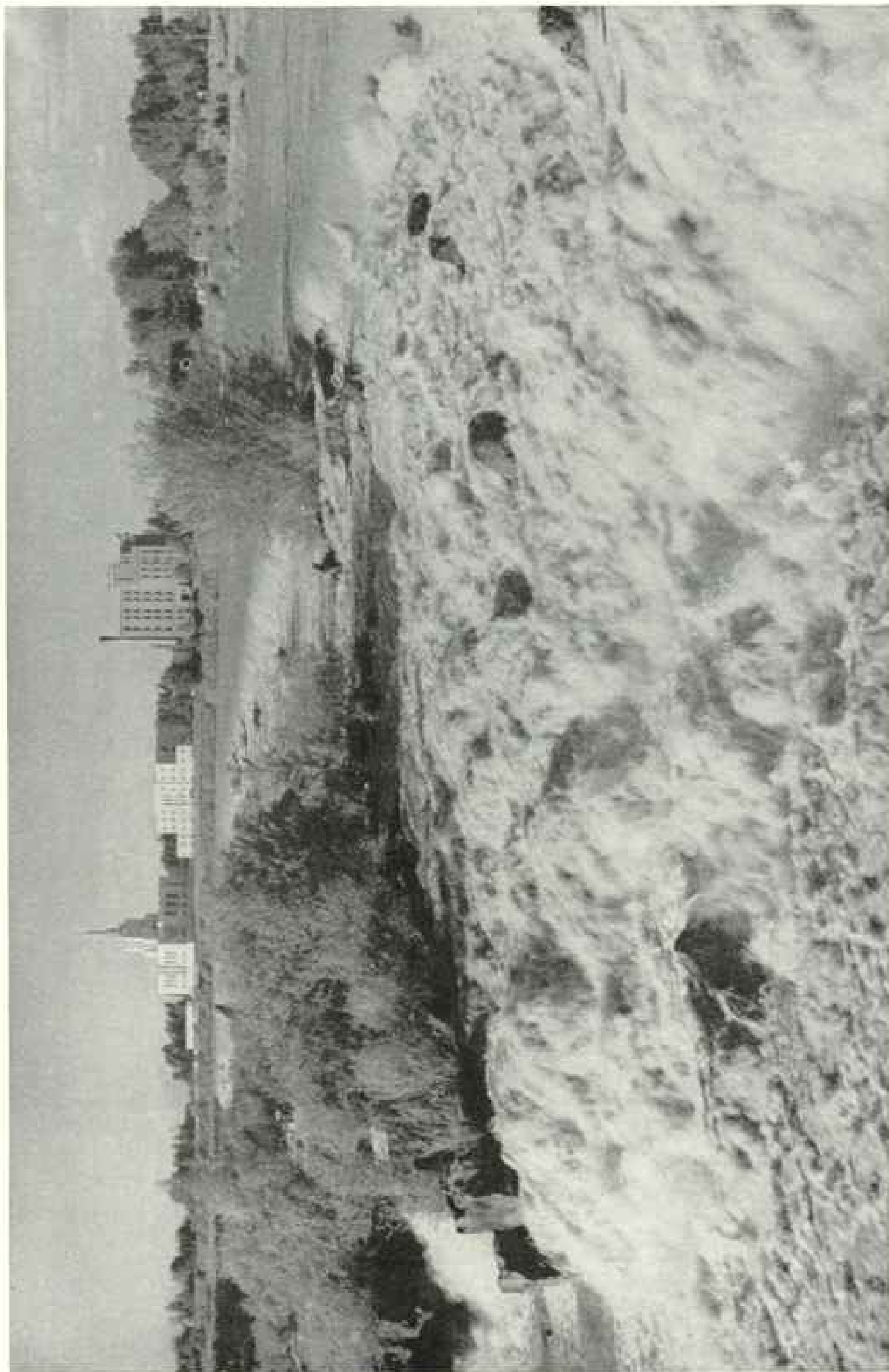
"Of course, the Snake is wasteful. Having fertilized the fields, it wastes itself in the ocean. Central Asian rivers, having produced their fine crops of cotton and melons, give their last swallow to the desert and their last gasp to the sun."

The Snake River doesn't die in the desert, but it might do so were it not for the Lost Rivers, which disappear north of the lava fields and reappear, it is believed, lacing the lava canyon walls, at Thousand Springs, near the Oregon Trail (Plates VI and IX).

New Steeds on the Oregon Trail

Along this historic highway of empire, fur traders and missionaries, loose-footed gold hunters and permanent settlers pioneered the way. For them, this pathway to two-ocean greatness was not "U S 30" but Trail Number One (page 651).

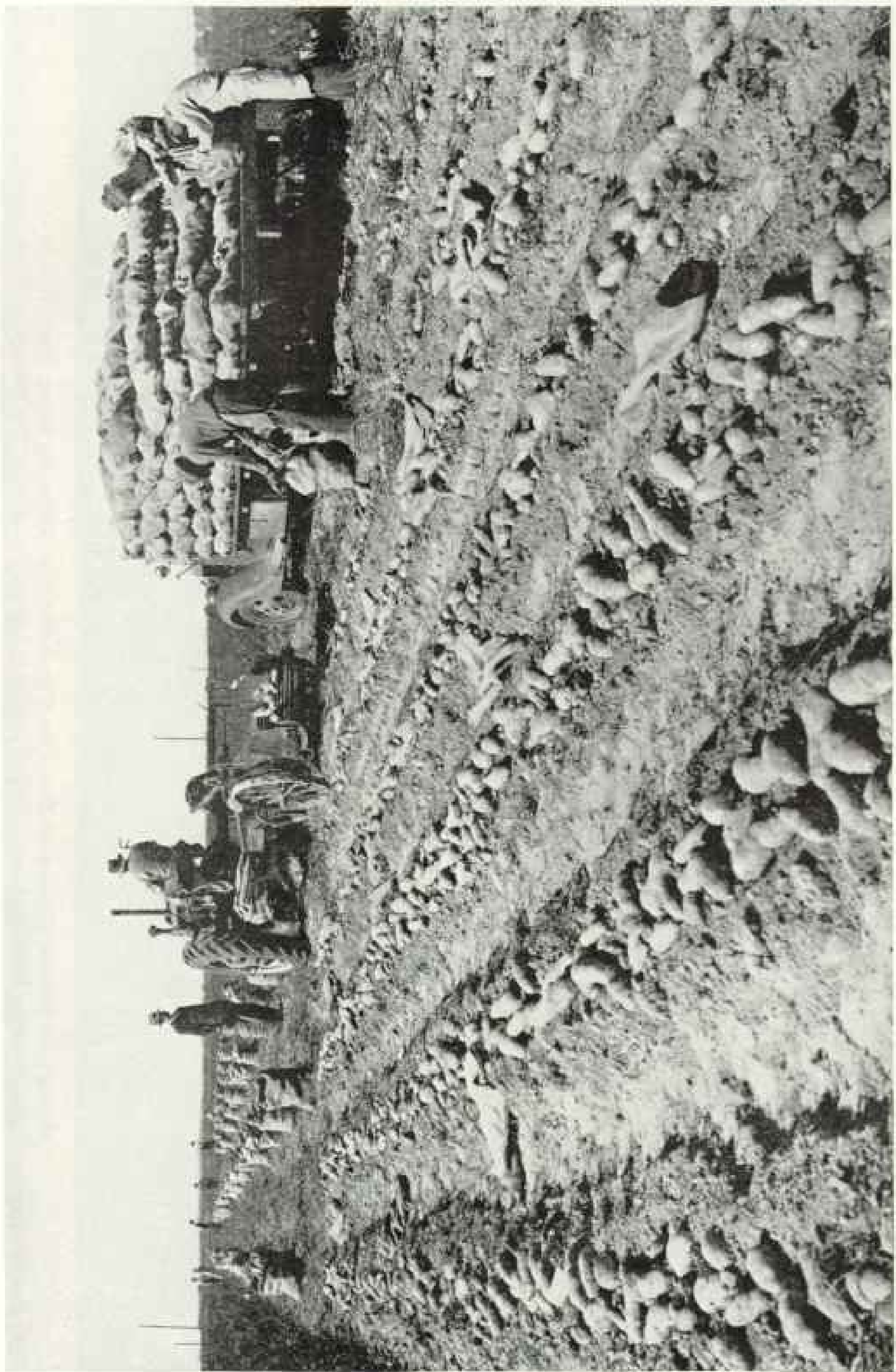
Motorcar and streamliner follow the Oregon Trail set by covered wagon, Indian bands,



Turbulent Show-off Is This Part of Snake River at Idaho Falls, Third City of the State

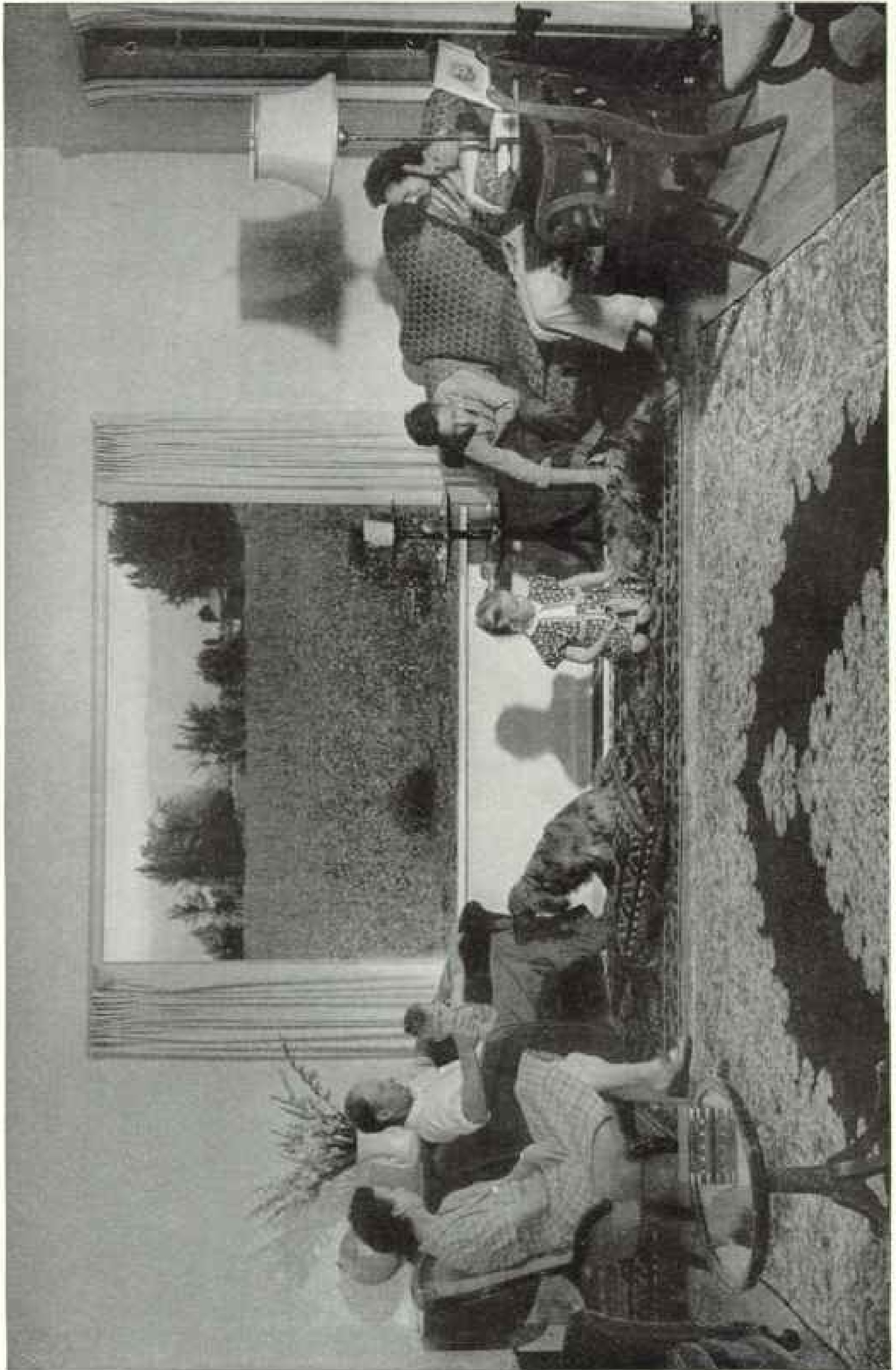
To the right, above the spillway, is the smooth but powerful pent-up water which spins the turbines, helps pay city taxes, and even supports a municipal golf course. In the background are the fine new Mormon (Latter-day Saints) Temple and Hospital (page 650).

L. W. Barron



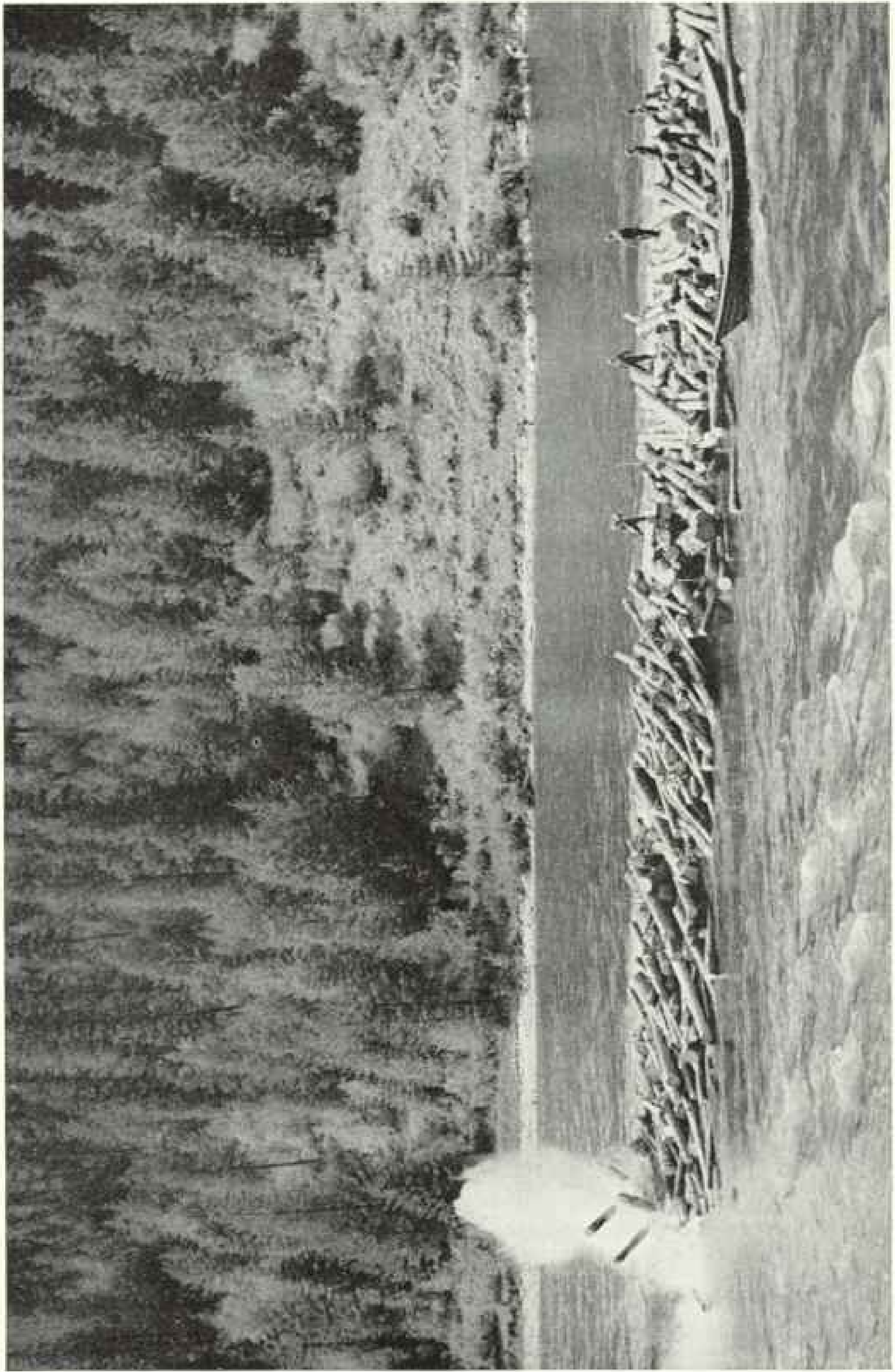
Under Dabs of Butter, Such Idaho Potatoes Are Big News from Times Square to the Golden Gate

In 1943, despite shortage of farm labor, Idaho grew more potatoes than it could ship. There is always heavy demand for smooth-skinned baking potatoes, but shipping costs are almost prohibitive on interior grades. Dehydration reduces 100 pounds of potatoes to a neat 15-pound carton for our armed forces overseas (pages 655, 668).



Through the Picture Window of This Fine Farmhouse One Views the Beans That Built It

College graduates John and Connie Remsburg, Idaho dirt farmers, specialize in growing seed beans (page 653). The spaciousness of their home and its comforts and conveniences show how rich farm life can be when irrigation canals bring abundant water to fertile soil.



With Sharp-spiked Peaveys and Explosives, This Game of Jackstraws Took Only Two Days

In the spring, logs come down the Clearwater River so closely massed that a lumberjack can skip from shore to shore. Here the logs have grounded on a bar, and men must struggle to unscramble the jam and send the lumber on its way to the mill (page 669).



Wartime Pocatello Seems to Be on the Road to Everywhere

A couple of M. P.'s note that Idaho is largely dark-shaded forests and light-shaded farms and desert. The darker quadrangle, a small slice of which lies in Idaho, is Yellowstone National Park (map, page 644). Pocatello has a large air base, and military uniforms are a familiar part of the street scene.

and roving buffaloes; and above it roar the bombers from three Army airfields.

Not all of the desert, however, is blessed with irrigation. North of Fort Henry is an oval expanse of dunes which look like the traditional desert of wind-blown sand of the Sahara. One of the principal charms of Idaho scenery is its unexpected changes.

South and west from St. Anthony stretches a volcanic plateau, broken by fields of naked lava too tough for even a rattlesnake's belly. The Craters of the Moon National Monument, described and pictured in *THE NATIONAL GEOGRAPHIC MAGAZINE* 20 years ago, lies near the northern limits of this weird landscape.* Its yawning craters and tortured lava have been cooled by time until now water in the caves is icy.

Speleologists find happy hunting ground in

* See "Among the 'Craters of the Moon,'" by R. W. Limbert, *NATIONAL GEOGRAPHIC MAGAZINE*, March, 1924.

eastern Idaho, for interesting caves are legion. Among those explored not many years ago is Crystal Falls Cave, which holds a frozen river and a frozen waterfall.

Boom-town metropolis of eastern Idaho is Idaho Falls, fast-growing ward of the Snake River (page 646).

It began with Taylor's toll bridge across the Snake and Anderson Brothers' store. Now only the bastions of the historic bridge remain, but the Snake River, harnessed by one of the largest municipally owned hydroelectric plants in the United States, still takes care of the town it created by furnishing an annual income of more than \$100,000 from power, and watering a million-acre tract of fertile soil which sends its crops to the city warehouses and factories.

From Idaho Falls' "Spud Alley" 10,000 carloads of choice potatoes have been shipped in a single year, and in its potato-flour mill, one of the few in the world, about ten million

pounds of culled potatoes, which normally would be wasted or fed to hogs, are turned into a valuable asset.

Out of the profits from the municipal power project Idaho Falls has built a large hotel, a \$200,000 city hall, a fine, artificially watered golf course—all without a bond issue or increase in taxes. Every spin of the turbines brings money into the coffers, and soon the beautiful city will be debt-free. Eventually it will also be free of taxes.

Pocatello, Railroad and College Town

Our road, continuing southeast from Idaho Falls through Shelley and Blackfoot and across the Fort Hall Indian Reservation, brought us to Pocatello and the north branch of the Lincoln Highway, which in Idaho takes roughly the course of the old Oregon Trail.

Paradoxically, Idaho's second city and principal gateway to the Northwest (page 650) memorialized an Indian chieftain whose propensity to wander from the paths of rectitude won him the name of Pocatello—"He does not follow the road." In 1862 this thieving bandit massacred the members of an emigrant party.

Nothing in the present pleasant city of Pocatello suggests such early tragedy. But for all its million-dollar high school, super-sized cheese factory, hill-backed football stadium, and neat business center, Pocatello is still a child of the highway and the railway. The streets are oriented to the diagonal rail and road line, rather than north and south. At the railway yards, car shops, and roundhouse of the Union Pacific Pocatello earns about half a million dollars a month.

But Pocatello also is a seat of learning and culture. Here is located the Southern Branch of the University of Idaho. This fine institution with its beautiful campus offers to hundreds of Idaho boys and girls all the advantages in higher education.

A permanent addition to Pocatello is the new Naval Ordnance Plant where guns up to 16 inches in diameter and 96 feet in length are relined. Each of the monsters is lowered lengthwise into an 8-story pit, the bottom of which is so far below water level that Navy divers were used in its construction.

While the gun-lining is kept cool by forced water, the outer shell is heated by electric resistance units. A hydraulic jack, powerful enough to topple a skyscraper, loosens the lining. Then a new inner tube is inserted, the shell is contracted with a grip of cooling gun metal, and the tube is rifled. Smaller naval guns are built here.

Many miles to the northwest, in a desert

bare as a setting for a Foreign Legion motion picture, the rejuvenated naval guns are fired to test their accuracy.

Pocatello also boasts of a substantial oil refinery, a large grain mill and elevator, and a tie-treating plant where most of the ties used on the Union Pacific system are creosoted.

A branch of the Lincoln Highway, coming into Pocatello from the southeast, passes through miles upon miles of sheep and cattle country. At present this region is so thinly populated that an average family has two square miles in which to graze its stock. Conditions here, however, may change after the war.

Underlying the waste of grazing land are five billion tons of phosphate—enough fertilizer to restore the fertility of worn-out farms in a nation. Relatively little has been done thus far to utilize this enormous reserve, for Idaho has been shut off from the world by difficult mountains and high freight rates. However, progress is beginning to be made.

Plans are already under way for the construction of a gigantic superphosphate plant in southern Idaho, and as the phosphate reserves of our southern States dwindle, hungry soils of the Middle West and East will look to Idaho for relief.

Ninety years ago westward-bound emigrants trooped through Soda Springs, next-to-the-oldest settlement in Idaho, sometimes at the rate of a thousand a day. Medicinal springs here were appreciated by the old-timers, who named one of them Beer Springs. The bubbly, invigorating water still attracts visitors as it did in the early days.

At Lava Hot Springs, midway between Soda Springs and Pocatello, are available baths remarkable for their mineral content.

The State has built and maintains an excellent institution here. The medicinal values of these waters compare favorably with those of better-known springs.

Idahoans hope to make this town a widely known spa for sufferers from infantile paralysis. By moving about in the pools, bathers can find exactly the desired degree of therapeutic heat. Even the Indians made Lava Hot Springs a neutral refuge where men of all tribes could gather.

South of Lava Hot Springs our party visited the Square Hat Ranch, where a \$70,000 crop of fat spring lambs roamed the hills. There we feasted on leg of lamb and delicious sourdough bread made by a Basque shepherd. Big, solid Dominic, who speaks "Spanish, French, English, and American," is one of a large clan who love America, support Victory drives, and fight for freedom.



Husband and Wife Watch for Idaho Forest Fires

Everything is shipshape in a modern lookout station. The sentinel scans the forested countryside for smoke which betrays a blaze. His wife, aided by the direction finder in front of her, telephones to headquarters. Other lookouts also report. Their lines of vision converge on the fire just as beams from widely separated searchlights concentrate on an airplane in the sky at night. Using a master map, headquarters then can locate the fire within a few yards. Fire fighters are dispatched by truck or plane (page 666).

Some Basques entered America long ago as deserters from Spanish ships and took refuge in remote country where they earned their livelihood as shepherds. Today the sturdy Basques play as prominent a part in civic as in pastoral life. The annual Basque festival at Boise is a gay and colorful event.

Driving westward from Pocatello, we entered a closely guarded area, with a large new air base close to the 26-mile reservoir above American Falls Dam.

The American Falls Reservoir, with a shore line of 125 miles and a capacity of 1,700,000 acre-feet, is the major element in a Federal irrigation project serving 400,000 acres of farmland and the towns of Rupert, Burley, Shoshone, Jerome, Twin Falls, Buhl, and Gooding, the latter nearly 100 miles away across the lava beds—all clustered about by smaller but thriving towns. Few of these

pleasant communities are over forty years old, but they offer most of life's comforts.

In each irrigation-born town old-timers told us they remembered when a certain bank site was a sheep ranch or a particularly rich tract of land belonged to sagebrush and coyote. Pelicans and cormorants now feed where, before irrigation, sun-loving lizards scurried about the Minidoka rocks.

First Electrically Heated School

In 1914 the town of Rupert built the first electrically heated high school in the United States. Girls in its domestic-science classes formed a habit of cooking with electricity. For fifty cents a day a family could heat a five-room house by flicking a switch and letting the white coal of the Snake River do the work of anthracite.

Nearly three-fourths of the widely scattered

farms in Idaho now have electricity; and the increased demand for power has necessitated an advance in rates. As a result, schoolhouse, hotel, and homes have been obliged to change over to coal furnaces.

Near Rupert we visited a friend of mine—a hard-working, college-bred dirt farmer. His home was a revelation to us of the prosperity irrigation and industry can bring to Idaho desert land (page 648). In his shingled potato cellar stood motorcar and tractor. A deep-freeze apparatus was ready to preserve produce stored until market time.

From the outside, only the big picture window, looking out on a richly laden field of seed beans, set his house apart. Inside, Oriental rugs gave color to the step-down living room. The sunny den had many of the latest books and magazines.

Little Margaret, taking Williams by the hand, showed him her father's plate-glass shower, her mother's cheerful sewing room, her own homey bedroom, and the automatic furnace, which can burn 8-foot logs if need be. Despite all this luxury, however, the child was aware of what gave her her blessings.

"Be careful not to step on the beans," she cautioned Williams while he was preparing to take color pictures of her in the field.

It was along this portion of the 1,000-mile Snake that the John Jacob Astorians, led by Hunt, racing for the fur trade of the Northwest, abandoned their canoes and plodded. From time to time, since they traveled along the high rim and suffered from thirst, they sought a trail down the lava cliffs to the thirst-quenching river (pages 643, 645).

Almost a century went by after their time before water was brought to the fields. Now gentle Guernseys are pastured high above the valley floor, and fields of potatoes, beans, and grain stretch far and wide.

A Natural Wonder Harnessed to Power

Two bridges across Snake River Canyon offer a topsy-turvy picture of verdant paradise at the foot of infernal lava cliffs, one of them, the Hansen Bridge, being one of the continent's highest steel suspension bridges, 345 feet.

The river near the city of Twin Falls once fell over three lovely waterfalls: Twin, Bridal Veil, and Shoshone, the latter "the Niagara of the West"—45 feet higher than its namesake.

This natural wonder has been sacrificed to the need for power. During much of the year its water-scoured spillway is dry. But when the spring floods come and searchlights flood the foaming crescent with 25,000,000 candle-power, Shoshone Falls are as majestic as ever.

Last October, Ira Burton Perrine, affectionately called "Father of the Twin Falls Tract," died at the ripe age of 82.

The *Times-News* of Twin Falls summed up Perrine's life work in these words:

"His monument is a rolling carpet of lush vegetation, many hundreds of square miles in extent—a verdant panoply that covers the sagebrush desert which was here when he arrived."

Some of the yields in this part of Idaho must break all records. A thousand bushels of sweet Spanish onions, seven hundred bushels of potatoes to the acre have been reported. Enough carrots with their vitamin A are grown here every year to strengthen for night-flying the eyes of all the airmen in the war.

The center of this mighty empire of the soil is Twin Falls—the "Magic City." Truly magic it is. It grew from the sagebrush and jack rabbits and now is a community of fat bank accounts, beautiful homes, and lovely parks—another illustration of what water, harnessed by the ingenuity of man and fed to a hungry desert soil, can do.

Seeds for the Nation

In Idaho most of the cultivated land is devoted to hay, potatoes, sugar beets, beans, peas, onions, fruit, and wheat. The area given over to the growing of vegetable seeds is small.

Yet on that tiny fraction of fertile land, much of it volcanic ash won from the desert within a single generation, Idaho grows more than one-third of all the vegetable seeds produced in the United States.

If a Victory gardener anywhere in the country plants hybrid sweet corn, the odds are 6 to 1 that Idaho grew the seed. If he plants turnips, the chances are 3 to 1, and if onions, 50-50. More than half of all the dwarf green seed beans in the United States in 1942 grew on less than 28 square miles of irrigated land in Idaho.

Dr. Williams worked several days photographing the production of corn, bean, lettuce, carrot, onion, and other seeds. One day, in an exceptionally fine field near Eden, he said to a seed expert, "These beans look like the ones I grew in my Chevy Chase, Maryland, Victory garden this year."

"The chances are your seeds were grown in this very field," was the astonishing reply.

An Englishman or a Russian might have had the same experience, for under Lend-Lease Idaho seeds are giving their increase in a thousand foreign fields, thus helping to feed fighting men and war workers from Astrakhan to New Caledonia.

Northwest of Twin Falls, the Snake is distended by subterranean streams which foam forth from the lava edge like the milk from the famous Guernseys on Thousand Springs Farm. Since this water, churned full of oxygen, has a uniformly favorable temperature of 58 degrees the year around, the region is perfect for fish hatcheries (page 678).

Federal and State hatcheries raise millions of fingerlings for stocking the streams, and one commercial fishery we visited raises trout in the same way that other farmers in the same valley raise turkeys, or the State Game Farm near Jerome raises pheasants.

In some of the pools of this commercial establishment the water is black with tiny trout; in others the parent fish swim lazily about, quite reconciled to letting man look after their numerous offspring.

A 5-ounce trout, properly browned, is a food for epicures. To make sure of getting exactly the right size for the pan, the fishery men empty a seine-draught of fish into a box with a bottom of slats so spaced that a quarter-pound trout will slip through and a 5-ounce trout will not. That takes care of the girth. Length is checked by holding specimen fish against a zinc plate.

No other view along the Snake is more dramatic than that looking down on Hagerman Valley where watermelons and peaches thrive, where five thousand turkeys of the same feather, breed, and size flock together, and where fossil remains of a hitherto rare form of horse, camels, swamp turtles, and mastodons make this the happy hunting ground of scientists whose prey died and was buried millions of years ago.

Beavers Moved to New Quarters

Here beavers have become a nuisance, for they build dams that flood the hayfields at seasons when the alfalfa should be drying. Idaho solves the problem by trapping the beavers and transferring them to soil-erosion areas where their dams will be a blessing rather than a hazard. This practice was inaugurated in 1932.

At the entrance to Hagerman is one of the Idaho-shaped tablets which mark the old Oregon Trail. It commemorates Dr. Marcus Whitman, who, in 1836, took his bride over tortuous trails to Walla Walla, where they were killed by Indians in 1847 (page 645).

On this trip, Dr. Whitman made a stubborn effort to reach the Columbia on wheels. What started as two wagons ended at Fort Boise as one cart. But on his second trek he led a large party of emigrants across the Rockies; and thousands of covered wagons in

after years widened the historic trail left by his pioneer wheels.

Between Hagerman and Boise, the road runs through sagebrush to Glenns Ferry and Mountain Home. There a large airfield is partly protected by sharp-fanged dogs, trained to Stone Age fierceness.

Much of the land around Mountain Home can be irrigated when sufficient water is available. Northeast of Mountain Home, Anderson Ranch Dam, the highest earth-fill dam in the world, is already 30 feet above water level. The Anderson Dam, when completed, will be the fifth highest dam in the world.

Boise Famed for Its Trees

In beauty, the Anderson Ranch Dam will not match the wide-curved Arrow Rock Dam near Boise, but it will be nearly 100 feet higher. In 1915, Arrow Rock was the highest dam in the world, and it still rivals Boulder Dam in the sweep of its clean curve (page 674). But Anderson Ranch Dam will exceed Arrow Rock in storage capacity and height above sea level.

As we drove into Boise, we crossed the inconspicuous New York Canal, which carries 7,000,000 tons of water a day to the good earth of Boise Valley.

The capital city, dominated by its Statehouse, was half hidden from our sight by trees. Originally they were cottonwoods, beloved by beavers, but thanks to Lafayette Cartee and Chinese tree lovers, Boise is now famous for its arboreal variety.

Captain Bonneville's early *voyageurs* greeted this wooded site between desert and mountain with a glad shout, "*Voyez les bois!*" and thus enunciated the source of the name *Boise*, which on our lips is now pronounced to rhyme either with *noisy* or *choicy*.

As the visitor to Boise steps down from the crack Union Pacific train, *Portland Rose*, passes the khaki-clad guests of the Red Cross Canteen, and looks up Capitol Boulevard to the high-domed Statehouse, he faces a tawny mountain wall which keeps off the winter winds (Plate II).

Boise enjoys remarkably mild winters because of this shelter; yet in summer, though the days are hot, nights are usually refreshingly cool. From green gardens or the Hillcrest Country Club veranda, beauty lovers watch the changing lights on this purple-crowned ridge.

Nature furnishes a considerable portion of the city with inexpensive heat. On Warm Springs Avenue homes are kept warm by hot water piped from subterranean springs. Pluto is the janitor.



In Lava Country It Takes Concrete to Keep Irrigation Water in Line

North of Shoshone, where subterranean rivers meander and ice forms in caves under sun-blistered basalt, this canal carries Snake River water to irrigated tracts near Gooding. In such areas, rivers lose themselves and reappear as springs scores of miles away (pages 645, 652).

Across the shrunken river from Boise Junior College is Julia Davis Park. When the hunting season opens, wild ducks seek refuge near its art museum and rose gardens.

In these wartime days the streets and parks are crowded with soldiers, and just beyond the prettiest picnic grounds are the sheds of a construction company which built mid-Pacific perches for planes on Midway, Guam, and Wake Islands. Idaho lumber has been playing its part in the war with Japan.

Now that the irrigated Boise Valley is a land of milk and prunes, it is hard to realize that early miners here paid 40 cents a pound for beans and \$1.25 for butter, packed in from Salt Lake City or from ports on the Columbia River. New Englanders used to ship general merchandise to the Pacific Northwest and trade it for furs, which they carried to China to trade for tea to be brought back to Boston. The trade was thus triangular.

Early mariners, after rounding the Horn,

sailed to the Hawaiian Islands, one of which the Columbus of the Pacific, Capt. James Cook, called "Owyhee." Hawaiian laborers, brought to Idaho to help build settlements, gave the name to Owyhee County, the Owyhee Hotel in Boise, the Owyhee River, and the Owyhee Reclamation Project.

At Boise Barracks, the capital city of Idaho was born on the Fourth of July, 1863. One of the original cabins, now preserved in Julia Davis Park, was that of Ira Pearce, a blacksmith, who stopped in Boise because his daughter was ill and the reward for shoeing a horse was ten dollars.

By that time, horses were galloping through Boise toward the Boise Basin gold mines. There sluice boxes and towns were being built as fast as trees could be sawed into 10-foot boards worth \$3 each.

Emerging from a mining-camp atmosphere, Boise felt that a State capital needed a railroad as a guarantee to permanence, but it was

many years before the need was satisfied. In September, 1887, a photographer was on hand to greet the first branch-line train from Nampa, but not until April 16, 1925, did main-line service begin and pretty girls in old-time hoop skirts welcome the then Union Pacific president to Boise.

Residents of the capital have always been interested in cultural activities. Even in the early days theater audiences here were entertained by famous actors and musicians. The city is nationally known for its Music Week, which has been copied by other cities throughout the country.

State Fair at Boise

Fortunate is the easterner who visits Boise at the time of the Idaho State Fair. The exhibits of livestock and produce are astonishing. Looking at giant specimens of fruit and vegetables from irrigated valleys, the "tenderfoot" can hardly believe the evidence of his eyes.

But the greatest fun is the rodeo—a real Wild West spectacle in which hard-working ranch cowboys ride unbroken broncos and steers fresh from the ranges.

There are, of course, contests for professionals, and an extraordinarily clever clown goes through side-splitting antics with a trained donkey, but the biggest thrills are furnished by riders not connected with the show.

When President Theodore Roosevelt visited the fertile plain below Boise, he said, "I think the most permanent and useful part of [Idaho's] growth will be the development of her irrigated agriculture."

Since that prophecy was made, our irrigated agriculture has been growing until now under President Franklin D. Roosevelt it is serving the whole Allied world. Today, every pound of butter, dozen eggs, deep-breasted turkey, bushel of onions, crate of lettuce, or box of prunes produced is in great demand.

There have been years, however, when Ada and Canyon Counties have suffered from overproduction. With soil of amazing fertility lying at moderate elevation and enjoying 300 sunny days a year, this plain grows more food-stuffs than normal demands can absorb. If adequate transportation were available at reasonable rates, the problem would be easy, but Idaho mountains make freight rates high.

Caldwell is hard at work on the burning question: "What can we do with surplus potatoes?"

Dehydration and potato plastics are two possible answers. With overseas troops need-

ing dehydrated potatoes, one of the world's finest and largest dehydration plants has now reached capacity production not far from Caldwell.

Since overlarge or too-small "spuds" are as good for dehydration as the choicest 14-ounce baking potatoes, hungry folk around the world may come to enjoy their flavor (pages 647, 668). The best potatoes bring to the farmer about \$1.40 a hundred pounds. Though just as rich in food value, a like quantity of culls will not sell for 10 cents. Since it costs the grower 15 cents to hire a laborer to pick up a hundred pounds of potatoes, culls have been left to rot on the ground.

Potato Pulp for Plastics

At the College of Idaho, in Caldwell, Professor J. H. Roblyer is making potato pulp into plastics. The Idaho Farm Chemurgic Council is sponsoring the research. The time may come when a potato farmer will endorse his check with a potato-plastic pen, grip a potato-plastic steering wheel, eat his baked potato from an attractively tinted and almost unbreakable potato-plastic plate.

In 1943 Mexicans and Jamaicans were brought to Idaho to help harvest "spuds." Local high-school lads earned \$10 a day in the fields. Said one farmer, with a rueful grin, "I'm thinking of giving my potato crop away and then hiring myself out to harvest them."

The college town of Caldwell has cultural interests outside of farm science. Here the Caxton Printers have published many books, among them two of particular value to any student of our State, the *Idaho Encyclopedia* and the *Idaho Guide*.

At Lapwai, near Lewiston, the Reverend Henry Spalding set up the first printing press in Idaho in 1839, and the modern *Tribune* carries on the tradition set by Idaho's first newspaper, the *Golden Age*, which appeared at Lewiston in 1862.

With the Union fighting for its life and news at a premium, the *Boise News* appeared at Idaho City in 1863, the still-potent *Idaho Daily Statesman* began publication at Boise the following year, and Silver City followed suit in 1865 with the *Owyhee Avalanche*. Today, Idaho, with a reading public less than that served by a single metropolitan newspaper, has nearly a hundred weeklies and a score of dailies.

The daily and weekly papers are generally of high quality. At Buhl a young graduate of the University of Washington School of Journalism made of the Buhl *Herald* such an outstanding success that critics pronounced

Idaho Made the Desert Bloom



© National Geographic Society

Photographs by Hazard Owen Williams

What Is Old Fuss and Feathers Kicking About?

In life, he was embraced by State Forester Girard's lovely daughter. In death, he brought Thanksgiving to American soldiers overseas. He is one of a 4,000-turkey flock near Caldwell, Idaho. So favorable to turkey raising are Idaho's sagebrush slopes and islands that its whole population could feast on the annual crop (Plate III).



© National Geographic Society

Boise's Capitol Boulevard Includes a Part of the Old Oregon Trail

In the foreground, where the "bench" breaks away to the Boise River Valley floor, are the Howard Platt Gardens, outside the Union Pacific station. In the distance, backed by "the Ridge," is the Statehouse. About midway, a memorial bridge stands where covered wagons crossed the Boise River on their way to Oregon.

Recreation by Maxwell Owen Williams

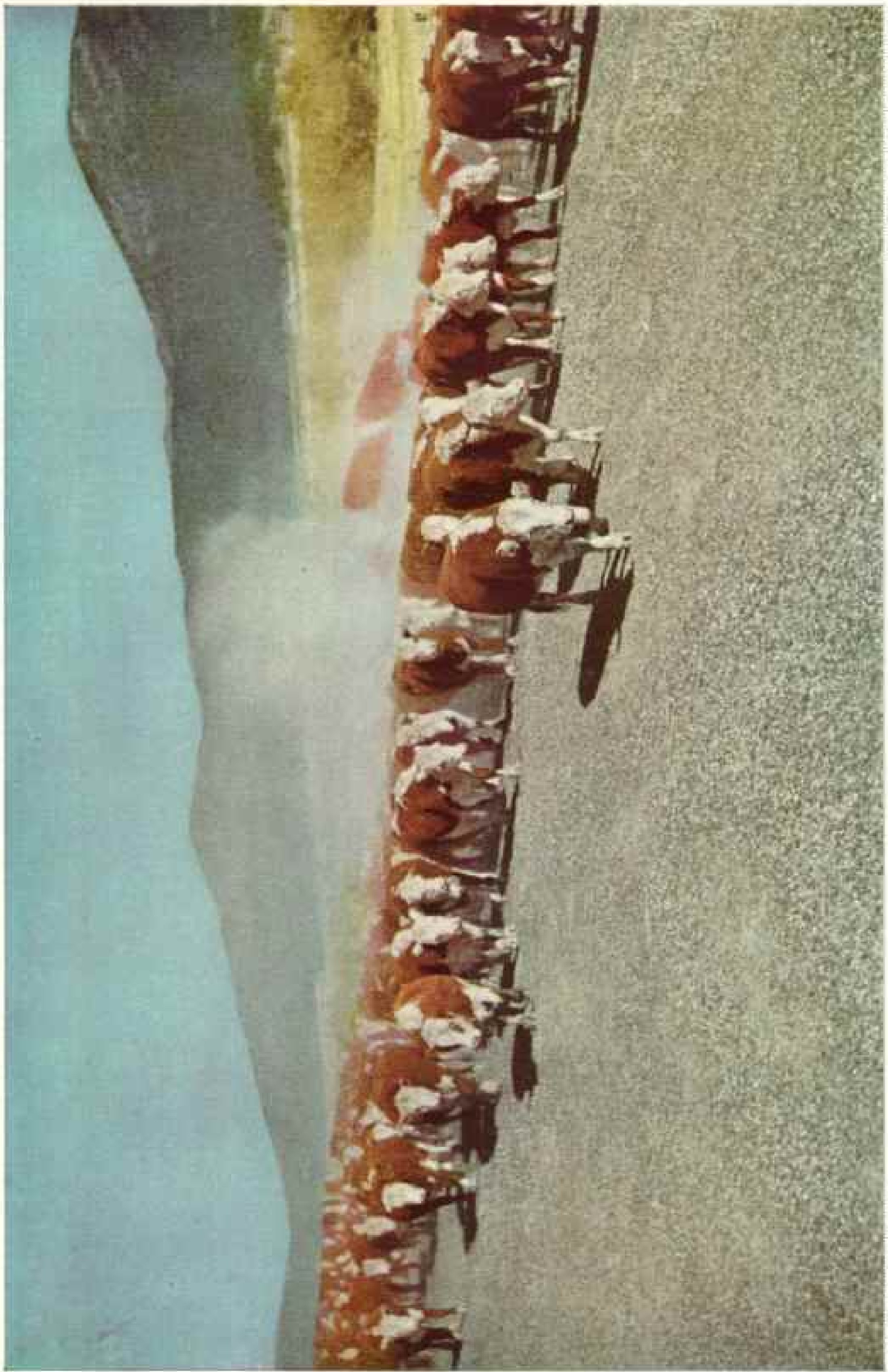


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On an Island in the Snake River, Thousands of Turkeys Gorge Themselves for G. I. Joe's Thanksgiving

Such a turkey farm is actually a meat plant, where tons of prepared food are transformed weekly into white meat and drumsticks. Never allowed to get hungry, these birds are not attracted by food but are herded, like cattle. The two merry blonds are nieces of U. S. Marshal Ed Bryan.

Illustration by Richard Owen Williams

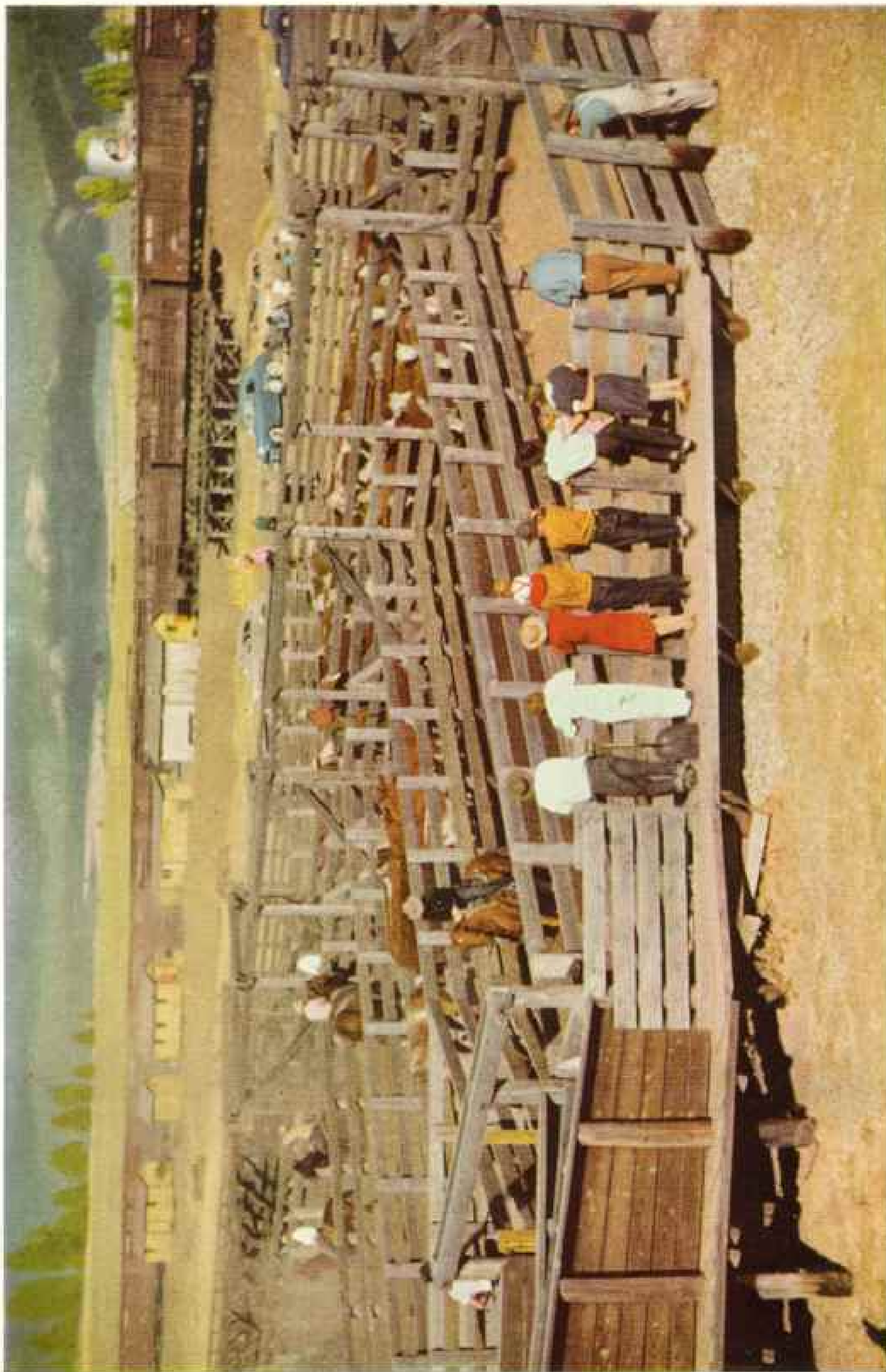


© National Geographic Society

Redrawn by Margaret Deou Williams

Under a Dust Cloud, White-faced Herefords Converge on Shipping Pens at New Meadows.

This is a part of a record, 24-hour shipment of about 125 carloads of prime steers on October 2-3, 1943. After coming down from their summer range, Circle C beef cattle go to Colorado to fatten on sugar-beet tops. When hay sells for a cent a pound, few steers are fed through winter.

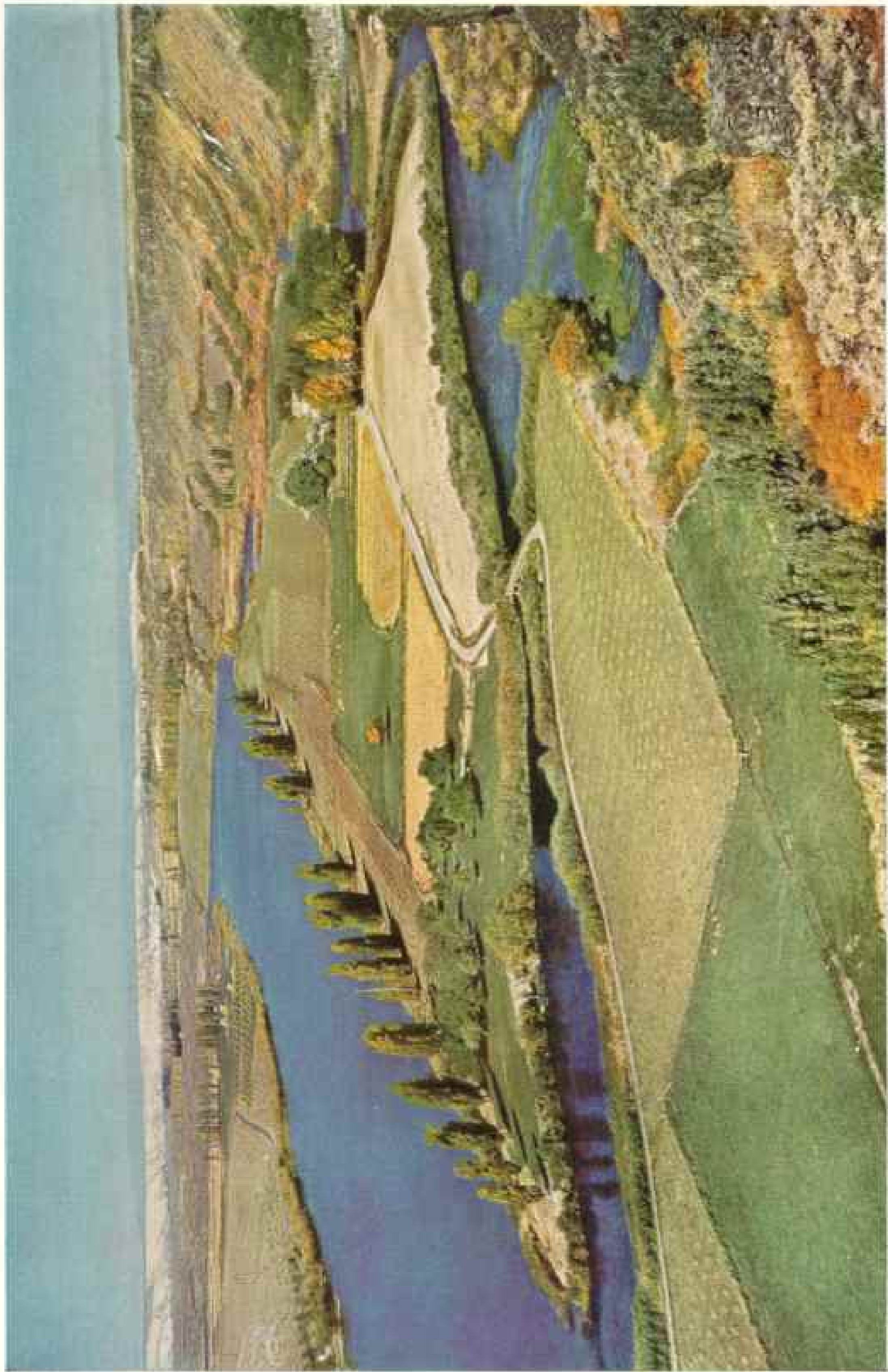


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Visitors Line the Fences to Watch a Record Shipment of 1,200-pound Herefords

Reproduction by Maynard Owen Williams

Cowboys move companies of cattle with military precision. From widely separated pastures, groups reach the pens with perfect timing, so there is neither congestion nor delay. Here at New Meadows cattle lovers have come from far and near to watch this annual show of beef on the hoof, moving to market.



© Saranah Geographical Society

Highways for Hudsons & Caribou

At the Foot of Lava Cliffs, an Island Paradise Spreads Itself Along the Blue-watered Snake River

On the left bank is a bit of U. S. No. 30, which more or less follows the wake of the prairie schooners from the Great Plains to the Pacific. Here the valley floor is no longer confined between high basalt walls, as it is a few miles upstream.



© National Geographic Society

Service with a Smile Makes Rationing Tolerable

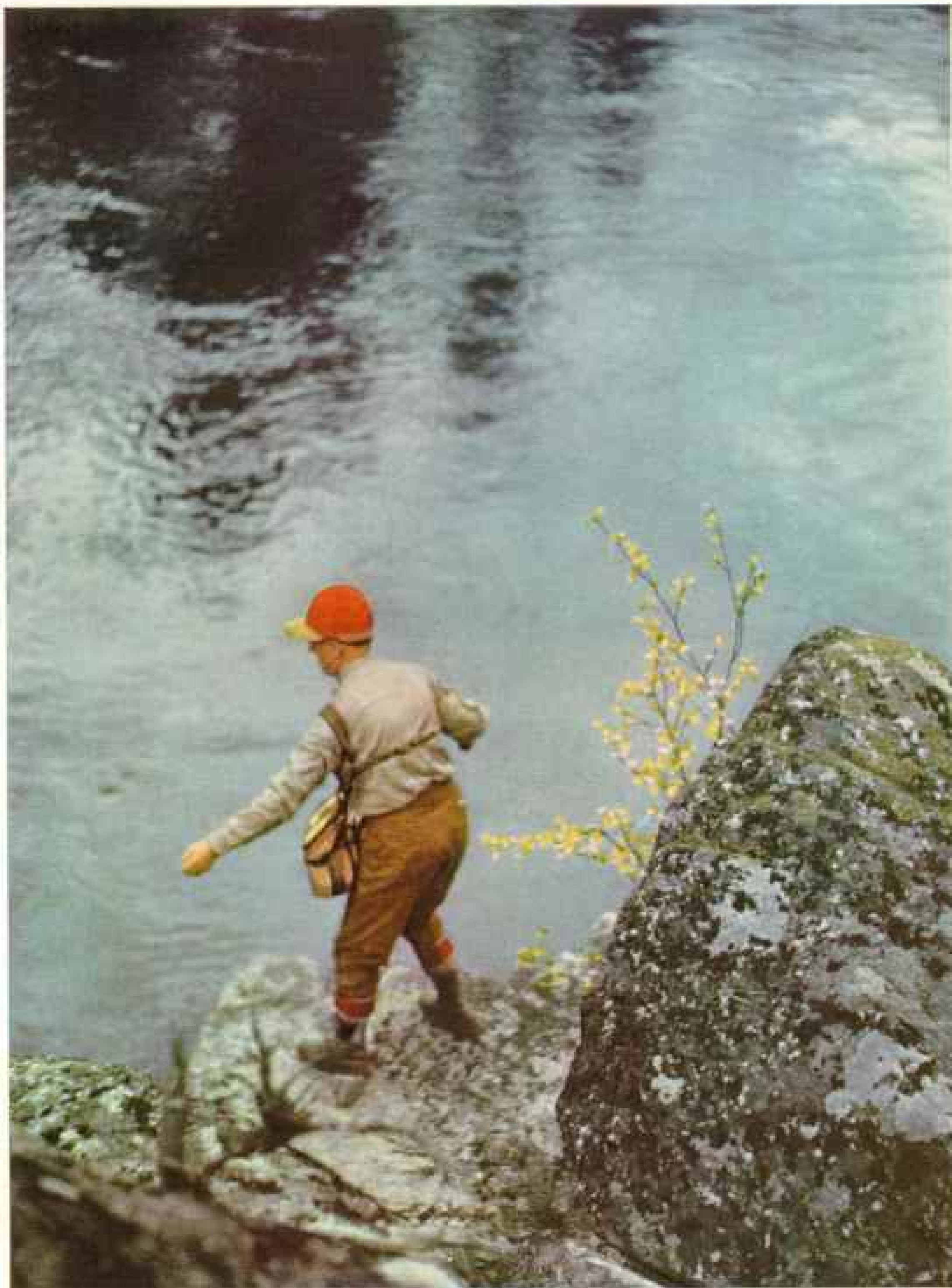
Idaho has sent so many of its sons to war and industry that the "filling station man" is likely to be a girl, as here at Sandpoint.



Contributed by Maynard Owen Williams

He Need Not Paw the Earth to Prove His Power

This fine Hereford, Junior Mixer 51st, on a farm near Gooding, is as gentle as a lamb, but Frances Bishop is not quite sure of it.



© National Geographic Society

Kodachrome by Maxford Owen Williams

Like a Figure in an Angler's Dream Is This Fisherman in the Idaho Primitive Area

One of Boise's civic leaders here tries his luck on the Middle Fork of the Salmon River. Result, one 10-ounce trout about every two minutes. About 60 percent of Idaho's extensive forests are on Federal lands. Idaho's three Primitive Areas are being preserved as sanctuaries for man and beast (Plate XV).

it one of the finest country weekly newspapers in America.

Nampa, trim and sunny, is the milk city of Idaho. Here a single cannery produces a carload of condensed milk a day. Here also are shops where many of the 20,000 refrigerator cars of the Pacific Fruit Express Company are brought for repairs and repainting.

Nearly 60 percent of the hybrid sweet corn seed in the United States in 1942 was grown near Nampa. Accompanied by a seed expert and his pretty secretary, Williams and I visited some of the finest fields, to record the sex life of seed corn. Before the pollen matured, the rows of Mama Purdue (Indiana) No. 39 were robbed of their tassels so that their silk was pollinated from near-by rows of Papa Iowa No. 45, thus producing a sturdy hybrid, Ioana (Plate XVI and page 670).

Onion Seeds \$100 a Sack

Close by a combine was threshing onions for seed. Each bulging sack of onion seed was worth \$100. The country around Nampa and Caldwell is the seed center of Idaho.

One of the most fruitful valleys in Idaho includes 22,000 irrigated acres around Emmett, famous for its big black Bing cherries and giant Hale peaches. In the best Idaho fruit country, growers increase their crops by the use of bees, which are rushed to the orchards in swift trucks and released at just the right time to help pollinate the blooms. Down the Payette and Snake Rivers from Emmett lie the solid and important towns of Payette and Weiser, centers of lush acres noted chiefly for their fine fruit.

A couple of hours' drive north of Emmett are the 1,200-acre Mesa orchards, far-famed for apples. Late frosts in 1943 reduced the apple crops, and the owners took a flier in cabbage enough to provide soup for a Russian army, if shipping space had been available.

Down near the site of old Fort Boise, where the Snake and the Boise Rivers meet, Lord Halifax recently visited Roswell because one of its citizens had sent a gift of seeds to war-blitzed England. The British Ambassador to the United States paused to say "Thank you," in an area where in early days British and American fur traders spied upon each other with envious eyes and almost brought their nations to blows.

Company flags flew in these clear skies, but Idaho is the only State in the Union over which the flag of another nation has never flown.

From Boise an excellent highway goes north about a hundred miles through forests and along the wild gorge of the North Fork of the Payette River to lovely Payette Lakes, where

a few years ago Hollywood producers found an ideal site for building a replica of old Fort Crown Point and filmed the motion picture, "Northwest Passage," the width of the continent from the scene where the events of the story occurred.

Summer homes, cabins, and camp grounds dot the lake shores, and in hot weather many Boise people enjoy regular week-end trips to the cool, mile-high resort. In winter, too, the Payette Lake country attracts visitors, for it offers splendid skiing. Snow frequently piles up five to ten feet, burying the ski chalets so deep that skiers have to tunnel their way to the doors.

At the south end of the main Payette Lake is McCall, a typical Idaho sawmill town. The Southern Idaho Timber Protective Association has its McCall headquarters in "Timber Shanty," a handsome log house designed, outside and in, to exemplify the beauty and utility of timber products.

To preserve the surface of the skinned-log interior walls, wood-panel ceilings, and polished floors, only a coat of clear varnish has been used. No paint hides the exquisite graining of the wood.

The only wall decorations are maps framed in unstained wood, of which also are made ornaments such as flower vases, candlesticks, dresser trays, and boxes for cigarettes, tobacco, and matches. Even curtain rods and rings are all of natural Idaho wood, as is all the furniture. Dressers and beds built like ship berths, with chests of drawers underneath them to hold things, are ponderous.

"If any woman who comes here to keep house ever discovers that she is strong enough to move these beds and dressers," said Harry Shellworth, Association official, "we'll have them nailed to the floor. Our rooms are given forestry titles such as Northeast Corner, Meander Corner (the bathroom), and so on, and we want things to stay put so that a logging man can find his way about in the dark."

Harry Shellworth is a real Idaho timberman, a mighty deer hunter, a booster for the Primitive Areas, and a leader in the campaign against wasteful logging. Knowing virtually all the old-timers in the State, he can spin by the hour "tall tales" of early days when mushroom cities now fallen to dust as "ghost towns" had populations of thousands digging or panning fortunes from gold deposits that soon dwindled away.

One of his favorite stories is of Roosevelt, the town that grew to 5,000 overnight when gold was discovered in 1894 on Thunder Mountain, east of McCall.

By 1907 the boom had subsided, and only



Blond War Worker Scott Doubles in Glue and Radio

At Potlatch Forests, Inc., giant sawmill of the western white-pine area, she mixes an adhesive stronger than the boards it joins. In the evenings she broadcasts over WRLC in Lewiston, Idaho, facing Clarkston, Washington. Names of the cities and LC call letters honor Lewis and Clark, pioneer explorers of our vast Northwest (page 669).

about 200 settlers remained in the town. Placer miners, working on mountain creeks in 1908, started a landslide which moved slowly but inexorably toward Roosevelt.

Despite warnings brought in by the mountain miners, the residents of Roosevelt did nothing about the situation until the slide began to dam Monumental Creek at the lower end of the main street. Then they attempted to blast the stream bed open with a few hundred pounds of dynamite.

The dynamite made no impression on the mighty pile of mud the slide had built across the creek, and water rose relentlessly in the town. From second-story windows furniture,

with the exception of a piano or two, was taken out by boats.

Roosevelt today is a rippling lake, a hundred feet deep at the principal corner of Main Street. What is left of the town forms a log jam at the lower end of the lake. Beavers have built a house in the attic of one of the old buildings which floated against the landslide dam.

Legend of No Business Mountain

A few miles southwest of McCall is No Business Mountain, a high point which overlooks thousands of acres of forest and the Payette Lakes. It got its name when a green sheepherder, hired to watch a flock near its summit, came running into McCall, frightened half out of his wits by a marauding bear, and panted, "I got no business up there!" Here is one of the finest of forest lookout stations belonging to the Association.

Such stations are placed 15 to 20 miles apart on commanding mountaintops throughout Idaho forest country. Anchored to the

mountains by cables and surrounded by cages of grounded copper wire to prevent their being destroyed by lightning, they are sturdily constructed buildings, furnishing first-story living quarters for the lookout keepers and completely glassed-in upper rooms for fire-detection apparatus.

Lookout keepers, often a man and wife, live in these mountaintop eyries during the summer when fire hazards are worst. By means of direction finders mounted over triangulation tables in the glass-walled upper rooms, they constantly search the horizon in every direction for smoke (page 652).

When a column of smoke is located, they

check the direction on the triangulation table and report their findings by telephone to the Association and to the nearest U. S. Forest Service headquarters.

Reports on each fire come in from all lookout stations from which the smoke has been sighted, and a fire dispatcher carefully combines all direction data on a master triangulation map. The point where the direction lines from several lookouts cross is thus quickly located.

At Forest Service headquarters fire-fighting equipment is kept ready to be sent out at a moment's notice by fast trucks or airplanes. The fire crews are highly trained, and they usually win if the blaze has not gained too great a headway before the reports come in.

Lookout work is a lonely job in remote mountain fastnesses. There is a little lookout on Feltham Peak over in Challis National Forest, north of Stanley Basin, where for a long time the lookout keepers' food supplies had to be dropped to them by parachute from an airplane.

Here in 1936 Frank S. Moore, Supervisor of Sawtooth National Forest, took some eastern visitors over a newly constructed road to a point within clambering distance of the top.

"It was one of the greatest thrills of my life," one of the visitors said. "From the summit we looked out over a veritable jumble of such mountain peaks as I had never imagined. A young man and his wife and two little children were keeping house in the tiny lookout cabin. They had not seen another human being for weeks and they had been getting their supplies by parachute until the completion of the rough trail we had just ascended."



On This Idaho-shaped Green, Putts Go a Mythical 100 Miles

Today's position of the cup is "Twin Falls," according to the chart of the first green, hanging on the ponderosa pine at this Hayden Lake course. Tomorrow, golf "pro" Henry T. Born may sink his ball at "Cocur d'Alens" or "Baise."

The better timbermen are ardent advocates of forest protection. They take pride in showing how progressive forestry methods are conserving and improving the forests. Nowadays only mature trees are cut. Smaller trees are left standing, and seedlings from the timber companies' own nurseries are planted in cut-over areas.

When the old-time lumberman ruined a whole countryside, leaving nothing behind him but stumps and fireweed, his defense was that he could not afford to pay taxes on a growing tree for a hundred years. Wise legislation has taken care of his complaint.

Under the new laws, in which Idaho has been a leader, he can cut the mature timber and leave a growing crop for his sawmills forty



How Will You Have Your Potatoes—Creamed, Mashed, or Hashed Brown?

Here the girl with the black gloves evens off trays of cooked potatoes on their way to the dehydrating ovens. Dehydration will reduce 100 pounds of potatoes to a 15-pound carton. The Simplot dehydration plant near Caldwell has won the Army and Navy "E" for its part in feeding our fighting men in faraway places.

years hence. During the growing period he pays a nominal tax of a dollar an acre.

These new laws have fostered better logging methods, but in these wartime days, with electric saws felling trees faster than ever before and a manpower shortage necessitating neglect of combustible brushwood, forests face increased fire hazards.

Beside the Payette Lakes a friend of mine, a commercial lumberman, lets choice timber live on to protect the beauty of the resort. The days of the ruthless exploiter of timber are past.

Tales of a Pioneer

At the "Timber Shanty" in McCall one night, former State Senator Carl E. Brown, who operates a big lumber business, told some of his experiences as a pioneer in Idaho.

"When I came out here about 40 years ago," he said, "I was a green kid 'tenderfoot' from New Hampshire, looking for any kind of work that would give me a start. I finally landed a contract to carry mail to a post office away up in the mountains some miles from a railroad. I had earned enough by working in the lumber camps to buy horses, and the mail contract looked good to me.

"But there was a catch clause in that contract. If I was late with the mail, I lost part or all of my fee for the trip. Everything went well until the big snows began. Then I was in trouble.

"One day my horses bogged down in six or seven feet of snow, miles from my goal, and I had to snowshoe over the drifts the rest of the way hauling the mail on a sled. I thought I had done a heroic thing getting there at all, but the postmistress pointed to my contract and docked me.

"That experience set me thinking. If I could get over the drifts with snowshoes, why couldn't my horses? I went back to McCall and fashioned a set of snowshoes for my team. Unbelievable as it may seem, the horses quickly learned to walk on them. From that time on, I was never late with the mail. My team hauled a toboggan-runner hobsled over 10-foot snow as easily as I could walk it on snowshoes."

The State of Idaho itself owns large tracts of timber within its borders. These are wisely administered under the capable guidance of State Forester Franklin Girard.

New Meadows, 10 miles northwest of McCall, is a major shipping point for yellow pine

lumber and also for prime beef on the hoof. Most of the cattle on hand when Dr. Williams and I arrived were hardy Herefords from the famous Campbell ranch—Circle C.

The following day began a record shipment of about 3,000 head in 25 hours, and to get photographs of the herds Williams took to the saddle, since a man on foot is liable to "spook," or stampede them. The cow pony, sensing a strange rider, turned the stream-crisscrossed pasture into a steeplechase, but the photographer escaped unscathed. Later he sat on a fence and took some close-ups (Plates IV, V, VII).

In the old days, cowmen, whose range extended right across the map, resented fenced-in areas. Many cattle now browse on Government land; but Government lands alone do not furnish enough pasturage.

Since a cattleman is allowed only as many animals as he can feed through the winter, he either must raise hay on his own ranch or buy it from a farmer who has hayfields. Thus in Idaho stockmen and farmers have learned to cooperate.

We followed the highway north from New Meadows and drove down the charming valley of the Little Salmon, where fleecy sheep graze beside still waters. The valley slopes down toward the big Salmon at Riggins.

Beyond Riggins we sped over a good road down the deep, mysterious canyon which we had traversed eight years before in a slow scow on the River of No Return. Good roads are doing what railroads have not yet done in uniting Idaho's north and south. Though the railways long since have been poised at New Meadows and Grangeville, they have never crossed the Salmon River barrier.

After crossing the mighty White Bird Hill the road drops abruptly down onto Camas Prairie in Idaho County. Idaho County alone is larger than the State of Massachusetts. Here Grangeville and Cottonwood are centers of a truly beautiful and amazingly fertile wheat country.

The "Seaport City" of Idaho

More than half a mile below the general level of the State, Lewiston sometimes calls itself the "seaport" of Idaho. Its elevation is only 750 feet—more than two miles lower than Mount Borah (12,655 feet) in Challis National Forest, the highest mountain in the State.

Nowadays some river shipping is possible by way of the Snake and Columbia Rivers from Lewiston to Portland, Oregon, and thence to the ocean, thus giving Lewiston some right to call itself a seaport. In 1805 Lewis and

Clark took five weeks to cover the 500 miles from the confluence here of the Clearwater and Snake to the Pacific.

Lewiston has two river fronts and an interstate traffic hyphen, the Lewiston-Clarkston Bridge to Washington. Up the Clearwater lies the finest stand of white pine in the world, and on its banks stands one of the largest sawmills in the Western Hemisphere. The owners consider timber a crop and they plan that this giant plant shall never lack logs for its insatiable maw.

It is a strange sight to see sure-footed "cats" (tractors with caterpillar treads) nosing around in the Clearwater River, herding lumber and breaking log jams, and busy bulldozers opening new logging roads from growing timber to lumber pile (page 649).

Women Work in the Sawmill

In the giant sawmill in Lewiston many of the workers are women. One of them, a graduate of two universities, mixes the glue which binds white-pine boards into almost unbreakable panels (page 666).

Wearing a blue beret over her blond hair, a checked shirt, riding trousers, and boots, she was a "natural" for the camera. She broadcasts her own radio program after her day's work in the sawmill.

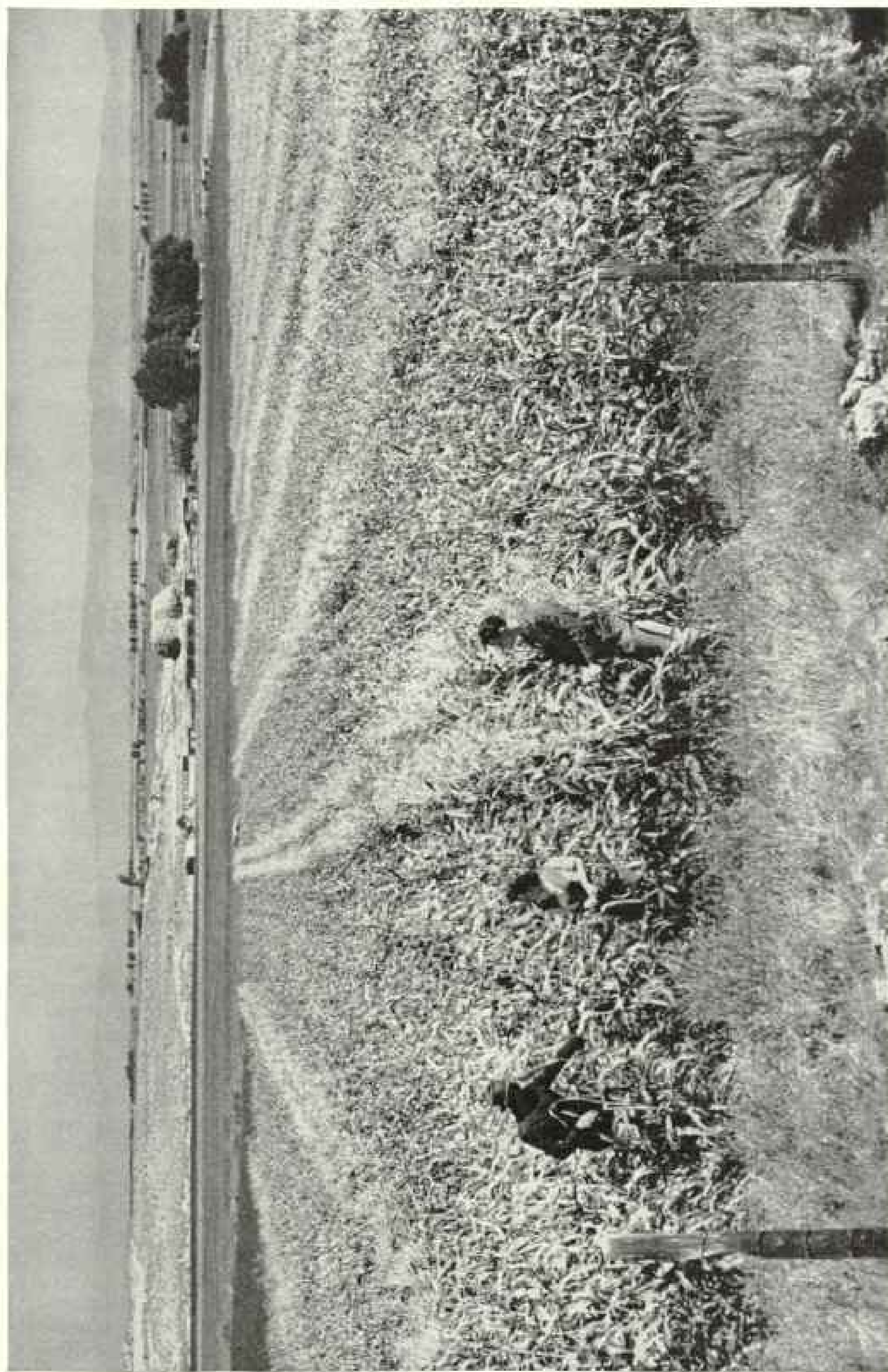
Up the river from Lewiston is Snake River Canyon, only ten miles wide, and the deepest river trench in North America. From the level of the Seven Devils to the treacherous rapids is a vertical drop of 6,600 feet. A trip by plane over this area is a breath-taking thrill.

As the motorist from Lewiston climbs to the Genesee plateau over a 10-mile zigzag, 50 million feet of floating logs, far below on the river, look like jackstraws. The road which climbs this dizzy height is a marvel of modern engineering. Since the country is clear of heavy timber, the traveler on the upper levels can look back and see the switchbacks lacing the steep mountainside like strings of a shoe.

Only Congress-created county in the United States, Latah is the seat of the University of Idaho at Moscow, alma mater to more than 7,000 graduates, with more than 3,000 of its alumni or students at war.

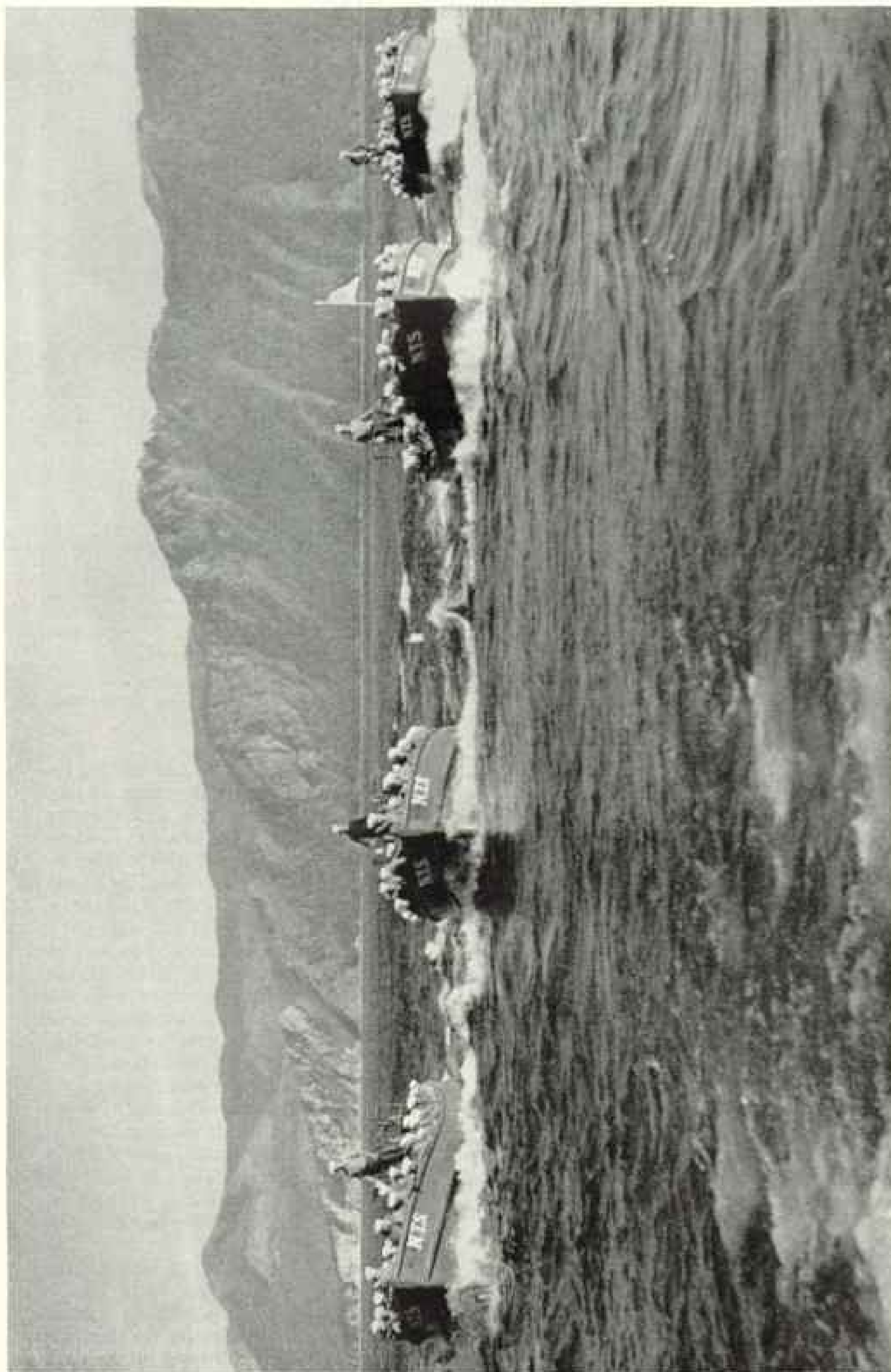
As one might expect, the University offers outstanding courses in agriculture, mining, and forestry. The 6,900-acre forestry laboratory is shared by winter sports.

The college atmosphere of Moscow is delightful, the climate excellent, and the countryside rich. Farther north, near Potlatch, great reapers describe wide, sweeping curves under a clear blue sky. When night begins



The Tasseled Rows Father, the Detasseled Rows Mother, a Sturdy Hybrid Sweet Corn for Seed

Each plant contains two elements of parenthood, male in the tassel, female in the silk. To produce a sturdier hybrid, the seed corn is collected from detached plants fertilized from plants of another strain. Here two rows of Iowa No. 45 (center) fertilize six rows of Purdue (Indiana) No. 39 to produce "Ioana" (Plate XVI).



U. S. Navy, Official

Apprentice Seamen, Bucking Fresh-water Waves 2,051 Feet above Sea Level, Remember the "One Ship Fleet"—the *Boise*

In the Solomons on October 11-12, 1942, and off Sicily on July 10-12, 1943, the light cruiser named after Idaho's first city won fame. Our Naval Training Station on Pend Oreille Lake bears the name of David Glasgow Farragut, a fresh-water lad who became the first admiral of the United States Navy (pages 641, 672).



U. S. Navy, Official

Navy Barbers at Farragut Defy the Samson and Delilah Tradition

First step in processing of recruits is a short haircut. "Hair Today—Gone Tomorrow" brings no sorrow. Hundreds of miles east of and nearly half a mile above the Pacific, the U. S. Naval Training Station near Bayview is the West's largest (page 641).

to bed down in the hollows of the hills, and the setting sun turns grainfields to gold, the landscape has a Technicolor touch.

We drove north from Potlatch through forests ever more magnificent to beautiful Coeur d'Alene Lake, which combines waterway for logs with bathing beaches, splendid homes, and all the panoply of an ideal summer resort (Plate XI).

Lumbering on Steep Slopes

Large-scale lumber operations on some of the steepest mountainsides in the United States are near by. The technique of the owners in lumbering these almost vertical forests is but another tribute to American genius.

At the once-quiet little city of Coeur d'Alene, lake swimming and surf-riding behind a powerboat are favorite sports. Blue-jackets here enjoy a busman's holiday by crowding the speedboats, or lounge at ease in charming City Park. Only a short bus ride away is the Farragut Naval Training Station on Pend Oreille Lake (pp. 671 and 679).

We passed a delightful day on Coeur d'Alene Lake, in the clean-lined cruiser *Donna Kay*, nosing into Beauty Bay, seeking out a

convoy of logs with a lumberjack walking the guy line between tug and cargo, sweeping past bright gardens and fine homes, and dropping in on Camp Sweyolakan in Mica Bay. There we were greeted by a Camp Fire girl who, we were happy to learn, was the daughter of our fellow "no-returner" of Salmon River days, Dean Fahrenwald (Plate XIII and page 643).

At Hayden Lake is a handsome country club and sporty golf course (page 667). When autumn dots the evergreen slopes with the gold and red of frost-painted deciduous trees, golfers gather around the glow of great logs in the clubhouse or drive to the Officers' Club in Coeur d'Alene for dinner and dancing.

United States Highway 95, which unites Idaho as the Oregon Trail once united our whole Northwest, continues into Canada through the international village of Eastport-Kingsgate at the northeast corner of the Panhandle. Only a shadow stripe in the forest marks the boundary line.

Three-fourths of the distance between the highway and the Washington State line is Priest River, which made a striking picture with a jam of logs stranded on its sandbars and a scurry of clouds mirrored in the dark water between its high banks.

The center of activity in this area is the town of Priest River and its dynamic State Senator, Bob Dow.

Back at Coeur d'Alene, we set out for Fourth of July Canyon, the Cataldo Mission, Kellogg, and Wallace.

Today the pine bark is closing in on the famous "July 4" inscription which Capt. John Mullan carved in 1861 while building a 624-mile land link to join Missouri River navigation at Fort Benton, Montana, with Columbia River navigation at Fort Walla Walla, Washington.

While Mullan was building his famous military road, Jesuit missionaries, following the invitation of the Coeur d'Alene Indians for "Black Robes," were constructing the Cataldo Mission close by.

Vast Riches Discovered by Chance

The Mullan Road now leads to one of the richest mining regions on earth. Out of seeming trifles a vast mining industry has come to contribute to our national strength.

Three cents' worth of gold dust, panned in the bottom of a dripping pan by Capt. E. D. Pierce at Pierce city while the Civil War was beginning, started gold rushes to Orofino, Pierce, Florence, Warren, and the Boise Basin. From the wealth prospectors found there millions of dollars went to sustain Abraham Lincoln's needy treasury. Thus Idaho helped to bring victory to the Union.

A borrowed jackass wandered away in search of grass. While looking for him, two miners discovered the rich lead-silver lode which made Bunker Hill almost as big a name in mining as in colonial history. A cow-puncher, searching for a lost steer, discovered a mercury mine.

A miner's wife, washing her husband's overalls, found around the inside of the tub a dark ring which turned out to be valuable ore. From this impromptu experiment in flotation, vast fortunes are now being made.

While Donald E. White of the U. S. Geological Survey was examining the drill cores that revealed one of America's greatest-known reserves of antimony, he detected the presence of tungsten, which strengthens the sinews of war.

At one fabulous three-year-old mine the outstanding buildings are a school, a hospital, and a recreation hall with movies, dance floor, basketball courts, bowling alleys, and a soda bar. No hard liquor may be sold in this mining camp. The mine officials fly in above primeval forest, but an electrical transmission line is marching mineward across hill and valley, answering the call for more power.

Idaho's gold production is relatively not high. Its largest gold-producing mine is at Atlanta. Strangely enough, however, this mine was abandoned as being completely worked out by one of the largest mining concerns in the world. An enterprising mining engineer from Boise bought the machinery as junk and got the mine with it. Then he went in to this "worked-out" property and made it produce almost as much gold as it had in the hands of its former owners.

Modern mining profits come from extracting several valuable minerals from a single ore. Our friend Dean Fahrenwald of the University of Idaho School of Mines, an outstanding expert on flotation processes, says: "There is hardly any mineral that cannot be floated or depressed by the skilled flotation technician. In practice, as many as four mineral products are being made from a single pulp feed by successive flotation treatments."

The dark ring left by the miner's overalls has become big business not only for the miner, but also for the manufacturer of flotation agents.

When the placer miner quit the worked-out claims of early days, many a roystering town, like Roosevelt, became a ghostly place of echoes, visited only occasionally by patient Chinese who earned a good living from panning color dirt cast aside by the white men.

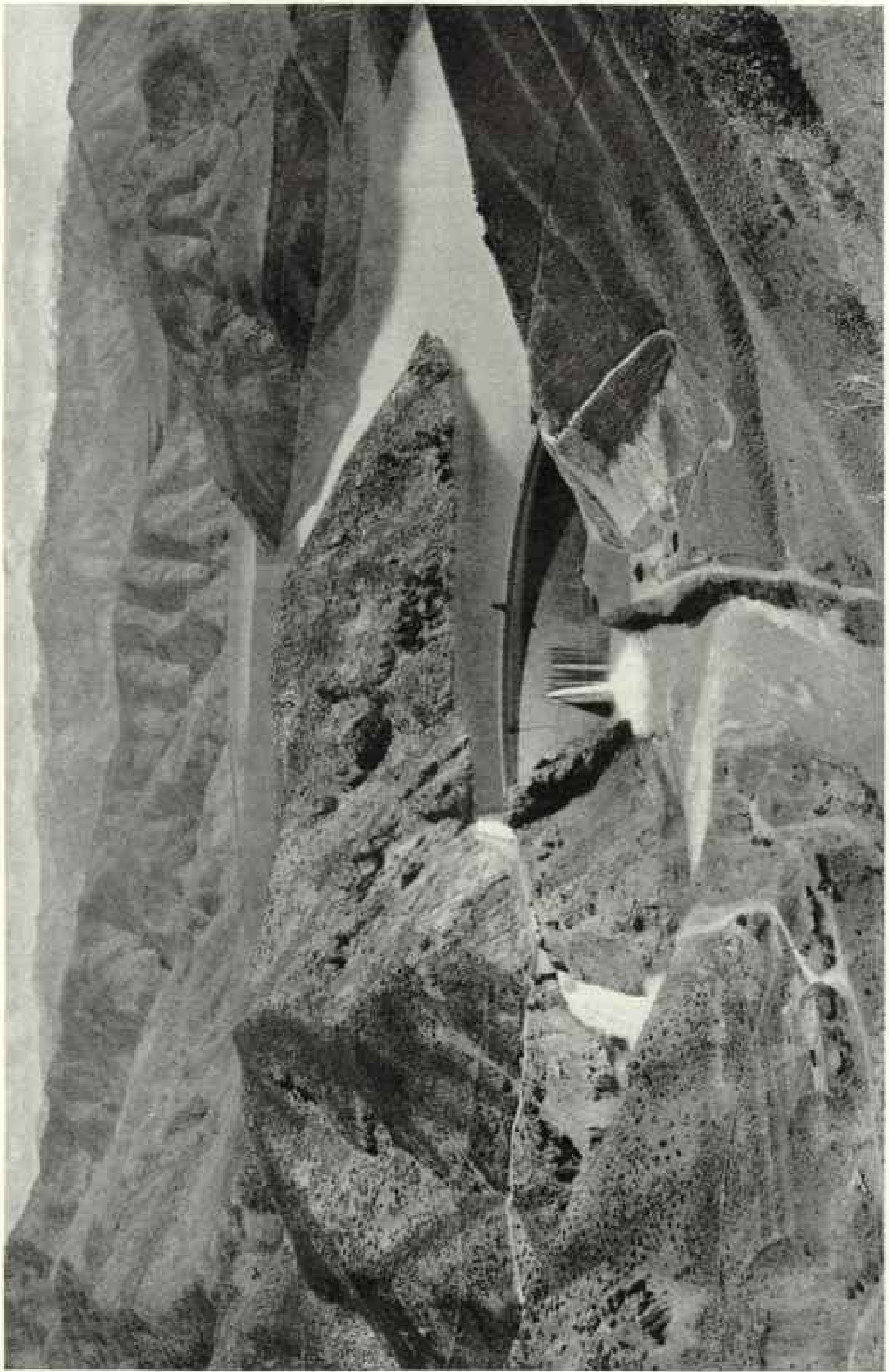
Decades later great floating dredges, handling a cubic yard of gravel for a nickel, scooped in the pay dirt, extracted the gold particles, and spewed out the rest. By modern dredging methods, Placerville is staging a comeback, and today, near Headquarters, a rock crusher is breaking up road material from which three crops of gold have been harvested.

Many Minerals for New Uses

At Kellogg, Stanly Easton showed us some of the first pigs of lead, zinc, antimony, and cadmium produced there, and a miniature obelisk revealing the geological stratification of the Coeur d'Alene mining district (p. 677).

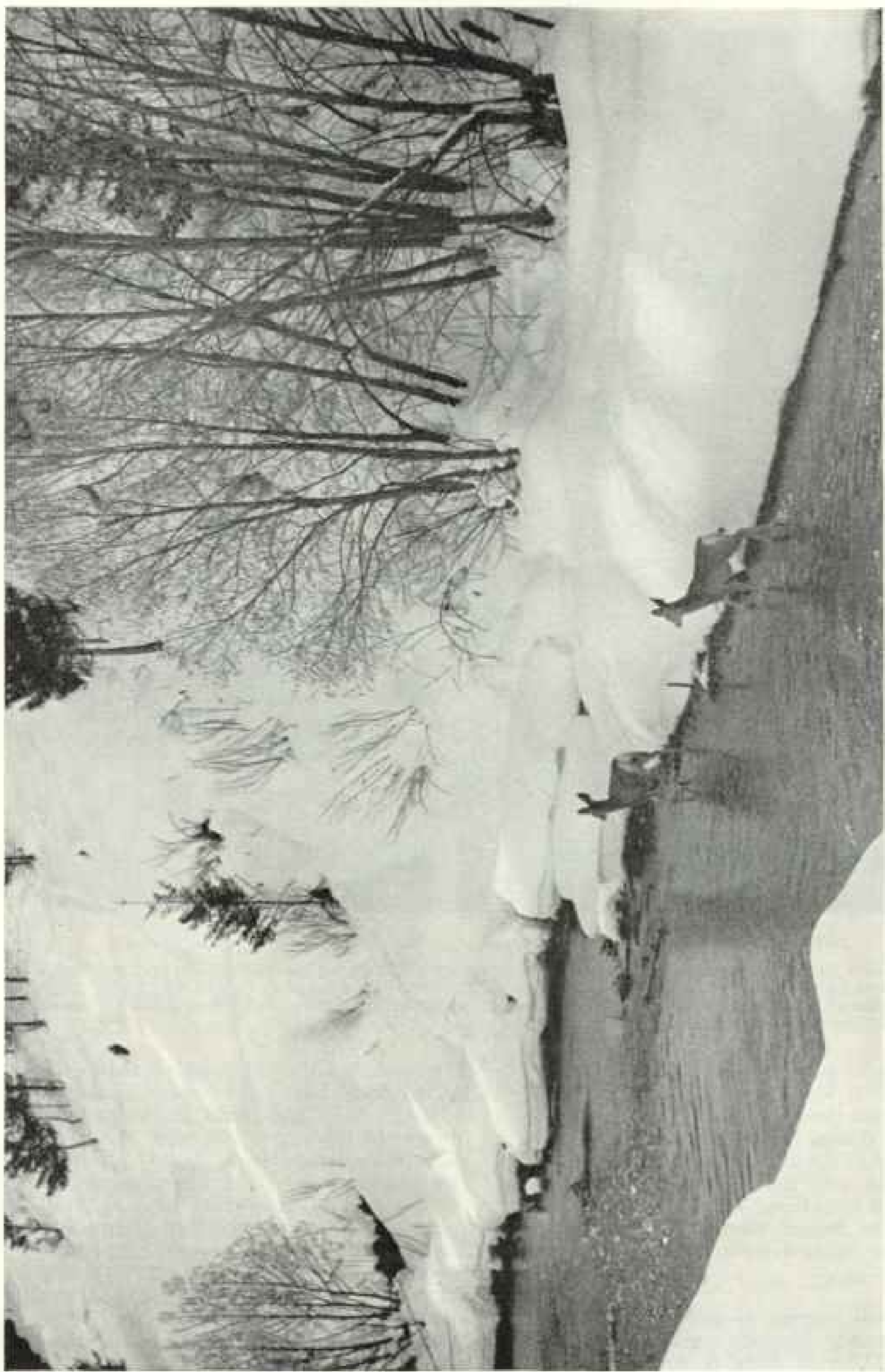
Automatic-sprinkling systems and safety fuses depend on cadmium for their operation, but in the production of zinc, cadmium, much used in electroplating, is an impurity. The electrolytic zinc plant at Kellogg turns out a zinc so pure that in a ton of it there is only about half an ounce of lead, iron, copper, and cadmium.

In these war days antimony is a strategic metal. Once a by-product of lead and silver production, it is now sought for its own worth. The largest-known deposit in the United States



In 1915, Arrow Rock Dam Was the World's Highest. Now, Five Feet Taller, It Is Dwarfed by Newer Dams

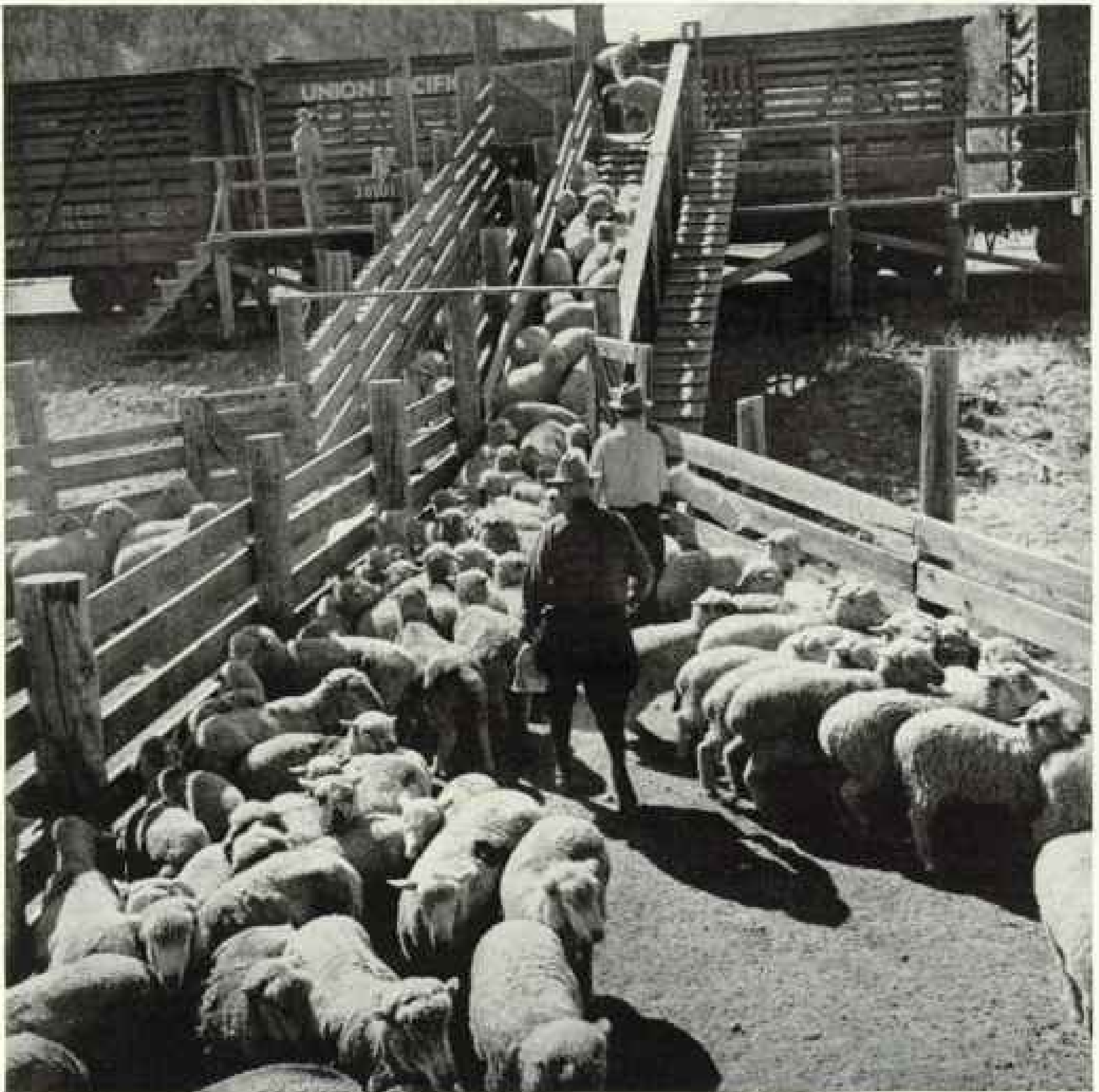
The 1,100-foot curve has a structural height of 354 feet and holds 286,500 acre-feet of water to a level of 3,216 feet above the sea. Soon Anderson Ranch Dam, highest earth-fill barrier, will help provide irrigation water for 400,000 thirsty but fertile acres in the Bobbe Reclamation Project (page 654).



Paul Cramer

In Idyllic Mountain Settings Like This, Navy Men Back from the Pacific Recover from Tropical Ills

The young deer, wading down Warm Spring Creek between banks of snow, are only a three-mile hike from Sun Valley, where convalescent sailors bathe in naturally heated pools. Before the site of this famous resort was chosen, experts explored whole States looking for an ideal location (Plate XIV and page 677).



If One Lamb Enters the Double-decker, Others Follow "Just Like Sheep"

With 250 spring lambs, each averaging 85 pounds, to each double-decker car, and with the price at 15 cents a pound on the hoof, how much were these seven carloads worth at Ketchum? \$22,312.50? Right. Near neighbor of far-famed Sun Valley, Ketchum ships rich cargoes of prime lambs, fattened in the rocky valleys of the Sawtooth Mountains.

gives its name to Stibnite in the forested interior of Idaho.

From cinnabar ore, red as lipstick under a light dusting of powder, comes mercury worth about \$2 a pound. Mercury, bearing the name of the swift messenger of the gods, is often called quicksilver, but the crushed ore must not be hurried through the cooking drums. Haste makes waste in mercury production.

"Who's Who" among the Mines

Until recently, 85 percent of Idaho's minerals came from the region around Wallace. The Morning Mine at Mullan led in zinc.

The Sunshine, largest silver mine in the United States, made Idaho first among silver-producing States. The Hecla lead-silver mine has one of the largest and most modern of mine plants. Leo Hoban and Lou Hanley graphically portrayed their mining operations.

Since Pierce's three-cent strike of 1860 (page 673), Idaho has produced about a billion and a half dollars in minerals. The 1941 production alone was more than \$41,000,000. For a State with few more than half a million inhabitants, that is an amazing record. What heights of production the war effort will reach, it is too early to estimate.



Zinc, Lead, Antimony, and Cadmium—Treasures from Rich Coeur d'Alene Mines

Stanly A. Easton, president of the Bunker Hill & Sullivan Mining & Concentrating Company, and a receptionist inspect this natural wealth. Light-colored metal on the table is a 66-pound slab of almost pure zinc. Behind it is antimonial lead and, in front, corroding lead. The square pig at right is antimony; the small slab in front, cadmium. The geologic strata of the region are shown in the obelisk (page 673).

Experts under the direction of W. Averell Harriman sought for years the ideal site for an American St. Moritz.

In an amphitheater near Ketchum, a sun-drenched plain was found at the foot of bare mountains on which could be laid out ski runs ranging from easy slopes where tyros might roll safely in the powdery snow to hair-raising steeps where a champion might break his neck. That dusty plain was transformed into the world-famous resort, Sun Valley (Plate XIV and page 675).

Today one of those bare mountains is called Durrance Mountain in honor of Dick Dur-

rance of Dartmouth, a college ski champion who took four and a half hours to climb it and four and a half minutes to ski down!

"I first saw Sun Valley in 1936," says Leo Borah, of the NATIONAL GEOGRAPHIC staff, "when some Idaho men asked my family and me to meet them at Ketchum and go on a trip around the rim of the Sawtooth Primitive Area.

"Before leaving Ketchum, we drove over to the site where a lot of concrete skeletons were the beginning of Sun Valley Lodge and its adjuncts. I confess the prospect looked pretty doleful to me. How such a barren, dusty



Here Fish Are Raised for the Market Like Chickens

At a commercial fish hatchery near Buhl, Idaho, tags are fastened to trout for sale in California. Each tag costs a cent. The fish pictured here weigh about a third of a pound each. The grower adds a nickel per pound to the selling price, thus paying for the tags and getting two cents additional for attaching them.

place could ever be made attractive, I could not imagine.

"We took our trip up the Big Wood River road and paused for a view on the glorious 8,752-foot Galena Summit. As we stood there, gazing down toward Stanley Basin with its gleaming lakes, then feasting our eyes on the jagged sawtooth peaks stippled with snow, I could not help wondering why this spot had not been chosen for a resort instead of barren Sun Valley.

Lake of Blood-red Fish

"We drove down into Stanley Basin and visited several of the loveliest lakes we had ever seen—Stanley, Pettit, Redfish, and Little Redfish—all set in fine forests, all teeming with game fish.

"In Redfish Lake we saw from a bridge over

a little inlet hundreds of the blood-red fish that have given the lake its name.

"That August night we stayed in one of the trim log cabins of the Idaho Rocky Mountain Club, one of the finest 'dude ranches' in the West. The sun had been burning-hot all day, but as soon as it sank behind the mountains the temperature fell so low that we had to drain our car radiator to prevent its freezing. In our cabin we kept a log fire burning all night.

"The next day our Idaho friends took us out to Yellow Pine for a midday meal. There we heard the story of 'Cougar Dave' Lewis, a famous veteran of Idaho Indian wars, who had died a short time before at the age of 93.

"He had felt a little out of sorts and had started to walk the 20 miles from his ranch to town. Falling by the wayside, he had been



Don't Drown, Girls! The Life Guard Is a Girl, Too

At Coeur d'Alene, 2,150 feet above sea level, this smiling miss protects her nose from the hot sun with adhesive. Idaho's men are at work, but gobs from neighboring Farragut Naval Training Station don't let her become lonesome (pages 671-2).

picked up in an automobile, his first ride in a motorcar, and taken to a hospital where he died the following day.

"Uncle Dave had killed more than a thousand cougars. He bred dogs for cougar hunting and made a profession of killing these treacherous predators. At his ranch he entertained hunting parties who came into the Primitive Area for deer. In his day as an army scout he had killed many a bad man, but he always explained when asked about these duels that he 'had to shoot first or be shot.'

"One of the proud moments of Uncle Dave's life was when Dr. Charles Mayo of the Clinic at Rochester made him a member of the National Geographic Society. A Yellow Pine man asked him one day why he did not nominate some of his friends to membership.

"'I'd like to do it,' the old man replied, 'but I can't think of anybody hereabouts that I'd consider worthy of that honor.'

"We did not go back to Ketchum that trip, but continued southwest to Boise.

"In 1939 we visited Sun Valley again, this time coming by Union Pacific train to Shoshone and taking the bus from there to the resort. What we remembered as a dust plain had blossomed. There was a lawn-bordered lake where dust had lain thickest, and the concrete skeletons had become magnificent fireproof buildings that appeared to be built of logs.

"Chair ski tows had been built to the tops of some of the bare mountains. The place looked like a resort in the Swiss Alps. So popular it had been in winter that the managers had kept it open the year around. Sum-

mer guests enjoyed riding up to the top of Proctor Mountain on the ski tow, for the trip afforded a thrill and the view from the summit was entrancing.

"The young sailors who are now convalescing at Sun Valley find themselves in as fine a spot for rest and recuperation as could be found anywhere in the world."

The three Primitive Areas—the Sawtooth, 201,000 acres; the Idaho, or Salmon, 1,232,714 acres; and the Selway-Bitterroot, 1,800,000 acres—are designed to bring relief from worry and care to civilians after the war, just as Sun Valley is bringing health to invalided fighting men (Plates VIII, XV).

One day when we were discussing vacations with C. J. (Ike) Westcott, who has made a fortune from filling stations, the oil man, disregarding the source of his income, pleaded for idyllic retreats where no automobile could sound its horn.

A Pack Trip on the Salmon River

"What you ought to do," he said, "is to go on a pack trip to the Middle Fork of the Salmon."

Williams went.

On the first day, under the direction of Tom Van Meter, Supervisor of the Payette National Forest, the party filed down from Snowshoe Summit, riding 45 minutes, walking 15 in every hour.

At noon they stopped beside Pistol Creek, built a fire, ate Forestry K rations—a palatable, sustaining meal out of a heavily waxed carton the size of a Cracker Jack box—and saw their well-ordered pack train jingle its way down the valley toward the Middle Fork Ranger Station.

By nightfall the group, consisting of a Chamber of Commerce secretary, an Idaho Wild Life Federation president, a dentist, an automobile dealer, a world traveler, and a forester, had become a comradely company, alert to the color of quaking aspens or the marble whiteness of great trees seen by moonlight.

"Whoever called me a tenderfoot misplaced his accent," declared one saddle-weary enthusiast. But when the cinches had been loosened, the horses fed, the saddles covered with tarpaulin, and the air mattresses blown up, cities seemed far away, the tongues in trees and books in running brooks very near.

At the next day's noon stop they caught and broiled over a campfire half-a-dozen cut-throat trout. Sixteen pounds, plus one fish, is the limit. The one-fish provision is for that extra-big one, which usually gets away.

Beyond Snowshoe Summit each hunter is

allowed two deer, instead of one, for in this overbrowsed area deer are threatened with starvation. On the winter feeding grounds above Mahoney Creek 10,000 deer so nibble away the tips of the herbage that each year's browse becomes less.

As the hunters led their horses down the steep maze of deer and cattle tracks toward the swift Middle Fork—dream Mecca of hunters and fishermen—a Curtiss Robin sat in a narrow airfield and a blond cowgirl splashed through the river and galloped across the sagebrush for the mail.

While waiting for the unlimited and unrationed dinner built around heaping platters of fresh trout at Tom McCall's, the trail riders took refuge in the bathhouse, where two streams of water, natural hot and cold, flow through at all times.

To increase the temperature, a board was slanted across the hot-water flume. Flakes of snow, falling through a hole in the roof, touched the bathers' steamy shoulders. It is possible for hunters on a 40-day trip through this area to camp nightly where they can enjoy baths in natural hot springs.

Soon after dawn, a steep climb in a drizzle that turned to snow led the party to a forest camp nearly 8,000 feet above sea level. Thousands of tree trunks, leveled by fire, had formed a maze through which riders carefully picked their way, while the wise old pack mules, running free, chose their own path.

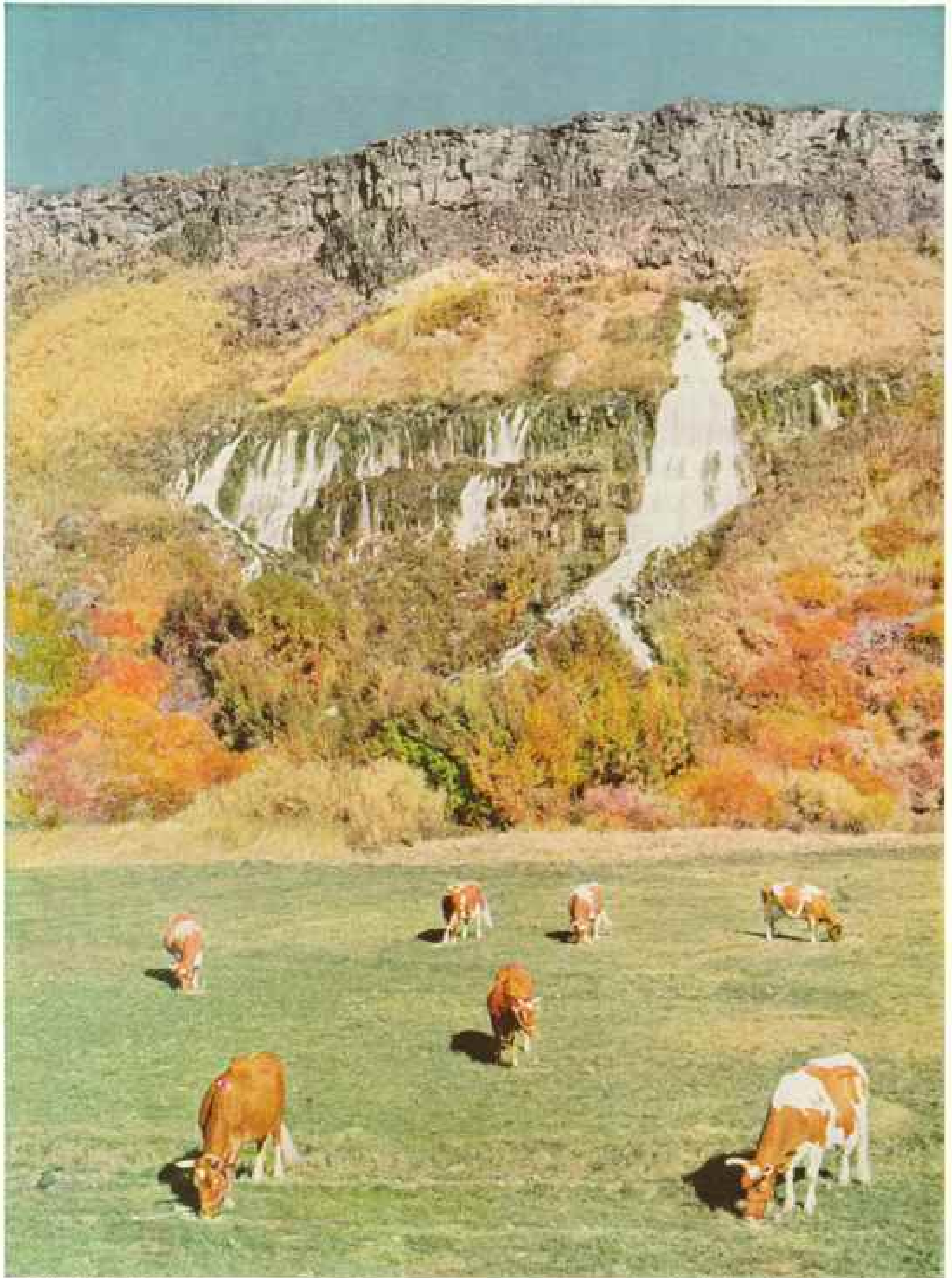
Hunting Accident—Airplane Rescue

By nightfall the bag for 13 hunters was eleven deer. With 15 to go, the second day of hunting opened to the sound of guns. But the most skillful hunter was painfully injured in an accident. How to get help was the problem.

Fortunately Mel Coonrod, who the winter before had saved nine of ten airmen who had bailed out above the steep slopes of the Middle Fork, was on hand. He dashed down to the Indian Creek Landing Field and telephoned for a plane. Flying over from Yellow Pine, Penn Storr had the injured man in Boise within four and a half hours of the accident—evidence that landing fields are useful even in a Primitive Area from which motor roads are barred.

The Indians, when they saw the dawn in our mountains, cried out: "Ee-da-how," which means literally, "Look, the sun is coming down the mountains." The name they then gave to the territory which became our State was both apt and prophetic. Idaho is really a Sunrise State at the morning of its greatness.

Idaho Made the Desert Bloom



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Modocville by Stulmeyer & Carpenter

Thousand Springs Farm Takes Its Name from Milk-white Waters, Pouring from Barren Rock

More than a hundred miles away, beyond the Craters of the Moon, the Lost Rivers disappear in a barren expanse of lava. Probably these clear cool waters, hursting forth after their subterranean journey, come from the Lost Rivers. This Guernsey herd is known far beyond the borders of Idaho.



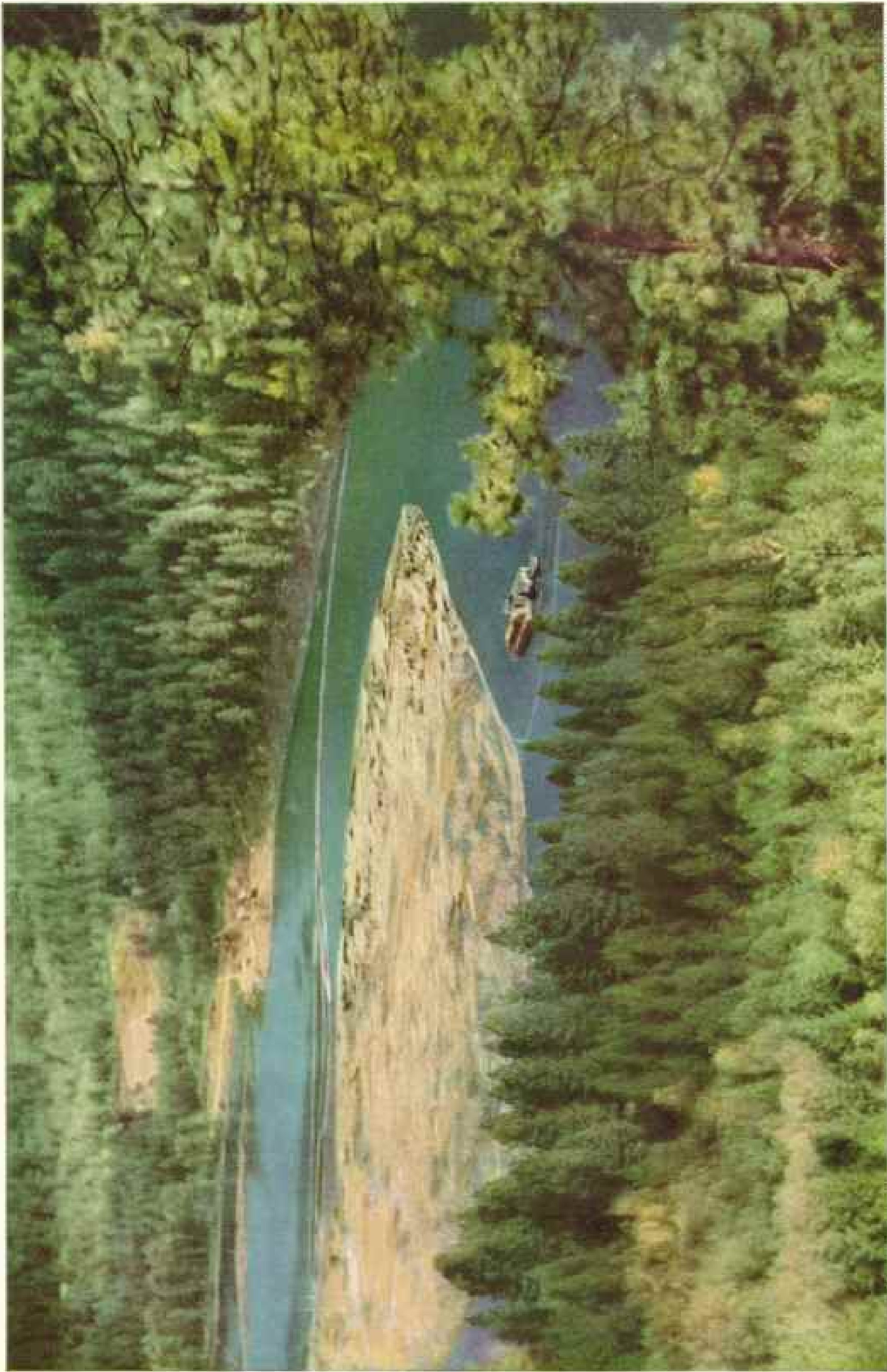
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Thousands of Idaho's Wild Pheasants Come from Fine-feathered
Breeding Stock at the State Farm



Illustration by Howard Ross Williams

Such Peaches and Plums Thrive on 60,000 Acres of Irrigated
Land South of the Payette River

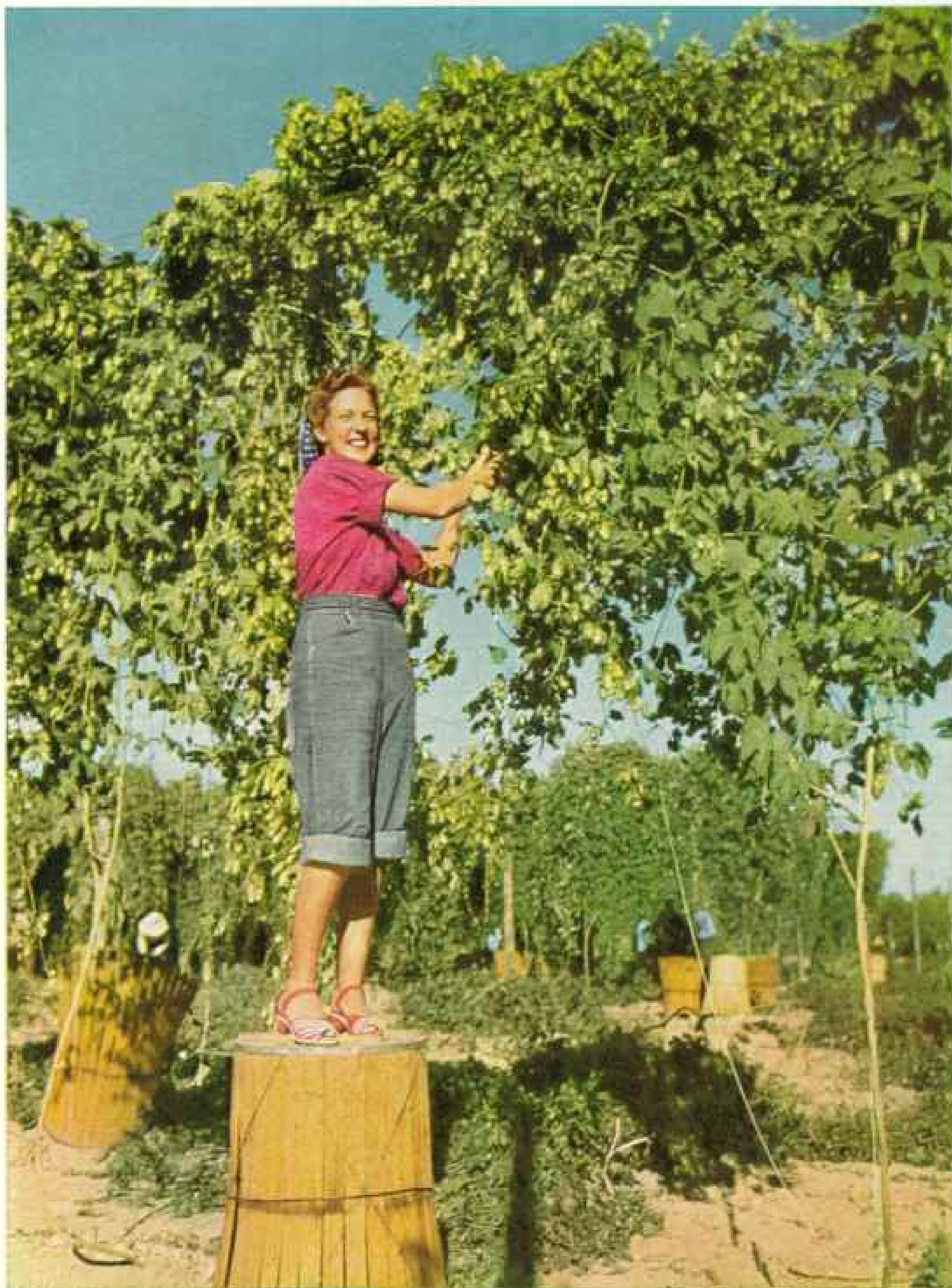


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One Tiny Tug Moves Acres of Logs Across Sparkling Coeur d'Alene

Across the eastern arm of this great waterway is the dock where truckloads of choice timber are dumped, rippling these placid waters as they splash in. Farther out, whitecaps often appear on the 77-mile-long lake, and it is an arduous tow to railway and sawmill.

Kodachrome by Marjorie Owen Williams



© National Geographic Society

Kodachrome by Raymond Owen Williams

Nowadays, the Farmer's Daughter and the Old Folks Pick the Hops

In Idaho, peas and beans flourish in fields once given to wheat, and growing of seeds for Lend-Lease export has developed amazingly. But south of Payette is an area where soil and climate are favorable to the hop vine, cones of which put the bitter in beer.

Idaho Made the Desert Bloom



With Onion Seed a Dollar a Pound in the Fields, a Seed Expert Displays a Fine Head as if It Were a Jewel

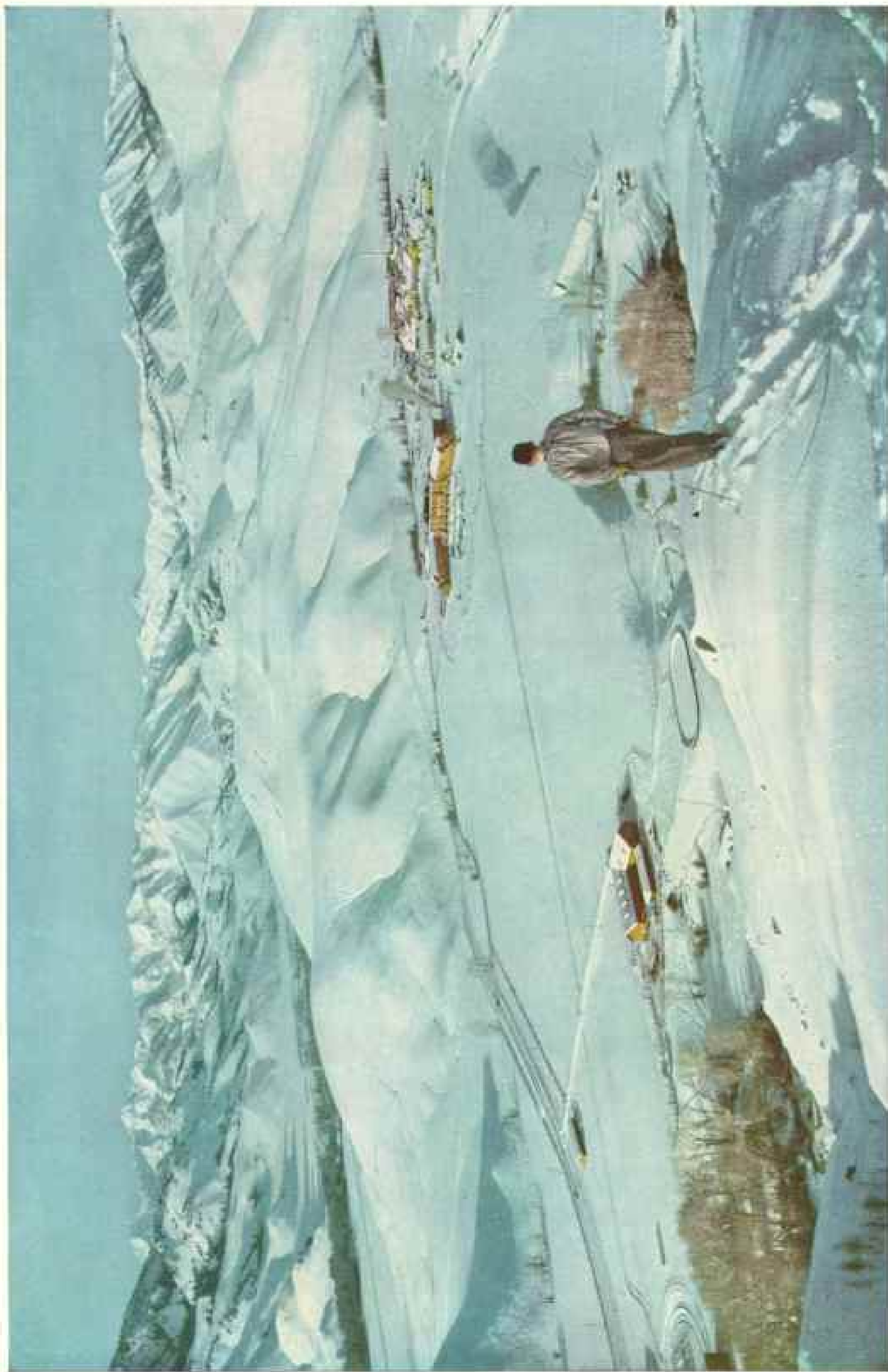


© National Geographic Society

Illustration by Marnad Owen Williams

Camp Fire Girls Greet the *Donna Kay* at Sweyolakan (Whispering Pines)

This summer resort is about 100 miles from the Canadian border on Couer d'Alene Lake. The lake is a favorite resort for swimming, surf-riding behind a motorboat, fishing, and camping.

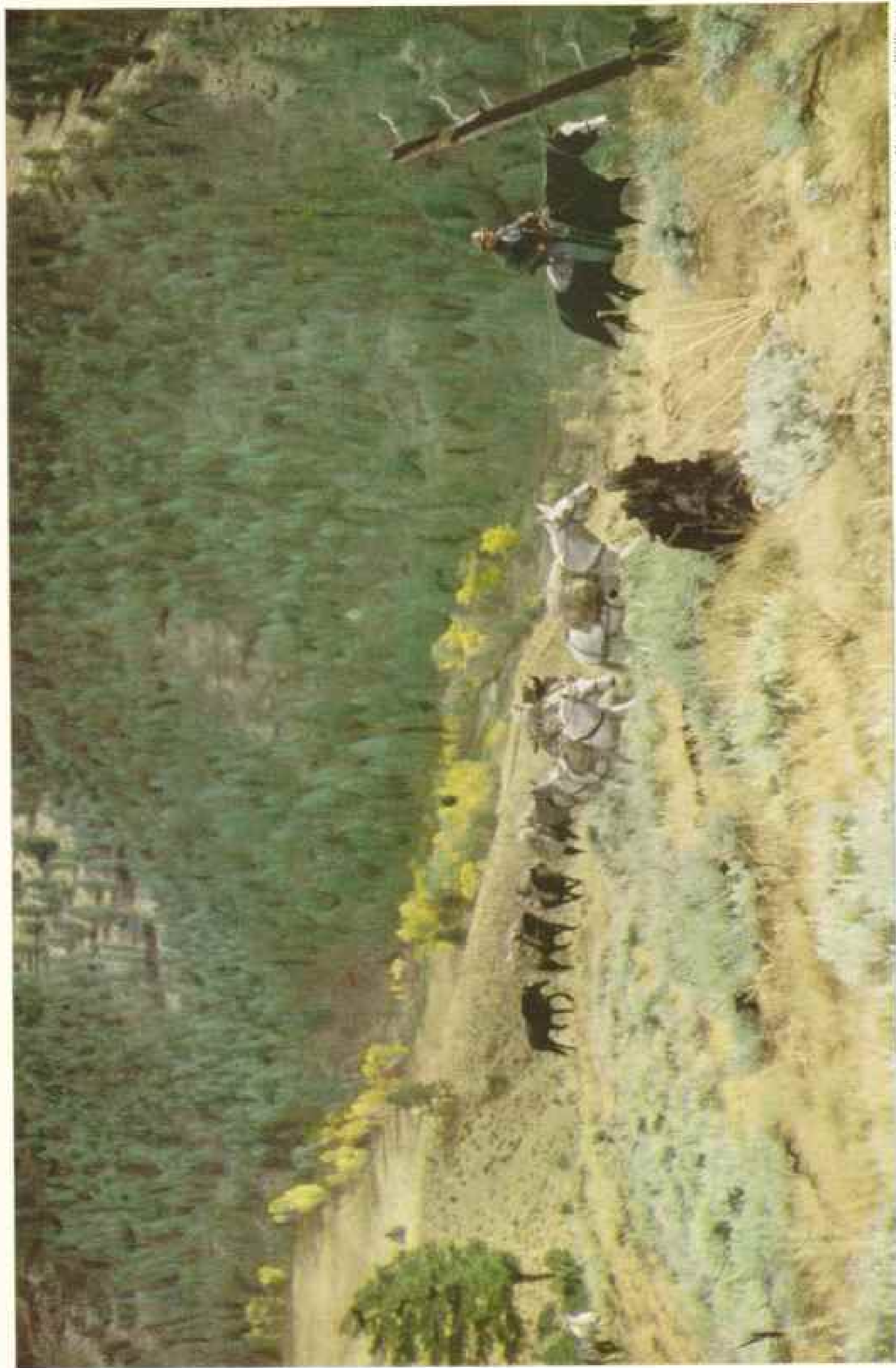


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Reproduced from United States Pacific Railroad Company

Far from Jungle Fevers, More than a Mile above Sea Level, Sun Valley Welcomes Navy Heroes, Home from the Wars

Created as a luxurious resort for favored folk who liked to ease old-worn muscles in a warm pool under a cold sky, Sun Valley is now a Naval Convalescent Hospital. There victims of tropical malaria or rheumatic fever can be nursed back to health.



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In One of Idaho's Primitive Areas, a Pack Train Climbs Steep Slopes to Kill Deer and Save Them from Starvation.

In winter, 10,000 deer may feed on this mountainside above the Middle Fork of the Salmon River. The browse is decreasing, the herd is increasing, so hunting is encouraged. More than 1,232,000 acres in this mountainous heart of the State are preserved as the Idaho Primitive Area (Plate VIII).



Ann Parry Holds Heads of Valuable Carrot Seed

Night-flying aviators now value the lowly carrot's vitamin A as much as do Peter Rabbit and Bugs Bunny.



© National Geographic Society

Endicottown by Maynard Owen Williams

This Hybrid Sweet Corn, Ioana, Was Sired by Iowa No. 45 and Mothered by Purdue (Indiana) No. 39

Idaho produces nearly 85% of all hybrid sweet corn seed in the United States. Its crop amounted to more than 5,300,000 pounds in 1942.

Touring for Birds with Microphone and Color Cameras

By ARTHUR A. ALLEN

Professor of Ornithology, Cornell University

With Illustrations from Kodachromes by the Author

A FLUTTER of wings close behind me, and a low, growling call. Quickly I turned and nearly slipped from my precarious perch when my gaze fell upon the crimson breast and iridescent green head of a Coppery-tailed Trogon. It was less than ten feet from my incredulous eye (Plate II).

The wonderfully beautiful bird was obviously disturbed by my ascent of the tree, and for a moment my heart pounded as if I had been caught red-handed at the secret door of some ancient Aztec treasure.

For fifty years ornithologists better acquainted with Arizona and more familiar than I with the ways of trogons had been hunting unsuccessfully for the home of this exotic bird. Now, perhaps, the discovery was to be mine.

We had been told of these strange birds in Madera Canyon, when we were in southern Texas, by the Roger Petersons, who in turn had been shown them by Maj. Allan Brooks while he was studying and painting the birds of the Santa Rita Mountains of southern Arizona earlier in the spring.

Indeed, the presence of this bit of tropical sunshine, not far from a recently completed road up the mountains, seemed to be so well authenticated that we began to hope we might capture its voice with the sound camera.

But as for finding its nest—this was beyond our fondest hope; and when our good friend, Dr. Charles T. Vorhies, of the University of Arizona, directed us to the spot where the birds had been heard calling and promised to treat us to a good dinner if we found the nest, we jokingly acquiesced.

Improbable as it all seemed, in less than twelve hours we had succeeded in recording the trogon's curious song, a song which has a strange resemblance to that of a hen turkey with a jew's-harp, and here was I on the verge of finding its nest.

Ten feet above was an old woodpecker's hole, a little irregular in outline from exposure to wind and weather and claws of departed *carpinteros*. In such places other species of Mexican and South American trogons had been known to nest.

I had climbed to several other promising holes that morning without even so much as

a squirrel scolding me. Moreover, since even in South America I had been unable to stalk trogons closer than 30 yards without their taking wing, I felt sure that the close scrutiny I was now receiving portended that I was either in the nest tree or very close to it.

"Watchful Waiting" Is Rewarded

Not wishing to disturb the bird further, I descended the tree and set up an observation blind on the ground. Within an hour the male trogon returned and flew directly to the hole toward which I had been climbing. For five minutes he clung to the edge of it, like a woodpecker, cocking his head very deliberately and looking down inside with seeming admiration.

I thought the female was probably within, but ten minutes later she appeared from somewhere in the forest and, after pausing at the entrance for an interminable moment, she slipped in and remained for twenty minutes. Perhaps she was laying an egg; or was she feeding her young by that curious and lengthy process known as regurgitation?

The next day, with the aid of a mirror and a flashlight, we settled the great question, for there, 14 inches down from the opening and with no sign of nesting material, were two shiny-white eggs. The first authentic nest of the Coppery-tailed Trogon in the United States had been discovered.

When we found that the birds were not afraid of the grass-mat blind on the ground, we raised it to a scaffolding in the tree above and soon were observing the birds on their own level, about 20 feet from the nest opening. Sometimes they perched on a near-by branch within arm's reach. The large eyes and trusting behavior gave the birds a friendly appearance.

We could not remain in Arizona long enough to record the hatching of the eggs and the feeding of the young, so we showed the nest to William Proctor, one of Dr. Vorhies' students who lived not many miles distant, and he kept it under observation until the young left. During this time it became the cynosure for all resident and visiting ornithologists, while we, unfortunately, had to depart.

Touring for birds with a microphone and

color camera is somewhat more complicated than merely setting out to see how many kinds of birds one can observe.

Before we returned to our "base camp" at Cornell University, we had in less than a year seen nearly 600 different kinds of birds, if we include the various geographic races, and by the end of the year a new record of 681 was established. However, we had recorded the songs or calls, and secured satisfactory color films, of only slightly over one hundred different kinds.

It would be possible to study the check list of North American birds, wherein is given the distribution of each species and subspecies, and plan a trip in which one might see, in one season, at least a thousand of the varieties listed.

But not much time could be spent in any one locality, and one would have to enlist the cooperation of many local observers to show one the exact spots where many of the birds of limited distribution are found.

Some of our North American birds, especially among the water-loving species, are found during the summer from coast to coast and from the Gulf of Mexico to Alaska, and the individuals from California are so similar to those from Maine that no one has ever been able to tell them apart. Such are the spotted sandpiper and the killdeer and Wilson's snipe.

On the other hand, a wide-ranging land bird like the song sparrow (Plate V) has been broken up into 26 different geographic races, and it would be almost impossible to find them all in one season.

Birds Migrate along Fixed Routes

It is interesting to contemplate the present distribution of North American birds when we plan a vacation with them. It may be a new idea to some who have not given it much thought that creatures so free-moving as birds, which travel thousands of miles on their migrations, should so restrict their movements during the summer and so direct their travel routes on migration that many common species are entirely absent over large parts of our country. We look in vain for water ouzels along the streams of the Alleghenies; we never see nutcrackers on the mountaintops nor magpies in the valleys of eastern United States.

On the other hand, wood thrushes are never heard singing in California, and the number of warblers found there is small indeed.

The reason doubtless lies in the fact that North American birds have come from two different sources and have not yet completed their conquest of the entire country.

The ouzels and the nutcrackers (Plate XVI) and the magpies probably came into North America by way of Alaska, and their closest relatives still live in similar habitats in Asia and Europe.

The warblers, on the other hand, invaded our country from the south, probably through the West Indies, when there was more of a land bridge to South America than now exists. Many species have not yet found their way west of the Great Plains and none has extended its range to the Old World.

Just why one species like the Kirtland's warbler should restrict its summer activities to a few counties in northern Michigan, while another like the Yellow Warbler (Plate I) should occur, with slight variations, practically all over the North American Continent is not always clear, but problems like this help to make ornithology the fascinating study that it is.

Bird touring with open eyes and listening ears drives home the subject of distribution. The bird student realizes when he leaves the range of one species and enters upon the range of another even more clearly than he recognizes the crossing of the Continental Divide or the various State boundaries.

For a number of years the Cornell Laboratory of Ornithology, through the sponsorship of the Albert R. Brand Foundation, has been engaged in recording on film the songs and calls of birds.* This has made possible an accurate study of the voice and hearing ability of the various bird species, in addition to providing a new approach to the study of birds through phonograph records of their songs. This method trains the ears in a way comparable to that which previous methods of bird study have provided for the eyes.

The song period of each species is comparatively short, and the difficulties encountered in recording even some of the commonest species are so numerous that it has taken years to secure even a moderately complete collection of the songs of birds of the eastern United States.

Extinction Threatens a Prairie Chicken

Our first objective on the western trip in the good old days before gas rationing was to be the Attwater's prairie chicken of southern Texas. Though it still occupies a portion of its previous range along the Gulf coastal prairies, it threatens to follow its close relative, the heath hen, into extinction.

* See "Hunting with a Microphone the Voices of Vanishing Birds," NATIONAL GEOGRAPHIC MAGAZINE, June, 1937, and "Stalking Birds with a Color Camera," June, 1939, both by Arthur A. Allen.



Lewis W. Waller

A Brown Pelican Jams on the Brakes and Drops Webbed Landing Gear

To provide a living for hungry nippers, this fisherman thinks nothing of a 50-foot power dive into the sea. Nests are of twigs, built on small islands near the mainland. Triplets are the rule.

Professors Taylor and Davis, of the Agricultural and Mechanical College of Texas, who have been directing a study of this species, put us in touch with Thomas Waddell, the local game warden at Eagle Lake. He seemed to know the whereabouts of every chicken on the prairie in that part of Texas and directed us to several "booming grounds." He warned us, however, that there was little chance of their becoming active unless it rained.

That afternoon he showed us about a dozen of the birds sharing a large pasture with several hundred cattle, including a few awe-inspiring Brahman bulls that glowered menacingly at us.

The next morning we arrived at the booming ground long before daylight. The cattle were still asleep, and five or six male prairie chickens were already there, though we heard

no calls from them. The placing of our blind and microphone frightened them away, and they did not return that morning.

A mile or more to the southwest, however, we could faintly hear a few "boom-booms," as if there might be some chickens courting in another pasture. Knowing the extent of some Texas pastures, I thought it might be a long hunt, but an hour's exploration showed us where the birds had been.

We planned, therefore, to set our blind and microphone in the evening and to sleep there, in order not to disturb the birds should they come to the booming ground during the night.

The top of the truck was equipped with a flat platform of such dimensions that we could use part of it as a base for a blind, or so that two of us could sleep very comfortably on it with air mattresses and sleeping bags.



A. E. BIRNEY

Flushed by Camera Plane, a Regiment of White Pelicans Casts Bottlelike Shadows on the Mississippi's Mouth

Winter visitors to the Gulf coast, these birds were engaged in a community hunt. Lining up in a semicircle, white pelicans beat the water and drove fish into shallows to be scooped up in the immense beaks. See "Pelican Profiles," by Lewis Wayne Walker, in the November, 1943, NATIONAL GEOGRAPHIC MAGAZINE.

With all things set, Charles Brand, son of the sponsor of our expedition, who served as our sound technician, decided to sleep in the truck so that he would merely have to turn a switch from his bunk if, following their usual habit, the chickens should start calling during the night.

My son David and I slept on top, under the stars. But it so happened that the stars lasted only until 3 A.M., when, with little warning, it rained!

But it's an ill wind that blows no good, for, true to Waddell's prophecy, the rain touched off the chickens and, inside of an hour, the "um-boom-boom" of a male bird in action was sounding across the dark prairie.

Soon a half-dozen ardent suitors were puffing out their air sacs and calling with almost the fervor of early spring.

None of the chickens approached the blind very closely, and their activities ceased by 7:30, so that, although we got a good record of their voices, successful color photography was out of the question.

It was interesting to watch the air sacs on the sides of their necks swell out like small oranges as they shook their heads and stamped on the ground preparatory to giving their resonant calls. Curiously, these calls sounded no louder at 30 feet than at a distance of a quarter of a mile.

Occasionally a bobwhite could be heard in the distance. From time to time a wonderfully graceful Scissor-tailed Flycatcher (Plate II) hovered over the booming ground, and one actually alighted on the blind.

Trees are scarce on the prairie, and one small knoll, with a dozen oaks and acacias and one pine, was the gathering place for five pairs of these beautiful birds, as well as innumerable great-tailed grackles and Mourning Doves (Plate VI).

The Scissortails were chasing one another around one particular oak, hovering above it, opening and closing their long swallowtails, and flashing the rosy lining of their rapidly vibrating wings against a deep-blue sky.

Courtship of the Grackles

In the lone pine the grackles were executing their courtship, accompanied by such sounds as shatter an adult's nerves but delight children when you draw your fingers over a toy balloon and let the air out at varying speeds: first, low squeals and then high squeals, followed by a crashing sound as if the bird were beating his wings on dry twigs.

All this accompanied a display of plumage that was equally ridiculous, for the bird first threw his head back on his shoulders and in-

flated himself until he appeared twice his normal size, his feathers standing on end and his enormous tail spreading. In the bright sun the brilliant iridescence of otherwise black feathers shot out gleams of purple and green. Next he threw his head forward and, as he collapsed, he rapidly fanned the air with his wings, producing the crashing sound already mentioned.

We drove the truck up to the pine, set our blind on top, and recorded the whole performance in color and sound.

That evening we accompanied Mr. Waddell to Eagle Lake to watch the fulvous tree ducks make their nightly excursion to the rice fields. I had always thought of this tropical species as rare in the United States, as indeed it is in most places; but here was a concentration that would give palpitations to a veteran duck hunter.

When we arrived at the lake, all was quiet except for the whistling of the cardinals from the brushy borders and the occasional guttural mutterings of a giant bullfrog; but as dusk fell, business boomed.

Yellow-crowned night herons began to move about; also egrets. Then flock after flock of the tree ducks rose up and circled over the marshy lake until the air was full. There were thousands of them, all squealing in a very unducklike manner "kill-deah, kill-deah" as they headed for the rice fields, which were now flooded but showing green above the water.

We decided to accept Mr. E. A. McIlhenny's invitation to visit his "Bird City," on Avery Island, Louisiana. This is one of the most unusual and picturesque spots in the South and one that lends itself so conveniently to color photography that it has become a mecca for bird observers from all over the world.

Thousands of Snowy Egrets (Plate XI), Louisiana and little blue herons nest within arm's reach of commodious observation blinds built by Mr. McIlhenny. These the birds have accepted as part of their security in a man-made and man-protected environment.

So spectacular are the herons that the average observer forgets completely some of the other birds that have even more interesting habits or more colorful plumages.

For instance, there was a tree full of anhingas, or snakebirds, at the opposite end of the lake. They intrigued us immensely, especially when the youngsters began rummaging inside their mother's throat for pollywogs and killifish.

The little fellows, with their long, slender, featherless necks, looked even more serpentine than their parents and spoke convincingly for the evolution of birds from reptiles.

And then there were Purple Gallinules, decked out in brilliant purple, green, sky-blue, red, and yellow—incredible color combinations and an exacting test for the Kodachrome film (Plate VII).

Thirsty Birds of the Desert

If you wish to study the birds of the desert at close range, you should offer them a drink, or, better still, go where someone else has been providing their much-needed water for some time prior to your visit. Drinking tanks for the cattle and bird baths lure the desert birds from far and near.

At Tucson we enjoyed the hospitality of a promising young ornithologist, Mr. Allan Phillips, who is preparing a comprehensive work on the birds of Arizona. He put us in touch with a most interesting chap, an apiculturist, who has helped many ornithologists get acquainted with Arizona birds. Mr. H. E. Weisner seems to divide his friendship between the birds and the bees. More than a dozen species were frequenting the shallow pan of water which he refilled several times a day.

We set up our blind a few feet from this watering place, and I amused myself for several hours studying birds I had not seen before except at a distance through binoculars.

There were two families of Gambel's Quail (Plate X) with young about two weeks old; cañon and Abert's towhees; ash-throated and Arizona crested flycatchers; Palmer's thrashers; phainopeplas; pyrrhuloxias; western mockingbirds and Arizona cardinals; Bullock's orioles; Mexican ground doves and white-winged doves; Gila woodpeckers and gilded flickers.

In addition to offering them water, Mr. Weisner bakes a cake for them, using cornmeal, suet, and honey. Even the woodpeckers are keen about this bird biscuit, and a beautiful pyrrhuloxia would take it from his hand.

There was one discouragement to nest hunting about Tucson, and that was the heat. The sand over which we tramped averaged about 150° Fahrenheit, although the air was not much over 100°. Early in the morning, however, it was cool, and then we added rapidly to our collection of bird songs.

In the evening we visited the groves of giant cactus and recorded the calls of the elf owls that utilized the higher nesting holes dug by the woodpeckers.

From Tucson we journeyed northward to the Grand Canyon, Bryce and Zion Canyons, and southwest to Boulder Dam. The grandeur of these natural wonders absorbs one, and even birds must wait. But a profound change in bird life, as compared with that of southern

Arizona, is evident. The canyons are farther north and of much higher altitude, that of the rim of Grand Canyon and Bryce Canyon being from 7,500 to 8,000 feet.

Our bird fauna is so intimately associated with differences in temperature that Dr. C. Hart Merriam, a former chief of the U. S. Biological Survey and member of the Board of Trustees of the National Geographic Society for 54 years, 1888-1942, conceived an explanation, based almost entirely upon temperature, for the many variations in distribution of plants and animals in America. He called it the "Life Zone Theory" and he formulated the "Laws of Temperature Control."

Temperature Differences Affect Bird Life

According to this theory, each species has certain basic requirements of temperature, or "a physiological constant," and its northward distribution or limitation is controlled by the length of the growing season and its southward distribution by the temperature of the six hottest weeks of the summer. This corresponds roughly to the period of reproduction.

Those species which cannot stand the heat of summer when rearing their young either go north or else find the same conditions on the tops of the mountains. On the other hand, those which require a long season to raise their young and don't mind the heat populate the southern areas.

Wherever we find a locality where the heat of summer is not extreme and yet the growing season is long, as on our Pacific coast, one is likely to find a great intermingling of northern and southern forms.

In the San Francisco Bay region, for example, where the fogs of summer reduce the heat, one finds northern or mountain birds almost at sea level. Chestnut-backed chickadees, hermit thrushes, juncos, brown creepers, and kinglets live almost side by side with such hot-country birds as mockingbirds, California Woodpeckers (Plate IV), bush-tits, California quail, wren-tits, and road-runners.

Of course, some birds and some plants are much more adaptable than others to ranges of temperature, and it is only those that have definite limitations that make good "indicators" of life zones to the faunal zoologist or to the touring ornithologist.

Thus the rim of the Grand Canyon is in the Transition life zone, with such indicators as Steller's jays, black-eared (pygmy) nut-hatches, red-backed juncos, Cassin's purple finches, and mountain bluebirds.

The floor of the Canyon, on the other hand, a mile below, is in the Lower Austral zone, with such birds as Say's phoebes, ash-throated

flycatchers, desert sparrows, and long-tailed chats.

Life zones are particularly conspicuous in the Rocky Mountain region, although, since many other factors there, in addition to altitude and latitude, affect temperature, there is a great deal of irregularity to the zones that is confusing even to an experienced observer.

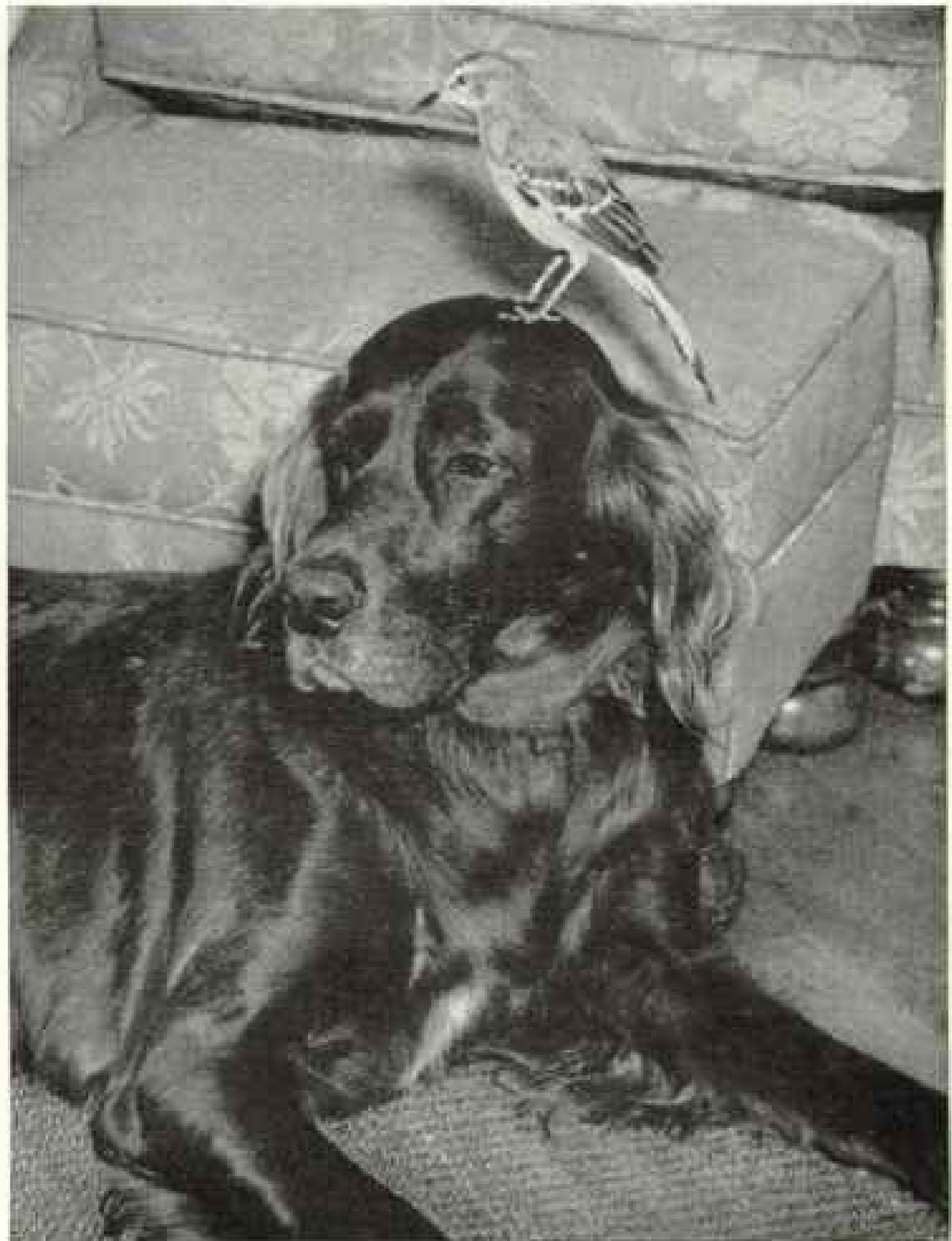
The trees, however, are usually good indicators. When you pass from the Digger pines into the yellow pines, you know you are passing from the Upper Sonoran into the Transition zone; and when the yellow pines give way to the red fir and the Jeffrey pine, you know you are passing from the Transition to the Canadian zone, without having to wait for hermit thrushes, kinglets, solitaires, or dusky grouse to tell you so.

In similar manner, when the whitebark pine replaces the Jeffrey and the mountain hemlock the red fir, you know you are entering the Hudsonian zone and you will be listening for nutcrackers and white-crowned sparrows. Finally, when you leave the trees behind and enter the Arctic-Alpine zone, you will start looking for ptarmigan just as surely as if you had traveled to Hudson Bay and started hiking across the tundra.

From Desert Lands to Rich Farms

But, after viewing Bryce Canyon, even a flamingo might seem colorless, and certainly the rest of the landscape for several days seemed very drab.

So we hurried on toward Pasadena, passing through groves of the curious Joshua trees, between Las Vegas and San Bernardino, which



Washington Evening Star

Of All Roosts, Abie the Mockingbird Chooses a Bird Dog

Abandoned as a fledgling, Abie was adopted into a Maryland home. He paid off with song and cheer. At feeding time he strode the Irish setter's back; his friend tolerated every indignity. Attacked by wild birds while exercising outdoors one day, Abie was never seen again. "We grieved terribly," his owner, Mrs. Arthur P. Owens, told *THE GEOGRAPHIC*. "To us, his brief visit was a lovely experience."

in turn gave way to oranges and lemons when we left San Bernardino and irrigation became possible.

With the change from desert to rich farm land has come just as distinct a change in the bird life, blackbirds and orioles and grosbeaks replacing the thrashers and cactus wrens.

From Pasadena a half day's drive took us to the Sequoia National Park in the mid-Sierras, where we were soon driving among trees that were giants when Columbus was a little boy. What we could see of the sky through a lacework of branches three hundred feet over our heads was deepest blue.

It was summer when we left the San Joaquin Valley below, but here it was spring with the dogwood in bloom, white against the red-brown trunks of the sequoias. But, despite the date, June 13, it was scarcely spring, for that night the clouds rolled in, it snowed, and the next day the clouds hung so low that we could see only halfway to the tops of the trees.

The following morning it cleared at day-break, and we recorded the cheery song of the fox sparrow, the chirping of a pair of evening grosbeaks, the twitter of the junco, the scolding of a white-headed woodpecker, the wiry song of the Calaveras warbler, and the conversational warbles of a Cassin's vireo.

It was then we heard our first sierra grouse tooting from the top of a red fir near one of the campgrounds and, in spite of the noise of chopping wood and the tinny rattle of meal preparation, we secured a fair recording of its low, rhythmical hoots.

Then once more the clouds came and we decided to move down to lower altitudes.

Bird Haunts of Berkeley

A sojourn at Berkeley for six weeks, while the writer was teaching at the University, gave us opportunity for recording and photographing the birds of the campus and for week-end excursions to favorite bird haunts.

Monterey, with its nesting Western Gulls (Plate XV), and black oyster-catchers occupied us first; and near here we were shown a nest of the rare white-tailed kite in the top of a blue oak, with an unusual second brood.

Another interesting week end was spent at Los Banos in the hot San Joaquin Valley, with its multitude of water birds. Flocks of white pelicans, white-faced glossy ibis, black terns, stilts, and avocets fascinated us most.

One Saturday was spent in Muir Woods with its giant redwoods and midget birds—chestnut-backed chickadees, kinglets, brown creepers and winter wrens, and another at Point Reyes, where hordes of murre, cormorants, and guillemots were nesting.

Near Stockton Jack Arnold showed us a colony of blue grosbeaks (Plate VIII).

Near Mount Diablo we located a nesting tree of the California Woodpecker that was convenient for study. This strikingly marked bird lives in colonies wherever the blue and valley oaks occur in sufficient numbers to supply its staple food of acorns. The birds drill holes in the bark in which to hide these treasures and give them constant protection against marauding jays and squirrels.

Even more interesting than storing of provender, however, is its communal way of living. There were several nesting holes dug in the tree where we set up our blind on top

of the car (Plate IV), but we soon discovered that in one there were young of differing ages and that they were being fed by two pairs of parent birds.

After considerable waiting I managed to get several shots which showed three birds at the nesting hole at one time, as well as a lot of stored acorns above it.

Most woodpeckers have a keen sense of territorial rights and will not permit intrusion near the nest by any other woodpecker.

Such a social arrangement as we found among these woodpeckers, therefore, came as something of a surprise to me.

The birds of the University campus, at Berkeley, are interesting and friendly but not very colorful. Brown towhees hop around the grass like robins, which, by the way, are much less numerous than our eastern robins. Spurred towhees whine from the shrubbery and forget the first two syllables of the "Drink your tea" song that the familiar eastern towhee gives (Plate VIII).

Our return from California by the northern route was marked by several interesting stops, although, since it was now August, the song season was over. We did, however, secure some calls of the mountain quail and the chukar partridge near the home of Superintendent Fisher, of Lava Beds National Monument, and of the nutcrackers (Plate XVI) at Crater Lake, where they have become nearly as tame as the ground squirrels and have learned to drink from the bubbling fountains.

On our way to Carson Pass, in the Sierras, the last of July, we had acquired a baby Burrowing Owl, which had ventured out of its mother's cyclone cellar, near Stockton, a little too soon for its own safety and stood in the middle of the highway defying traffic.

Speo, as we christened him, shortened from his generic name of *Spotyto*, became David's special pet and care for the rest of the trip. And now, as I write this in my study, he watches my moving pencil with apparent fascination, ready to pounce on it, should I lay it down, as if it were a slender lizard or a cricket.

When we let him fly about the study at night, he becomes as sportive as a kitten. His little courtesies, his inquisitive gestures, his intimidating postures when he discovers something strange, and his mock ferocity in pouncing on an eraser keep us amused and bring to mind the golden days spent in touring for birds (Plate V).*

* The Cowbird (*Modothrus ater*) which the author refers to on Plate I is found throughout the United States except in high mountains and the southeastern corner. Its eggs are speckled. The Red-eyed Cowbird (*Tangara aeneas*) referred to on Plate III does not occur north of southern Texas. Its eggs are plain blue.

A Bag of Bird Portraits



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Why the Two-story House? To Oust a Social Parasite

A Cowbird laid an egg in this Yellow Warbler's nest beside one of the owner's. Refusing to be imposed upon, the Warbler added another nest, burying the Cowbird's speckled contribution where it could not hatch. The Warbler then laid eggs in the second-floor nursery and here busily cares for triplets.



Rare Visitor to the United States Is the Coppery-tailed Trogon from the Tropics. The author discovered the first Trogon nest in the United States in the oak forest of the Santa Rita Mountains, Arizona. The **Coppery-tailed Trogon** (male above) is related to the Quetzal, worshiped by Maya and Aztec.



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Illustrations by Arthur A. Allen

Scissor-tailed Flycatcher with Tail Longer Than Its Body Builds a Home on the Range.

During courtship, males flutter over the treetops, opening and closing their long forked tails like shears. This dainty female nests in a thorny tree near Austwell, Texas, where, as in Oklahoma and southern Kansas, the birds are common in late spring and summer.

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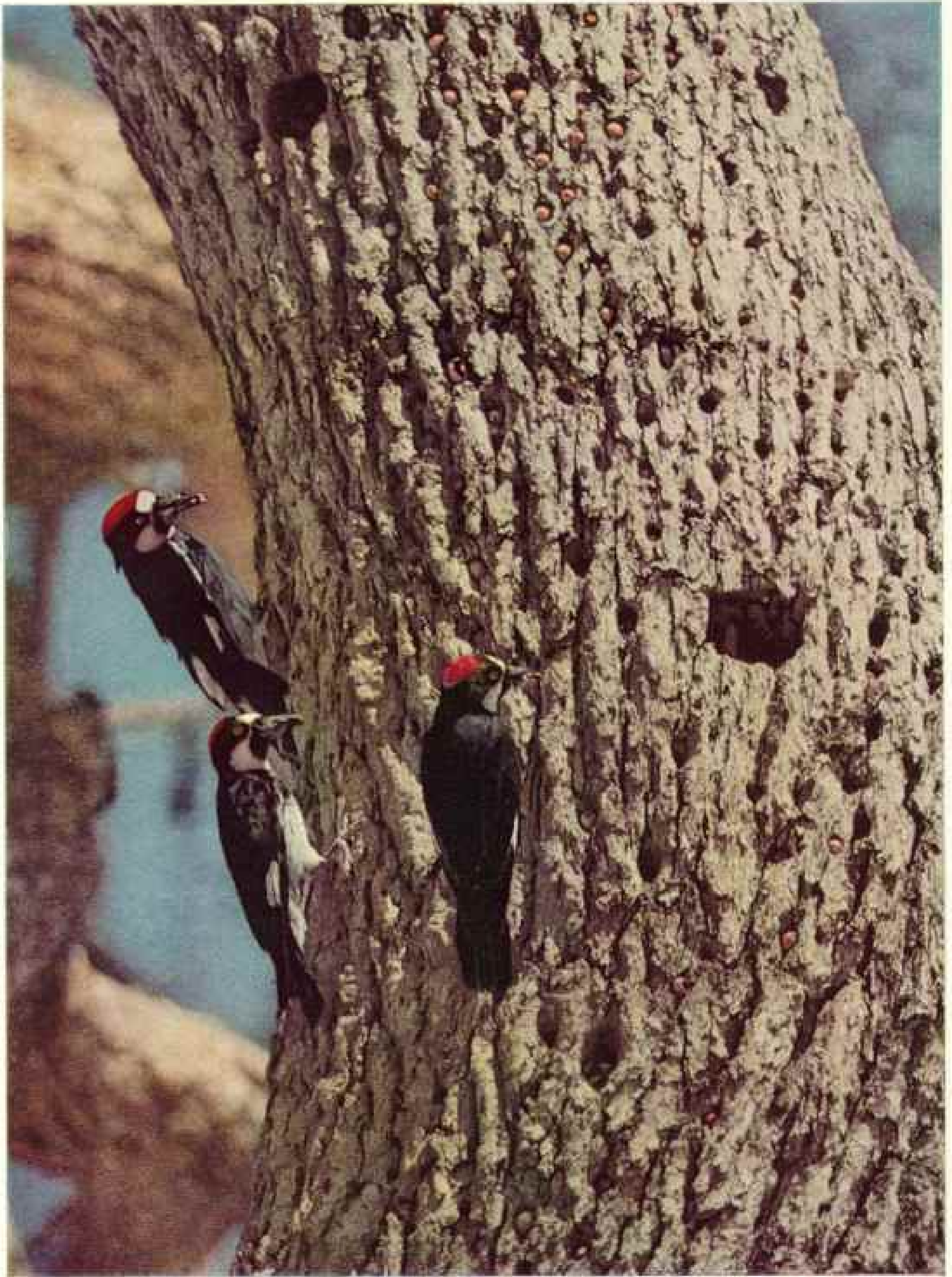


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A Sennett's Oriole Home along the Rio Grande, Cunningly Concealed in Spanish Moss

The plain blue egg among the speckled ones was laid by a Red-eyed Cowbird. To obtain this picture Professor Allen exposed the eggs by parting the moss. The Oriole (female), which has not detected the fraud, can't decide whether to enter by the large new door or to slip in the old way. It finally decided on the latter.



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Kulachman for Arthur A. Allen

These California Woodpeckers Live in a Two-family Flat and Share the "Acornary"

Two pairs use the nest hole to the right. Parents combine forces to drive Jays and squirrels from the acorns which they store in holes drilled in the bark. Here two females, indicated by black bar separating scarlet crown from white forehead, and a handsome male (upper left) bring food.

A Bag of Bird Portraits



Rescued from a California Highway, This Burrowing Owl Has Been David's Pet Ever Since

Taken from its cage, it becomes playful in the author's Ithaca, New York, home. **Burrowing Owls** live in prairie-dog holes or burrows that they dig in the western States, and feed largely on lizards, grasshoppers, and small snakes. The Florida Burrowing Owl, slightly darker, frequents Florida prairies.



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Kodachromes by Arthur A. Allen

From Georgia to Alaska, Maine to California, the Song Sparrow Makes Its Home

In gardens and shrubbery this familiar bird greets spring with cheerful and melodious song. So adaptable is it that 26 different races are recognized, the **Eastern Song Sparrow** (above) having the widest distribution.



Mourning Doves Are Often Mistaken for Their Larger, Extinct Cousin, the Passenger Pigeon. These familiar Doves are found throughout the United States, southern Canada, and Mexico. **Mourning Doves** are frequently seen along highways, and in fall are hunted as game birds by sportsmen.



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Illustrations by Arthur A. Allen

A Florida Ground Dove Builds Its Home in a Jasmine Vine

But the fragrance is doubtless wasted, for birds have little sense of smell. **Florida Ground Doves** are not much larger than Sparrows; yet, with their mincing steps, small heads, and chunky bodies, they are typical Doves.



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Kodachrome by Arthur A. Allen

The Purple Gallinule Is Up-to-the-minute in Attire, but Likes Its Feet Wet

Flat little blue hat perched cockily, and with bright-red beak and yellow legs, this flashy bird could serve as a fashion plate. Here a male rearranges the nest in a Louisiana marsh. The northernmost breeding range of the **Purple Gallinule** is the Gulf States, but it occasionally surprises bird lovers in New England and Canada.



Male Is the Showy One in the Blue Grosbeak Family; Female and Young Are Somber. The Blue Grosbeak is found throughout southern United States. It frequents the borders of woods and brushy places. Here a **California Blue Grosbeak** nests in a thicket in the lower Sacramento.



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Red-eyes by Arthur A. Allen

Is This Towhee Surprised! No Mouths to Feed; the Family Is Full

Towhee, Chewink, Joree, or Ground Robin, as it is variously called, is familiar in brushy gardens. This is the **Red-eyed Towhee** (male) of eastern United States and the South in winter. Resident Florida Towhees have white eyes; those of Alabama and central Georgia, yellowish.

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Kodachrome by Arthur A. Allen

Nature's Mousetrap—a Young Saw-whet Owl Lunches near Grand Canyon, Arizona

Its mother had cached a white-footed mouse on a branch while teaching it to hunt. The friendly **Saw-whet Owl** may sometimes be captured by hand in daylight as it sits quietly in a thicket. In adult plumage the breast is heavily streaked. Its rasping cry sounds like a saw being filed.



Like Other Desert Creatures, Gambel's Quail Can Go Weeks without Water

Yet when offered a pan of water in a Tucson garden, this thirsty family drank copiously. An important game bird in Arizona, **Gambel's Quail** ranges throughout semiarid areas of southwestern United States and northern Mexico. Male and young right; female left.



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The Flat Gravel Roof of a Schoolhouse Served as Home Site for This Nighthawk

Strangely, it is not a Hawk at all, but related to the Whippoorwill. The common name derives from its hawklike appearance when on the wing. **Nighthawks** do aerial acrobatics at dusk when catching insects.

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Ladies' Hat Fashions Nearly Exterminated the Snowy Egret in the Gay Nineties

So great was the demand for the filmy aigrettes that adorn this Heron's back in spring and summer that it became extremely rare. Efficient protection has made the **Snowy Egret** familiar again along southern lakes and shores. Florida visitors may see flocks of thousands along the Tamiami Trail.



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Reddish Egret Is a Rare Bird, Except in Texas

Along the Gulf coast it is common, traveling in flocks and chasing small fish through the shallows instead of stalking them. The Reddish Egret, like the Little Blue Heron, has a white phase, showing no color in the plumage. Tip of beak and feet are dark.



Illustration by Arthur A. Allen

Sandhill Crane Can "Let His Hair Down," Too

He promenades in stately manner here, but when courting he performs in the best square-dance fashion. In early spring, Sandhill Cranes assemble in groups of four to forty to perform an old-fashioned "minuet"—bowing, prouetting, and high-stepping.



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When Danger Threatens, Big Sister Horned Owl Spreads Her Wings to Protect Little Brother

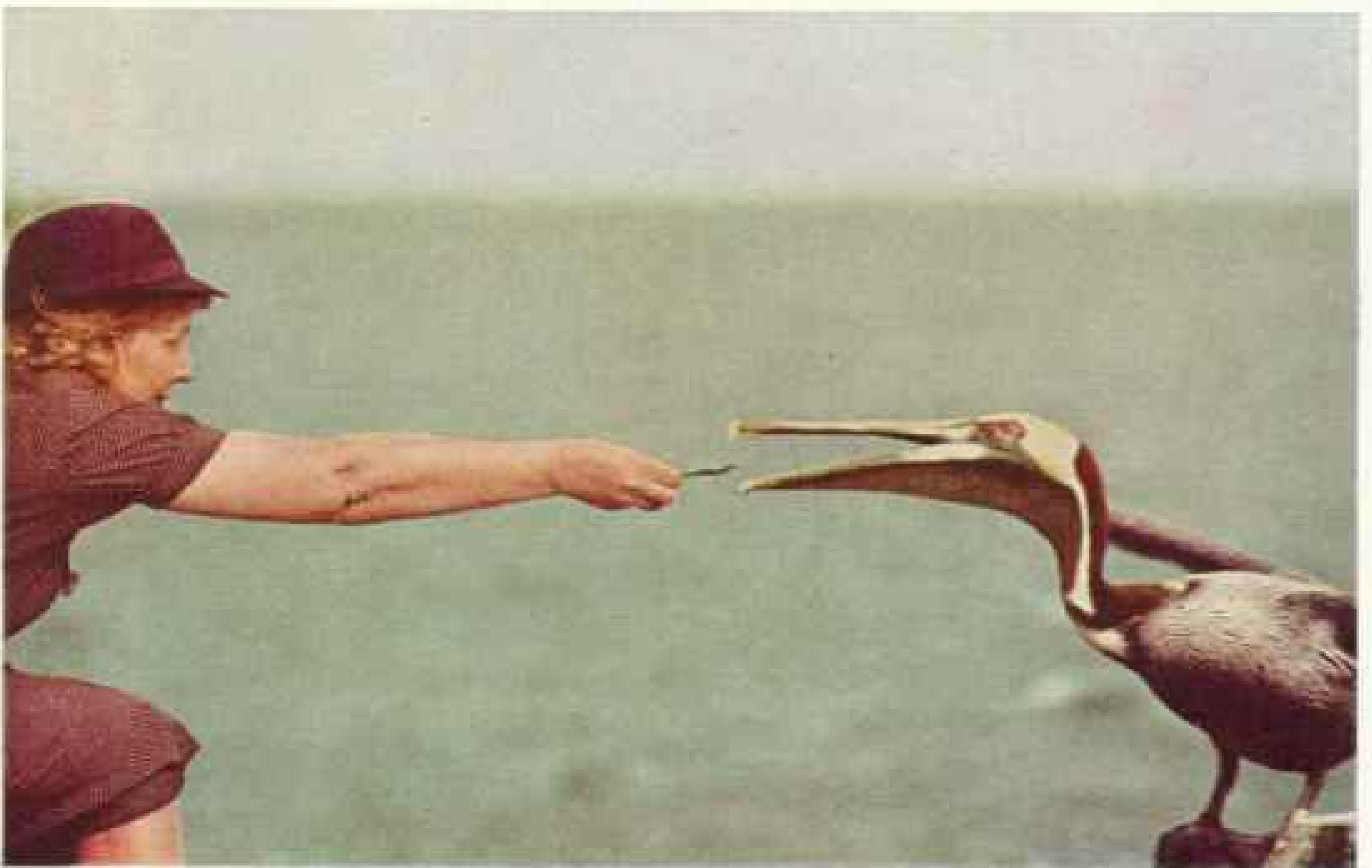
These **Western Horned Owls** near Tucson, Arizona, will wear head tufts of feathers, resembling horns, when fully grown. Among Owls, as well as most Hawks, females are larger than males. One of the fiercest and most powerful of birds, the **Horned Owl** is found throughout North America. "Tigers of the air" sometimes strike fearlessly with their claws at men approaching their nests. They will attack any bird or mammal not too large; even house cats and skunks are not immune. Poultry raisers are their worst enemies. When rabbits, squirrels, mice, and other rodents are scarce, the Owls turn to fowl, wild and domestic.

Illustration by Arthur A. Allen



A Vanishing Species—the California Clapper Rail

Its salt-marsh home in the San Francisco and Monterey Bay regions is being transformed rapidly into building lots or wharves. The bird's brown color more nearly resembles that of the King Rail than the familiar Clapper Rails of the eastern coast of the United States.



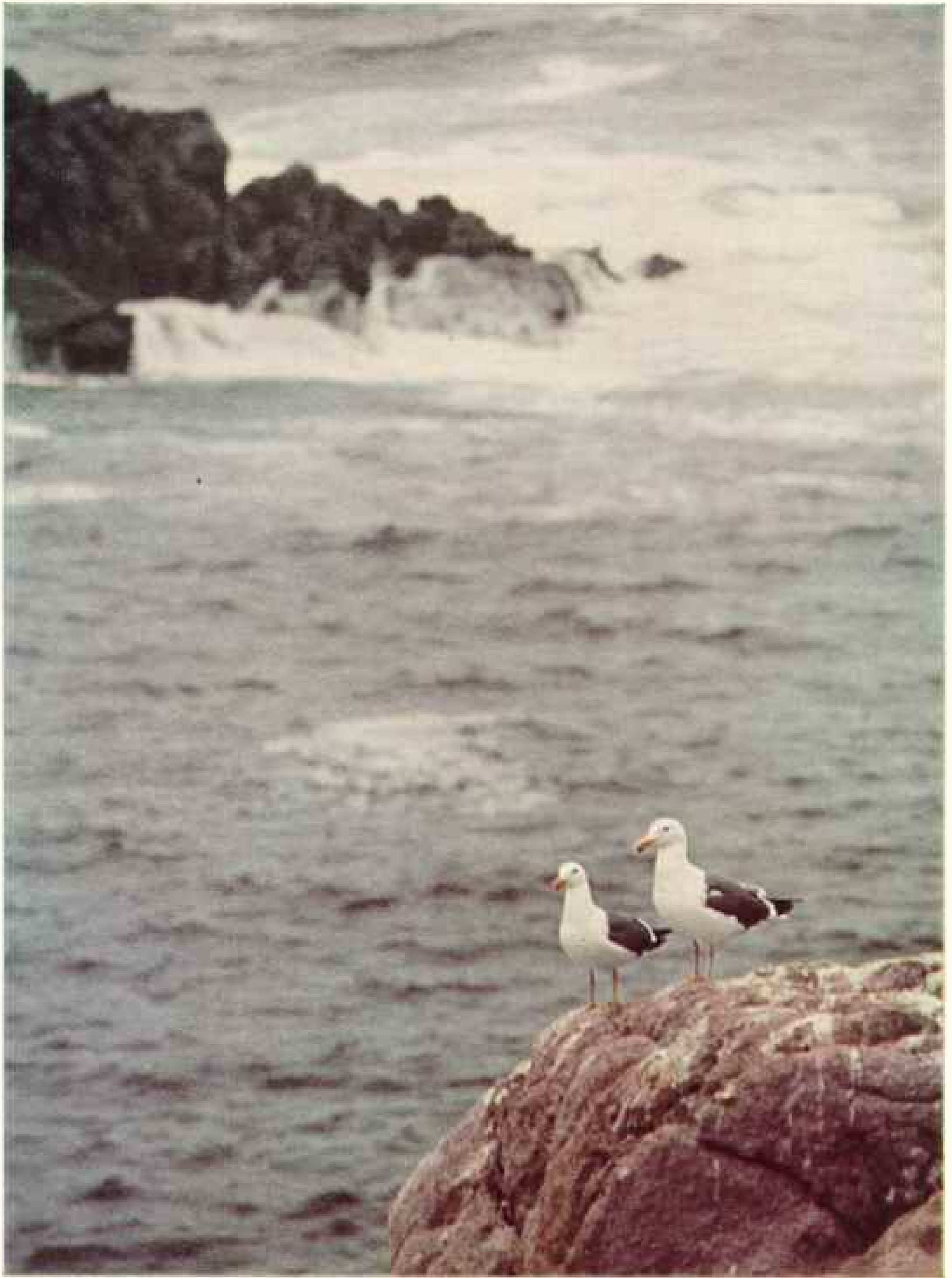
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Mrs. Allen Offers a Minnow Which Doesn't Quite Fill the Bill

Eastern Brown Pelicans haunting St. Petersburg, Florida, wharves have become so fat and lazy that they seem to prefer "panhandling" for fish rather than diving and catching their own.

A Bag of Bird Portraits



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"How About Eggs for Breakfast? Let's Rob a Neighbor's Nest"

When sea food and refuse are scarce, **Western Gulls** ravage the nests of sea birds, devouring eggs and young. These large Gulls are seen everywhere along the California coast, where they haunt rocky shores, breaking reefs, and harbors. This pair is perched on a headland above the surf at Monterey.



Illustration by Charles Brand

Christmaslike Bands Identify This Nutcracker, Whose Home Is at Crater Lake, Oregon.

The fondness of **Clark's Nutcrackers** for meat, suet, peanuts, and other handouts makes camp robbers of them. Crowlike in action, these western mountaineers are as much at home on the ground as in the fir trees and normally consume large numbers of grasshoppers and big wingless crickets.



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Illustration by Arthur A. Allen

When These Hudson Bay Natives Go South, They Choose the Snow Fields of New York

Even when the temperature drops below zero, the **Snow Bunting** (left) and **Hoyt's Horned Lark** do not seem to mind, provided they can find weed seeds or food supplied by man. Horned Larks owe their name to black feather tufts which they can erect above the eyes.

Exploring a Grass Wonderland of Wild West China

BY RAY G. JOHNSON *

With Illustrations from Photographs by the Author

LAST YEAR a timely and welcome invitation came from Governor Liu Wun-wei of remote Sikang Province to visit the lofty grasslands west of Kangting, known until recently as Tatsienlu. On May 23, 1943, I left Chengtu for this wild-western China "roof of the world."

Sikang is the newest province of the Republic of China. It lies along the China-Tibet borderland, and is about 1½ times as large as the State of Oregon. It is a wild and rugged region, rich in grasslands and minerals, but until recently practically inaccessible except by caravan (map, page 718).

There I rode on horseback through places where few white men had been. I talked with native women who had never seen a village, heard of a white man, or faced the "evil eye" of a camera.

I called on the leading candidate for Panchen Lama of Tibet, a six-year-old boy, and took a picture of him which I believe to be the only one in existence (page 714). I shot musk deer and Tibetan eared pheasants in a hunters' paradise.

I "reached for leather" on top of a 16,000-foot pass when my horse smelled my boot and evidently, because it missed the rancid butter odor of the natives, bucked in the full style of the Western cayuse.

There I saw vast areas of heavily sodded forage lands of relatively high grazing capacity, now fully utilized by vigorous, hardy types of livestock.

Whole mountainsides were clothed in glowing banks of spring blossoms. Here were well-known shrubs growing wild in a vast profusion of rare varieties.

But these strange sights and vivid experiences were incidental. My real purpose was to gain an answer to a number of questions concerning livestock and rangelands.

Dr. C. C. "Benson" Chen, a veterinarian holding a degree from Iowa State College, was assigned by the Ministry of Education to take official charge.

Dr. C. W. Swen of Nanking University's † Agricultural Economics Department was asked to gather and study the marketing and cost phases of the range livestock operations.

Dr. Louis K. Lü, a dairy-production man from the faculty of West China Union Uni-

versity, with degrees from Cornell and the University of California, also was assigned to us. A Tibetan interpreter and a representative of the Sikang Government were to join us at Kangting.

Here Few Trucks Had Traveled

"Thirty to 35 days of travel on horseback north and west of Kangting should enable you to see a fair cross section of the high grassland regions," casually remarked Governor Liu's secretary. "It will take a day to reach Yaan (Yachow). One or two days will be needed for outfitting at Yaan, and then two days by truck and you should be in Kangting."

Soon I learned that not a dozen trucks had yet gone the entire distance.

A windproof and rainproof tent was uncovered at Dr. David Graham's. It was a relic of his active work in the Tibetan borderland for the Smithsonian Institution. Oiled silk, weighing only 22 pounds, exclusive of poles, which would shelter three inside and three more in the fly, was a find.

An old World War I army saddle once used for breaking broncos, found mildewing in a mission attic, looked good to this buckaroo accustomed to a Western "sideboard" saddle.

Possibly I could use that saddle horn in roping horses or cattle, or at least as a steady-ing influence should I be mounted on a cranky saddle horse.

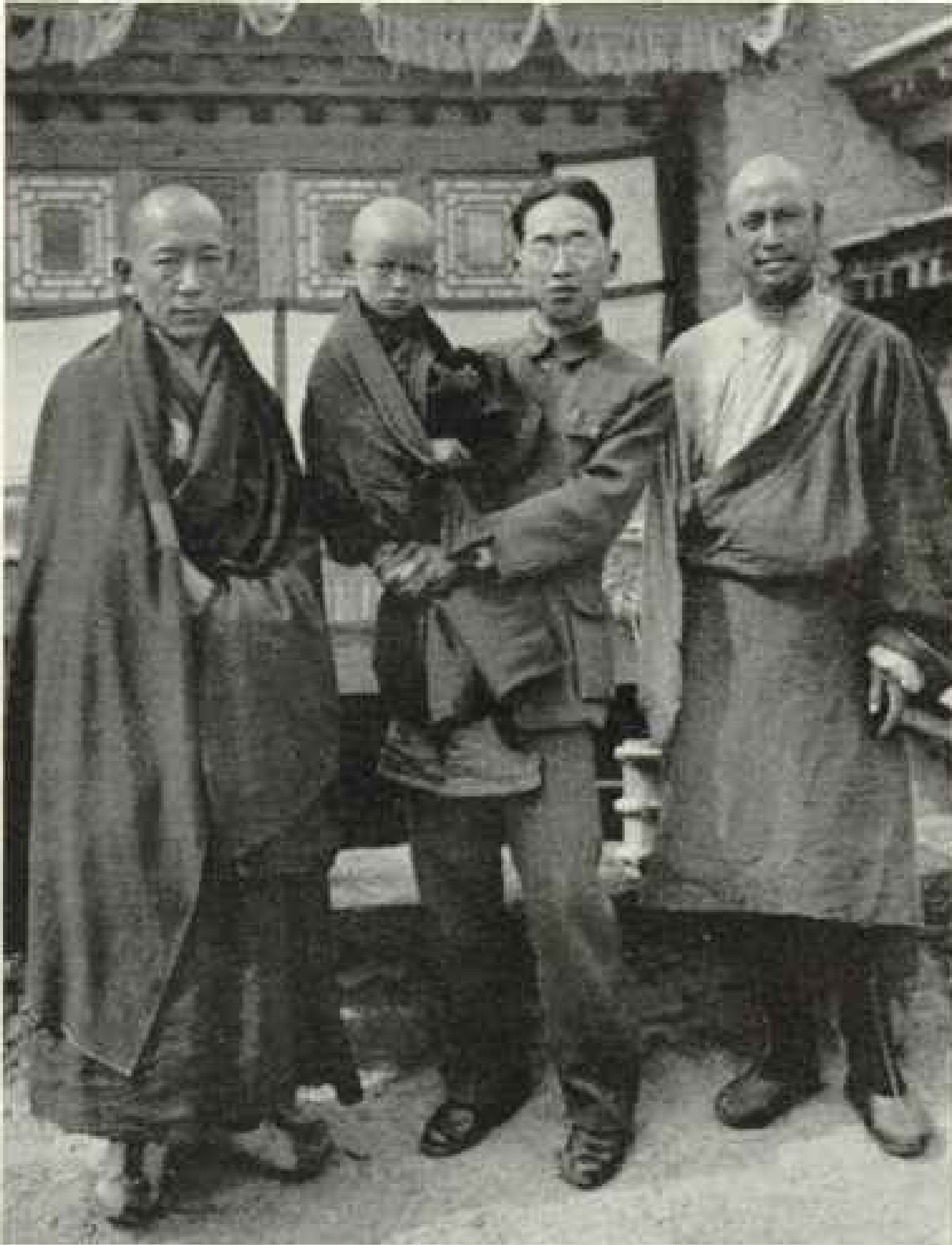
Since we were to be on China's "roof of the world," we borrowed an aneroid barometer.

Helpful Chinese students located a camera with an F:4.5 lens. A telescope tripod with a universal-joint head cost \$1,250 at the film shop. Then came the parting with \$5,440 for 34 rolls of fresh film (exchange 20 to 1).

I regretted leaving the comfortable home of that practical agricultural missionary, Dr.

* The author, head of the Animal Husbandry Department of Oregon State College, was one of several men with the Cultural Relations Division of the U. S. Department of State, assigned to the American Embassy at Chungking, China, and in turn loaned to the Chinese Central Government to aid China in its efforts for increasing agricultural production. Professor Johnson was assigned to the Ministry of Education under whose auspices he studied agricultural production.—The Editor.

† Now in Chengtu, and joined with West China Union University and others to form the Associated Universities.



Candidate for Panchen Lama—a 6-year-old Woodcutter's Son

Since he was born at the minute of the former Panchen Lama's death on November 30, 1937, the lamas believe he may be the reincarnation of their dead spiritual leader (page 739). There were two other candidates when Mr. Johnson was in Tibet. C. Hull, Lihwa magistrate, holds the boy. At right is the child's father; at left, C. Ting, a Living Buddha from Lhasa, in charge of examining and training the young candidate. This photograph is believed to be the only one of the boy in existence.

Frank Dickinson, of West China Union University. He had brought the first of the now popular improved Eureka lemons and Red June apples to the West China alluvial plain.

Because of his efforts, the first Holstein bull was introduced. Daughters of this bull are now producing many times more milk than the native cows. Chinese dairymen can sell these offspring for \$35,000 to \$65,000 each—or keep them and sell milk at \$8 to \$11 per cup.

Dickinson advises in the supervision of Madame Chiang Kai-shek's herd of purebred Holstein cattle. His Rhode Island Red hens are scattered widely—as are his agriculturally

trained Chinese missionaries.

We left Chengtu in a heavily loaded bus in early morning. It was a typical Chengtu spring day—the air warm, humid, and quiet, the sunlight not direct enough to burn.

Hogs Tied by the Eyelids

Customs inspection held us near the city gate where for an hour we heard the chatter and hum of market-bound farmers, and the squawk and squeal of the ungreased wheelbarrows loaded with grain, flour, and the last apricots, or with one or two overfat 300-pound hogs.

They were not "hog-tied," yet lay quietly on their backs. Seldom did one resist efforts to move him. I could not understand such docility.

Closer examination revealed that every hog had a cord sewed through and fastened to each eyelid, with which he was tied down to the wheelbarrow.

We traveled through a flat plain. Winter wheat and oats were almost all harvested. No field lies idle more than

three to five days. It is plowed even while grain bundles are drying. Then comes the flooding. The plowed land is harrowed and worked down under water.

The plodding water buffalo is the farm draft animal. Finally, the rice is hand-planted by crews of peasants who lay out arrow-straight rows without use of marking string or "sighted-in" pegs.

Land utilization is broken only by scattered burial grounds covered with grass, by an occasional mud fort remaining from Communist Army days, and by the scattered farmers' homes and villages.

The villages are encircled by mud walls shaded by clumps of gracefully arching bamboos about 20 feet tall.

In the afternoon we were crossing the scrub-covered hills extending west between Szechwan and Sikiang Provinces. Every open place or semiflat plot was dry-farmed.

Leaves and Twigs for Tibetan Tea

We reached Yaan after dark. The Governor and some other provincial officials live here, although the official capital is Kangting.

This small town, at the point where the Ya River broadens out from the mountains, is the center of the tea-growing area which supplies Tibetans with leaves and twigs for the heavy-bodied red tea they drink at every meal (page 741).

This tea is grown on the surrounding hills; leaves and twigs are gathered, dried, and delivered by the farmers to one of the company packing houses. There they are crudely graded, steamed, and moist-compressed into wicker-bound bricks. Each bundle weighs approximately 20 pounds, dry weight.

These bricks dry in open ricks and are then started on the long shipment to the west, perhaps as far as the three months' caravan trip to Lhasa, capital of Tibet.

Transportation to Kangting, 150 road miles, is mainly by human porter, although pack mules and two-wheeled carts drawn by three horses or mules carry large loads (page 726).

For the return trip from Kangting they pick up wool, medicinal herbs, hides, and furs.

Quartered with Dr. and Mrs. Clarence Vickert, of the China Inland Mission, we thoroughly enjoyed their descriptions of trips



Carts Are Scarce, Human Backs Plentiful, in Yaan

Here a coolie pauses with a heavy load of coal to glance at news bulletins posted on the wall. The author observed that this coal, found near Yaan, is a good grade of anthracite.

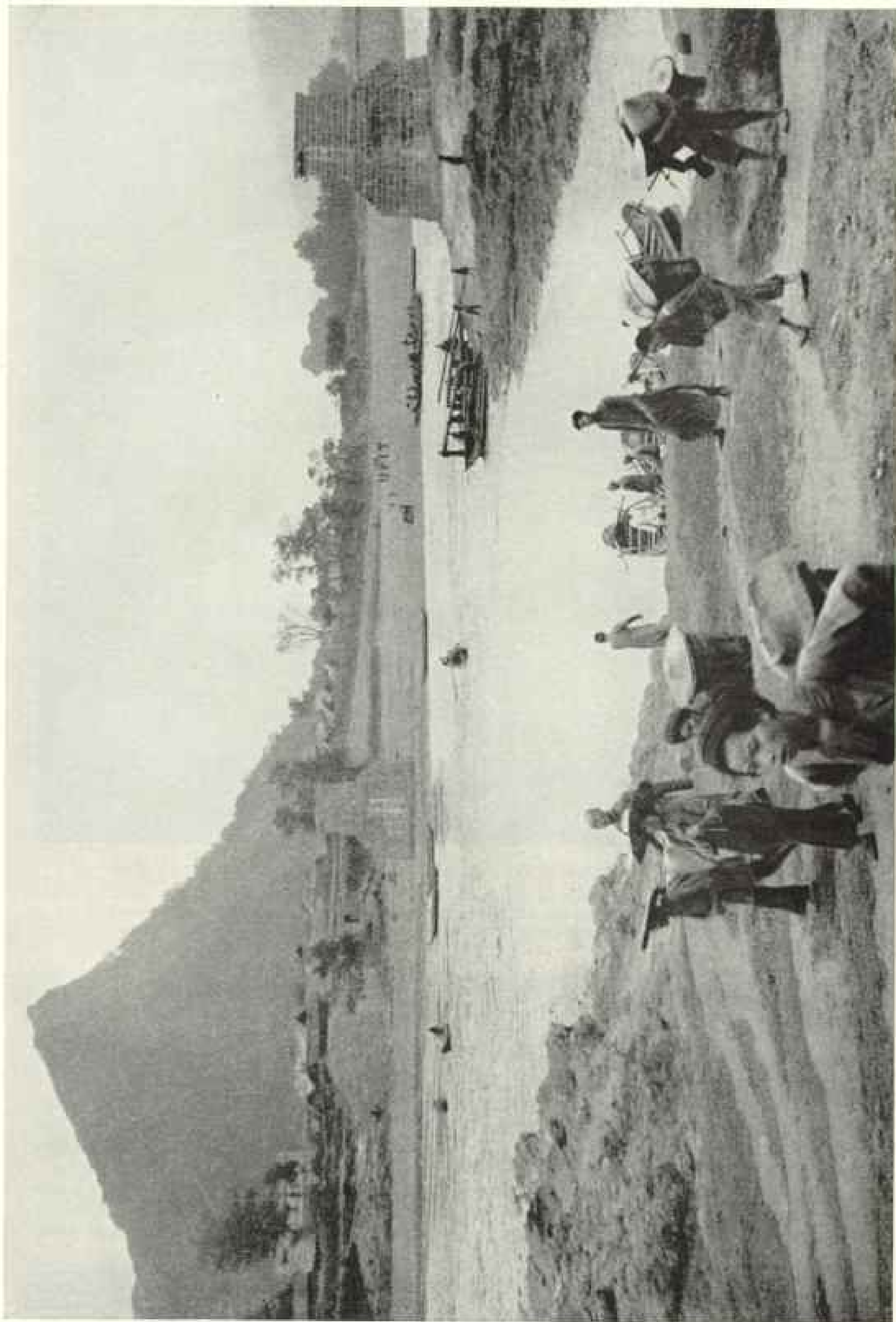
to Kangting and of one to Minya Konka, the 24,900-foot-high snow mountain just south of Kangting.*

Wanted: A Pressure Cooker

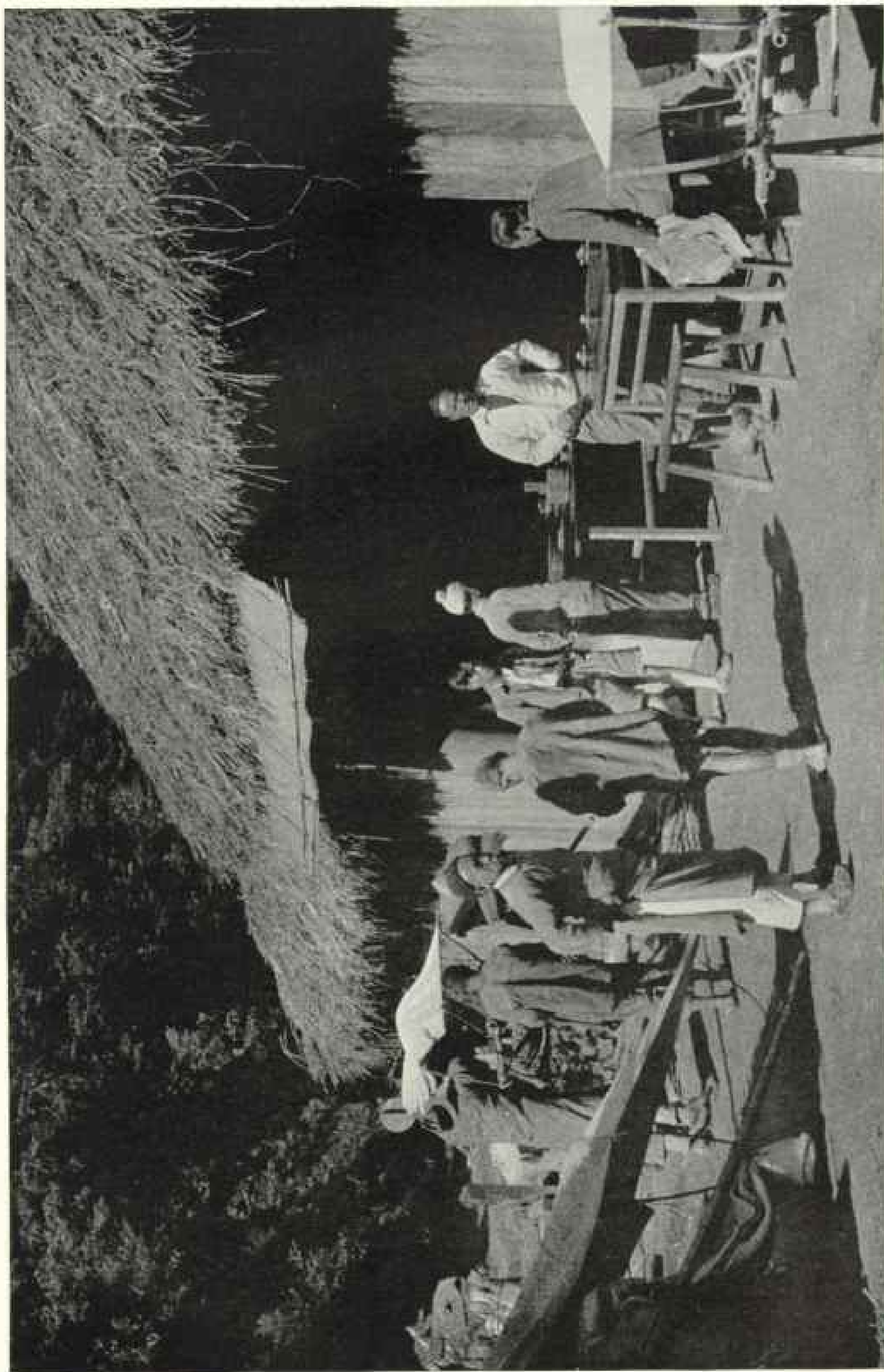
"A pressure cooker for your rice if you don't intend living on *tsamba!*" they warned (page 741). Not one of us had thought of this equipment, necessary to prepare meals efficiently at elevations of 12,000 to 16,000 feet.

We were entertained at one dinner in Yaan attended by several young Chinese engineers who are hewing well-constructed roads from

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Glories of the Minya Konka," by Joseph F. Rock, October, 1930, and "Climbing Mighty Minya Konka," by Richard L. Burdsall and Terris Moore, May, 1943.

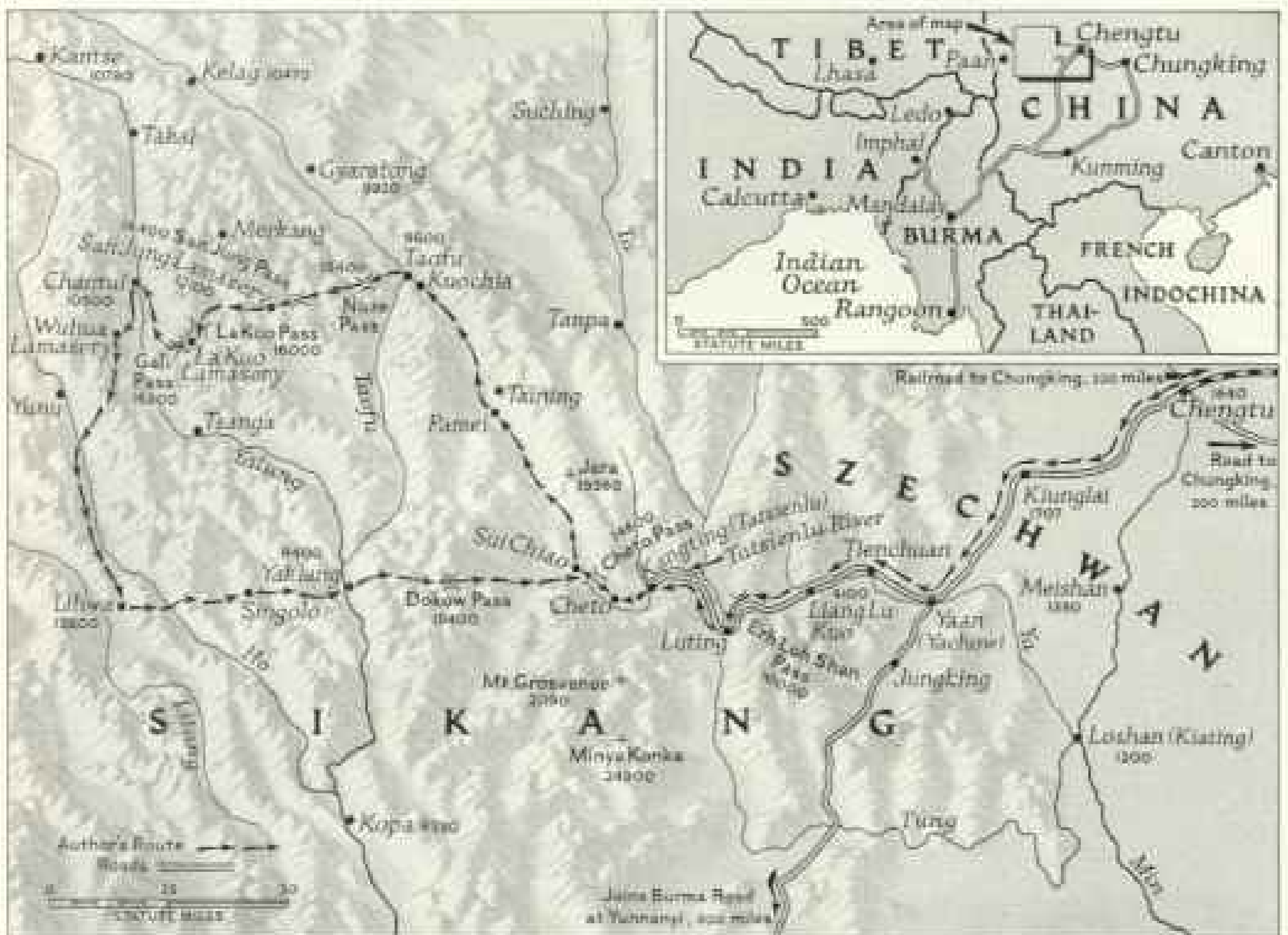


Bare Hands Built These Buttresses for a New Bridge across the Ya River. Chinese Engineers Undertake Such "Impossible" Tasks



Weary Travelers on the Steep Erb Loh Shan Highway Pause for a Cheering Cup at a Roadside Teahouse

The road leads to Kangting, trade terminal for Chinese and Tibetan merchants. Many high hillsides along the way had been burned over to enrich lower lands with ash fertilizer and to wipe out coarse grass and underbrush, hiding places of dangerous tigers and leopards (page 710-1).



Record of an 800-Mile Horseback Trek over Sikang's Mountain Grasslands

From Chengtu to Yaan, the author and his party made the first stage of their journey by bus. Next lap, to Kangting, was by 1½-ton truck. From there on, around a vast circuit punctuated with snow-covered peaks and passes more than 16,000 feet high, motors gave way to horses.

the solid rock of these mountains. Here men's hands displace the now unobtainable heavy road machinery and the gasoline to operate it. These young men say, "It can and will be done," even when told, "It is impossible."

Another quiet affair was at the home of Commissioner of Reconstruction Liu, a refugee from war-torn Anhwei Province. Paper mills, road building, alcohol plants, irrigation improvement—all fall in his field. Quietly and efficiently he is utilizing young men who have engineering training from both Chinese and foreign universities. He had taken his engineering at the University of Edinburgh.

The Commissioner told me enthusiastically of his work as his friendly Scotland-born wife served us shortbread made with yak butter from farther west.

When we left Yaan, our one-and-a-half-ton truck, a relic of Burma Road days,* was loaded with rice for upcountry, and ample gasoline for the round trip was aboard.

* See "Burma Road, Back Door to China," by Frank Outram and G. E. Fane, NATIONAL GEOGRAPHIC MAGAZINE, November, 1940.

Our young driver predicted we would have trouble ferrying the river ahead; the rains were making high water. Soon we pulled onto the ferry approach. The flat-bottomed boat was tied in place. But where were the ferrymen?

Ferrymen Gone to See a Play

Farmers on the hill above shouted to us. The ferrymen had gone to the village to see a drama!

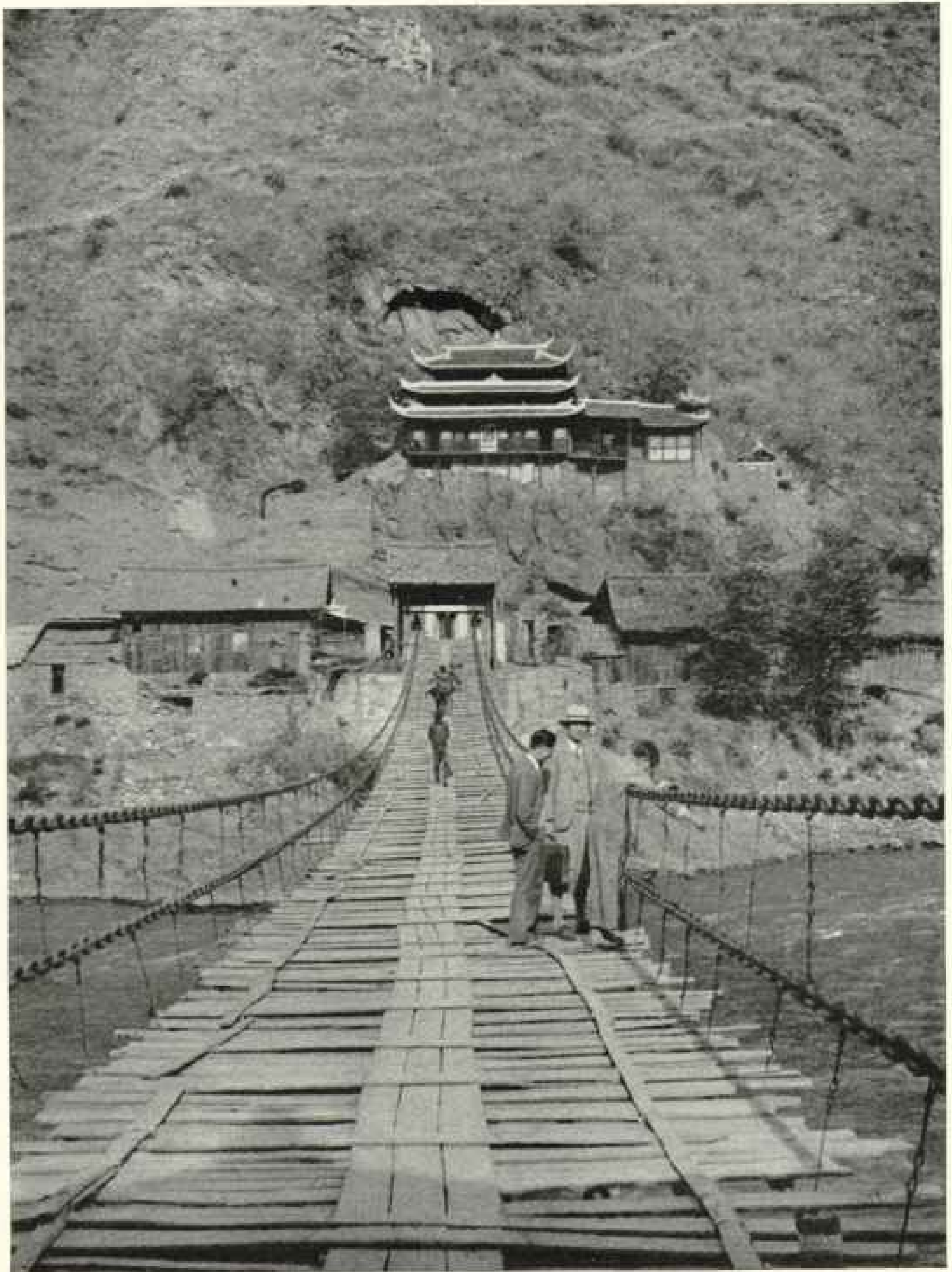
We rearranged our load cover for better rain protection and then looked west where our road led over the mountains. The virgin timber had been cut or burned years ago, but we could not see far. The mountaintops extended into the clouds.

"They come—the ferrymen!"

The cry came soon after we had sent out searchers. We caught a slight eddy on the opposite side in crossing and soon were on our way to Tienchuan.

There the magistrate, advised by telephone of our coming, awaited us. These magistrates, head of local political districts (*hsien*)

Drawn by Irvin E. Allerton



Long-time Link between the Chinese and Tibetans—Luting's Chain Suspension Bridge

The lamasery across the Tung River, first one encountered by the author, has a Chinese roof. Here the travelers enjoyed roasted walnuts in molasses syrup. English-type walnuts grow in profusion and, even when shelled, are cheaper here than peanuts (page 713). Mule caravans, laden with Tibetan tea, cross this bridge.



With His Rifle, the Tibetan Guard Carries a Two-pronged Gun Rest

The author learned its value when he tried to hunt at 14,000 feet. Twenty feet of slow walking uphill takes a man's breath. More strenuous exertion makes his head whirl, and his aim becomes inaccurate (page 734). The bipod rest helps keep the barrel steady. On his left hip the guard carries his Buddha box, containing articles of religious worship.

similar to counties in America, are responsible to national and provincial government heads.

Tienchuan is located in a small basin cradled under the shoulder of the first of the high mountains. It serves as the main market place for the well-to-do farmers near by. The last of the rice fields are here. Corn grows on low hills.

Last of the Water Buffalo

This basin is the second greatest tea-producing spot of the Sikang country. Potatoes, a staple crop of the mountaineer, are plentiful and appear to be disease-free. Here were the last of the water buffalo, and we began to see work cattle raised for sale.

We planned to stop that night at the tea company warehouse at Liang Lu Kuo. Travel was upgrade through a narrow valley amid steep hillsides and knifelike ridges all covered by dense broadleaf vegetation.

Occasional "farms" broke the green pat-

tern of the low scrub of these deforested lower mountains—farms that had come into being because of burning this scrub growth.

Buckwheat is seeded in the ashes. Beans, potatoes, or corn are planted the following season. Then Mother Nature retakes her own. The steep hillside has become too badly eroded to plant, or brush and weeds have taken back the land after two years of cropping.

The farmer then moves over to another hillside and starts on a new piece of land that also has a 60- to 80-degree slope.

The exhausted farm land becomes the roaming ground for the small deer, wolves, and occasional leopards which live in the brush. In ten years another farmer can reburn it. This long rotation process continues until no soil remains on the rock.

Liang Lu Kuo, a roadside village of 300 families, is squeezed between the river and highway in the narrow valley at 4,100-foot elevation. Shops, hostels, and resthouses for



Luting's Bespectacled Mayor Entertained the Visiting Agriculturists

In this remote area automobiles were a curiosity. Here villagers climbed all over the party's truck, inspecting it minutely. Along the roads terrified horses, mules, and children ran away at its approach.

the tea carriers comprise the business of the village.

Tigers and leopards recently had killed off most of the goat flocks. A leopard had killed a tea carrier the previous week. Perhaps these incidents accounted for the reluctance of servants to bring baggage from our truck after dark.

Drought Broken: Meat Slaughter Begins

Villagers were in jubilant mood. It continued to rain heavily. "The drought is broken. We can again slaughter for meat," they said.

In this area it is tabu to slaughter when you pray for rain. I wished their prayers had not been answered so violently. Too much rain is not bracing for the nerves when one is piloted in fast turns around hairpin curves carved out of sheer overhanging rock walls, high above the torrential creeks.

Breakfast next morning did not include eggs. Leprosy is prevalent throughout this

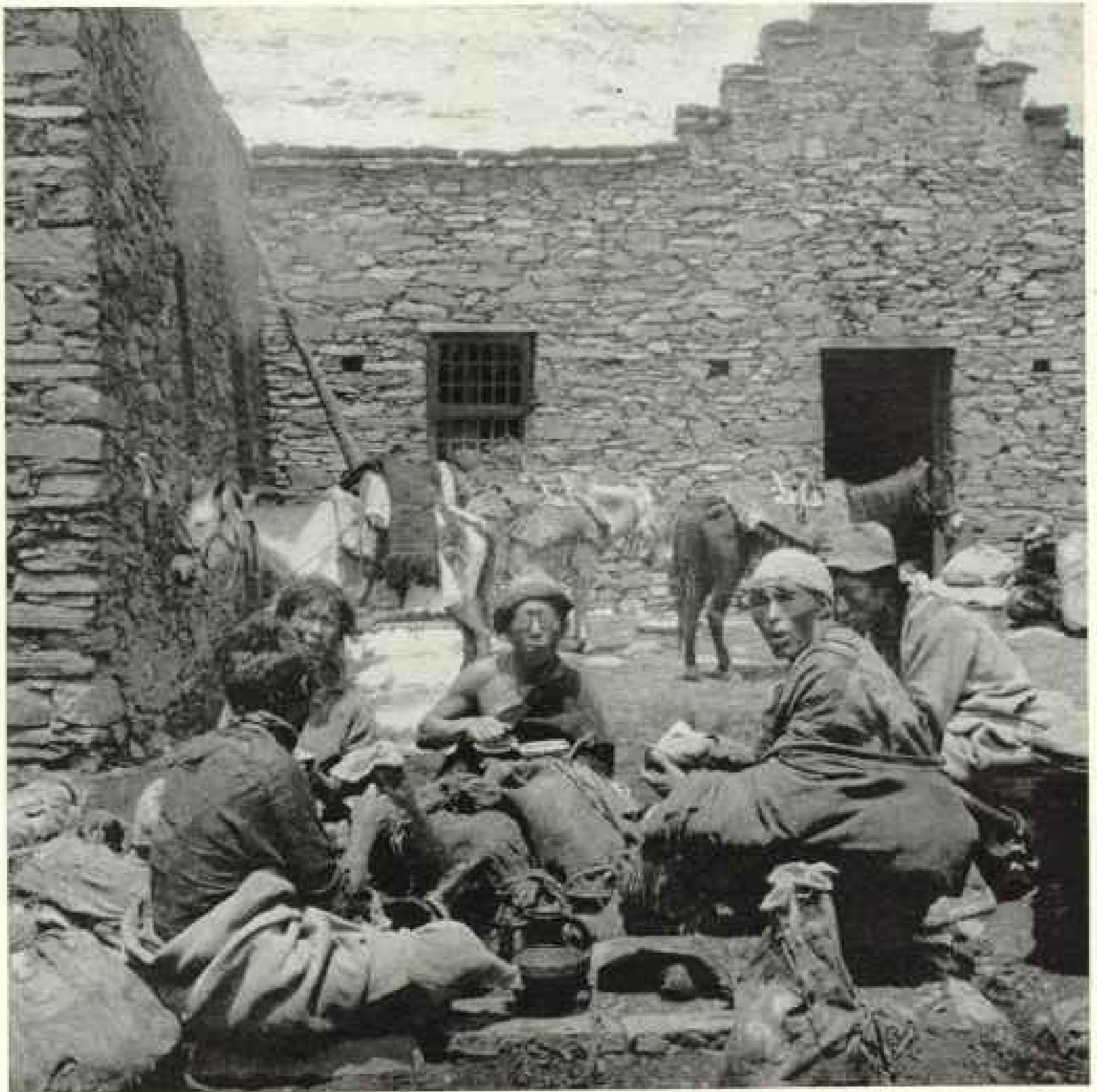
mountain district, and the belief is that eating eggs spreads the disease.

A beautiful outlook lay before us as we climbed the sides of the valley and on to the canyon heads. It had seemed to me that Chinese artists must tax their imaginations in drawing their startling pictures of overhanging cliffs, ridges barely wide enough to walk on the crest, and trees that actually grew out of the side of perpendicular walls of the canyon.

The answer was here. It is real.

Roadside plants include many garden sorts that are expensive at home—Buddleia, Pyracantha, kudzu, rare scented climbing roses, anemone, St. Johnswort, and small orchid-like iris. Plant explorers first found our popular regal lily here.

We had lunch on top of the Erh Loh Shan Pass, having climbed 4,900 feet in traveling only 22 miles. The morning's travel had taken us from the burned hillsides into broad-leaf timber, dense and tangled. This was a rain forest.



Woola Men at Sui Chiao Eat an Early Dinner of Tsamba and Buttered Tea

Woola is a tax system whereby Tibetans must supply saddle animals to the Government a certain number of days each year at a fixed price. Only by drawing on such a supply of mounts could the author's party travel (page 731). *Tsamba*, parched and ground barley, mixed with tea to a hard dough consistency, is a staple food of Tibet (page 741).

Toward the top of the mountain were scattered conifers. These were in groves as we came closer to the canyon heads. Here was the first of a brilliant series of displays of rhododendrons, mostly giants compared with the average North American specimens. Occasionally one was 18 to 20 feet tall and 10 to 12 inches in diameter at the base.

Then came an abrupt change in Nature's pattern. Out of a rain forest, heavy and dense, into the sparse scrub covering on a wind-swept pass we looked sharply down into a brown, nearly treeless, semiarid canyon.

Close to the top was a sloping bench of

several thousand acres. Old fire-scarred tree snags indicated comparatively recent forest, destroyed by man. Low-growing scrub, largely of tiny bamboo, now occupied the land.

Tightly crowding the wind-swept mountainsides for weather protection were a couple of small resthouse villages for porters and muleteers who handle freight to and from Kangting (page 717).

We "switchbacked" our way down the mountain to the town of Luting (page 721). Around there we found semidesert plants. Entirely surrounded by high, heavy-rainfall country, this narrow valley seldom experiences



Kangting's Women Porters Carry Heavy Bales of Wool over Two Miles of Rugged Trails to the Highway

First washed and dried, the wool then is baled and wrapped in ramie-fiber sacking at the Kangting scouring plant (page 730). Wheeled carts cannot reach the plant, so human porters must go to them. The carts then trundle the wool to the distributing center of Yaan.

severe storms. Tall cactus is everywhere; bunch grasses replace the sod-forming grasses of areas of greater rainfall.

Roasted Walnut Kernels with Molasses

Ancient walnut trees grow well up on the valley sides or under irrigation near the valley floor. Shelled English-type walnuts were cheaper than peanuts.

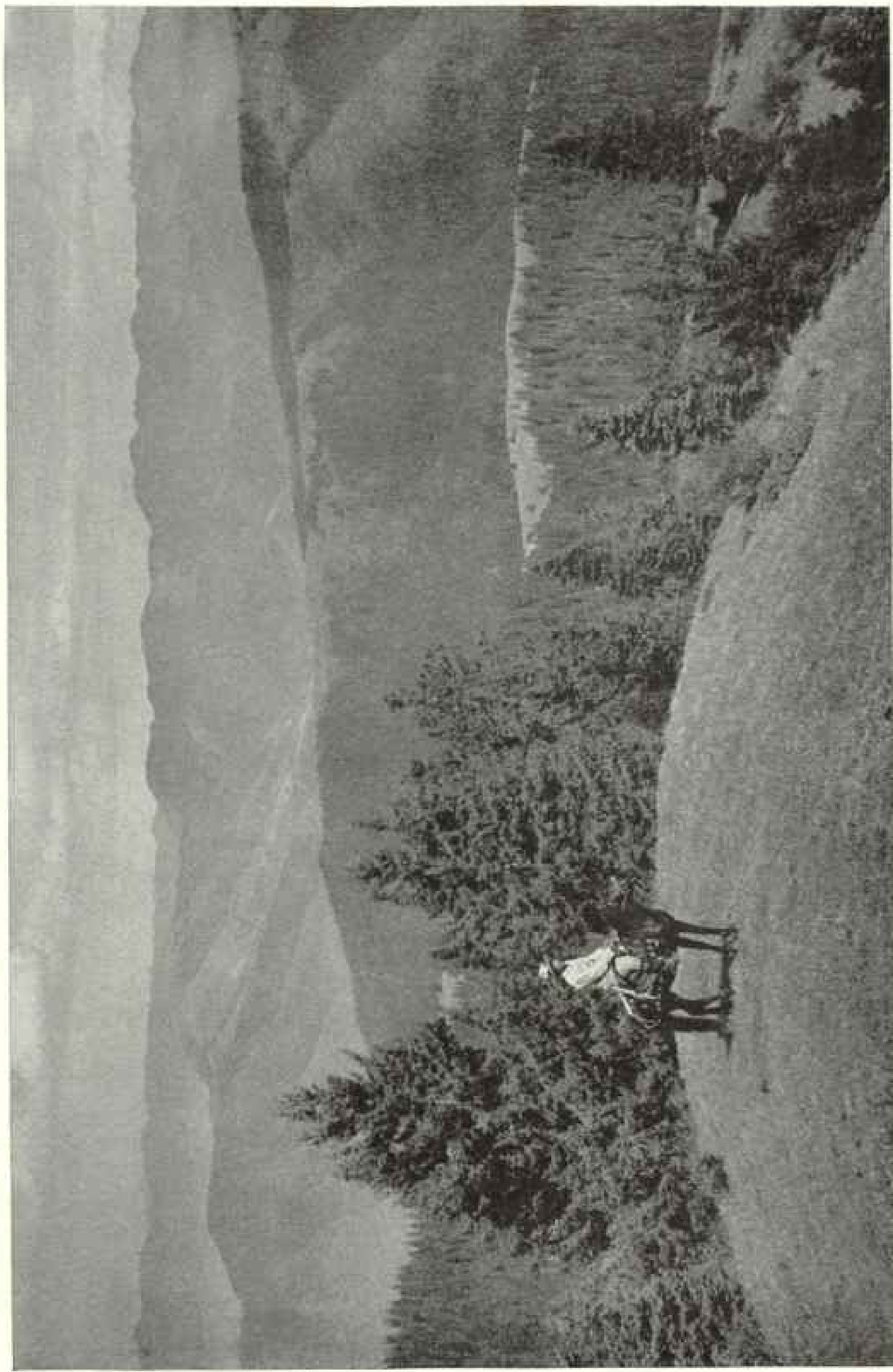
Walnut oil is cheaper than rapeseed oil, since the latter can be used for the oil lamps. We all enjoyed the cheapest dish on the table, roasted walnut kernels with molasses syrup.

One of the oldest chain suspension bridges

in West China crosses the Tung River at this place. Here we first saw Tibetans.

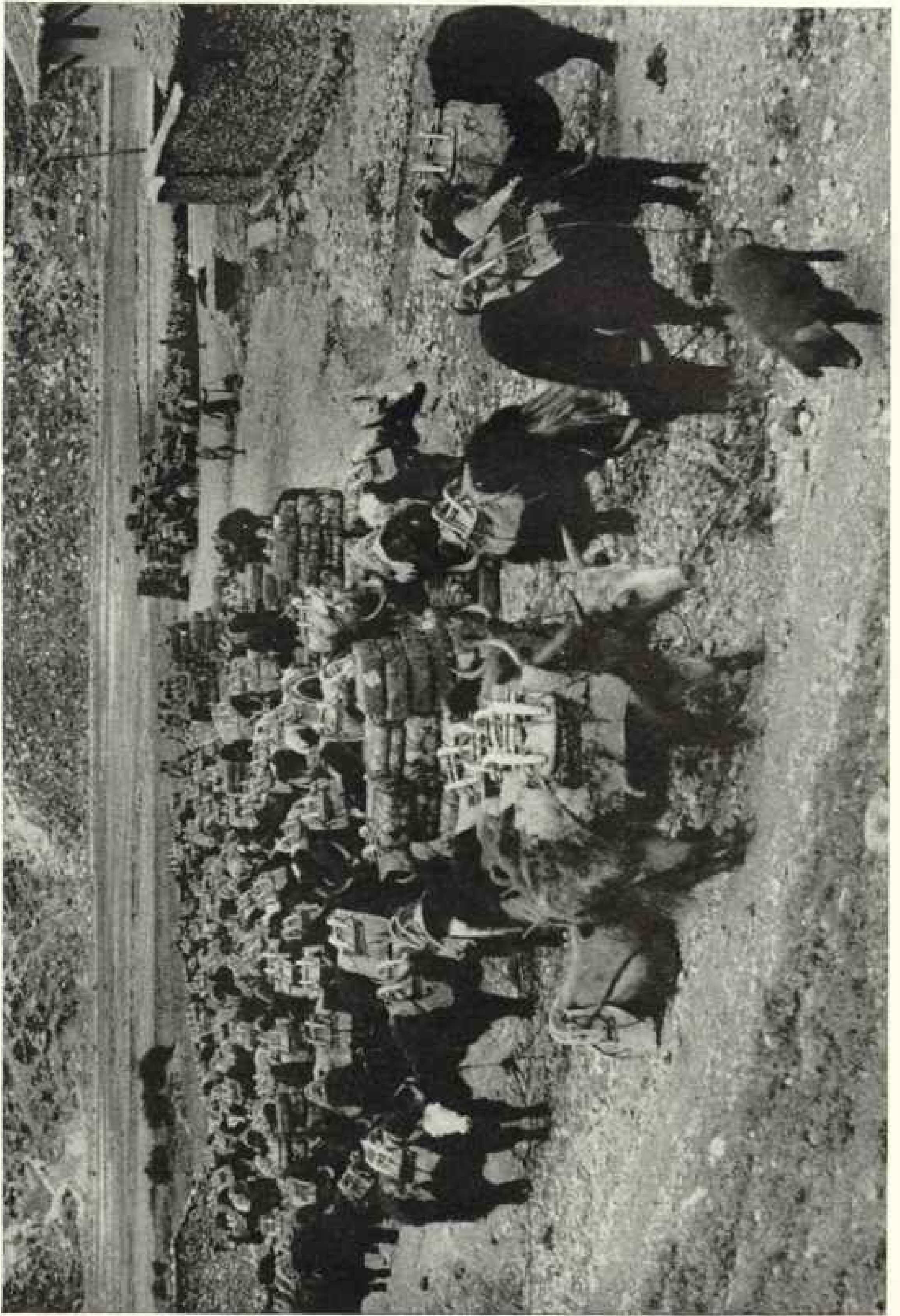
Just across the bridge on the west was the first lamasery, but it had a Chinese roof (page 719). We saw our first Tibetan caravan of mules outbound for loads of tea. The three muleteers were huddled together boiling red tea over a dispirited fire fanned by the goatleg-skin bellows all Tibetans carry.

Automobiles are still new to this valley, as indicated by runaway mules and horses, terrified children stampeding from the road, and by the immediate suspension of all farm work as we passed by.



In the Heart of the High Grasslands—Alpine Grass and Timber Country of Sikkang Province

Astride his mount in foreground is Nam Ka Soong, the author's indispensable guide. Tibetan-born, he learned Chinese as a boy, then spent seven years in England. Nam Ka's familiarity with the Tibetan system of taxes and levies enabled him to solve many unexpected travel problems. (page 731).



A Tibetan Yak Caravan Reaches Kangring, Gateway to the Grasslands, with a Cargo of Wool, Butter, Herbs, Hides, and Fur



He Will Carry This 220-pound Load of Tea 150 Miles

To a packing house in Yaan, farmers deliver the leaves and twigs (page 715). They are dried, graded, steamed, and pressed into wicker-bound bricks. Each bundle weighs about 20 pounds. This tea carrier has 11 bundles in his consignment, with which he plods over the trail to Kangting.

Farming, to feed the population of Kangting, about 45 miles upriver, is the main business. High on the valley sides farmers still burn over the hillsides to get the benefit of ash fertilizer on lands below, to kill coarse grass and underbrush, and to destroy the hiding places of tigers and leopards. We saw evidence of another leopard man-killer on the top of Erh Loh Shan Pass. Farm land was the steepest we had yet seen under the plow.

Cultural operations are on the contour, as the ox or mule used for draft cannot go up and downhill on most of these farm plots of one to five acres. Serious erosion, often in the form of deep gullying, was the rule and abandoned farm lands were common.

We crossed the 300-foot bridge to visit the stables on the other side. The 20 tiny mules of the Tibetan mule train were tethered by front legs to a hair picket line outside the stable. Inside the stable were 36 Chinese pack animals which were carrying loads of herbs downriver. Each mule had a load of 220 pounds.

Chinese packsaddles, made to stay in place without a cinch, are easy for the man handling the animals, but are so rigidly built that they are tough on the animal. Tibetan packsaddles are similar to those in western United States.

We saw many people of the Lolo tribes around the market place. These little-known and primitive people, recognizing no outside rule, live in near-by mountain regions. They do not tolerate intruders in their home villages; yet they did not appear the ferocious man-killers that we heard they were.

They mingled with the farmers who were

selling the last of the season's apricots and the first of the peaches. These we did not greatly enjoy. They never become ripe. The fruit is picked at the first sign of color, and local purchasers seem to enjoy the hard, tart flesh of a "gourd green" peach.

On the Way to "Lama Land"

Leaving Luting and crossing by ferry the next morning, we were soon ascending the valley floor toward Kangting. Vegetation quickly changed from the xerophytic bunch grasses and the cactus to groves of soft-shelled walnuts and thickets of *Buddleia*, *Pyracantha*, azalea, and clematis.

We were reaching "Lama Land." The men,



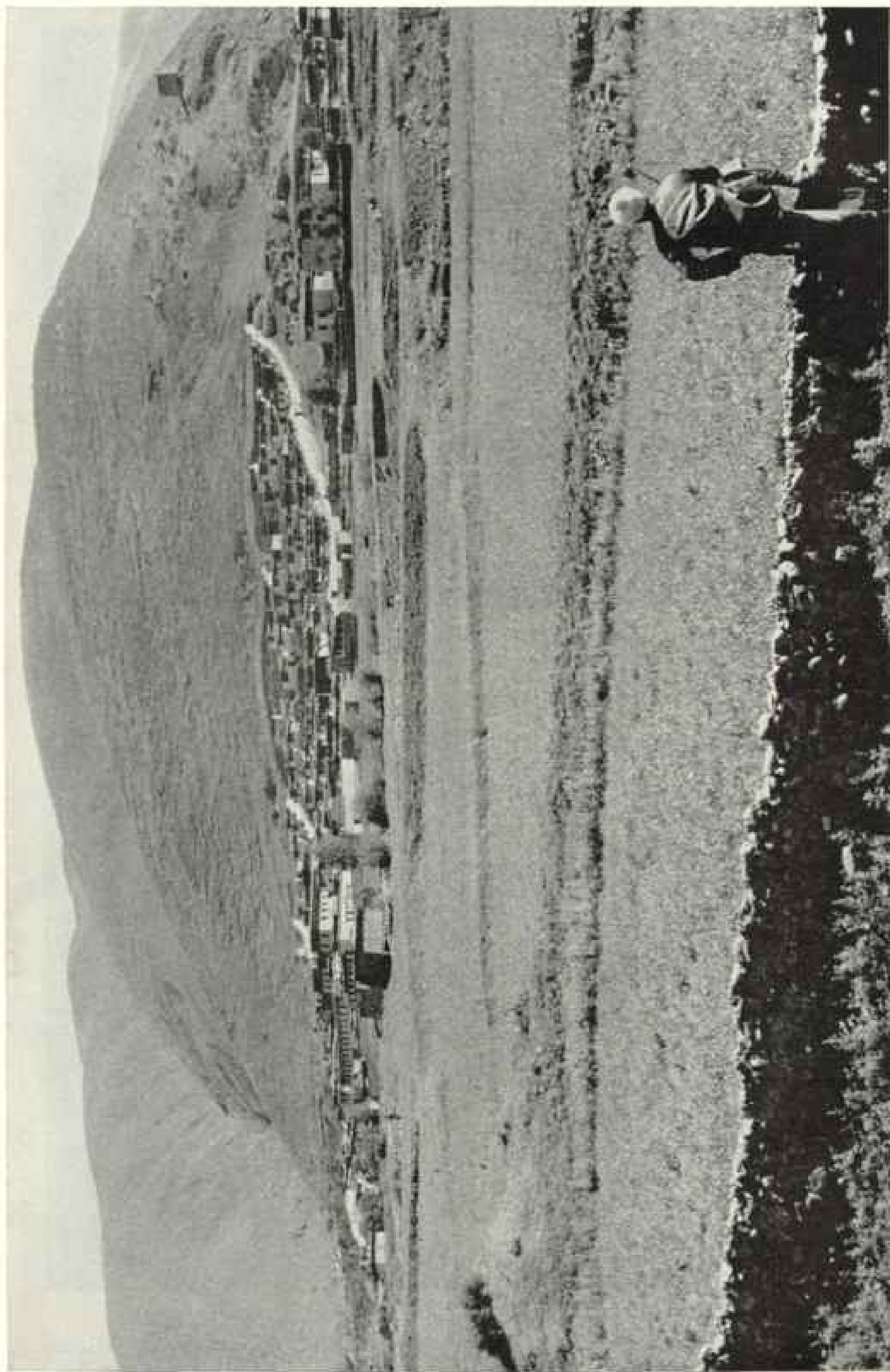
With Babies, Bag, and Baggage, Two Tibetan Women Join the Author's Party

The children are tightly strapped to their mothers' backs. The women are widows of two Chinese soldiers who had recently been killed in skirmishes to the north of Chantui. They traveled with the agriculturists from near Chantui to Lihwa.



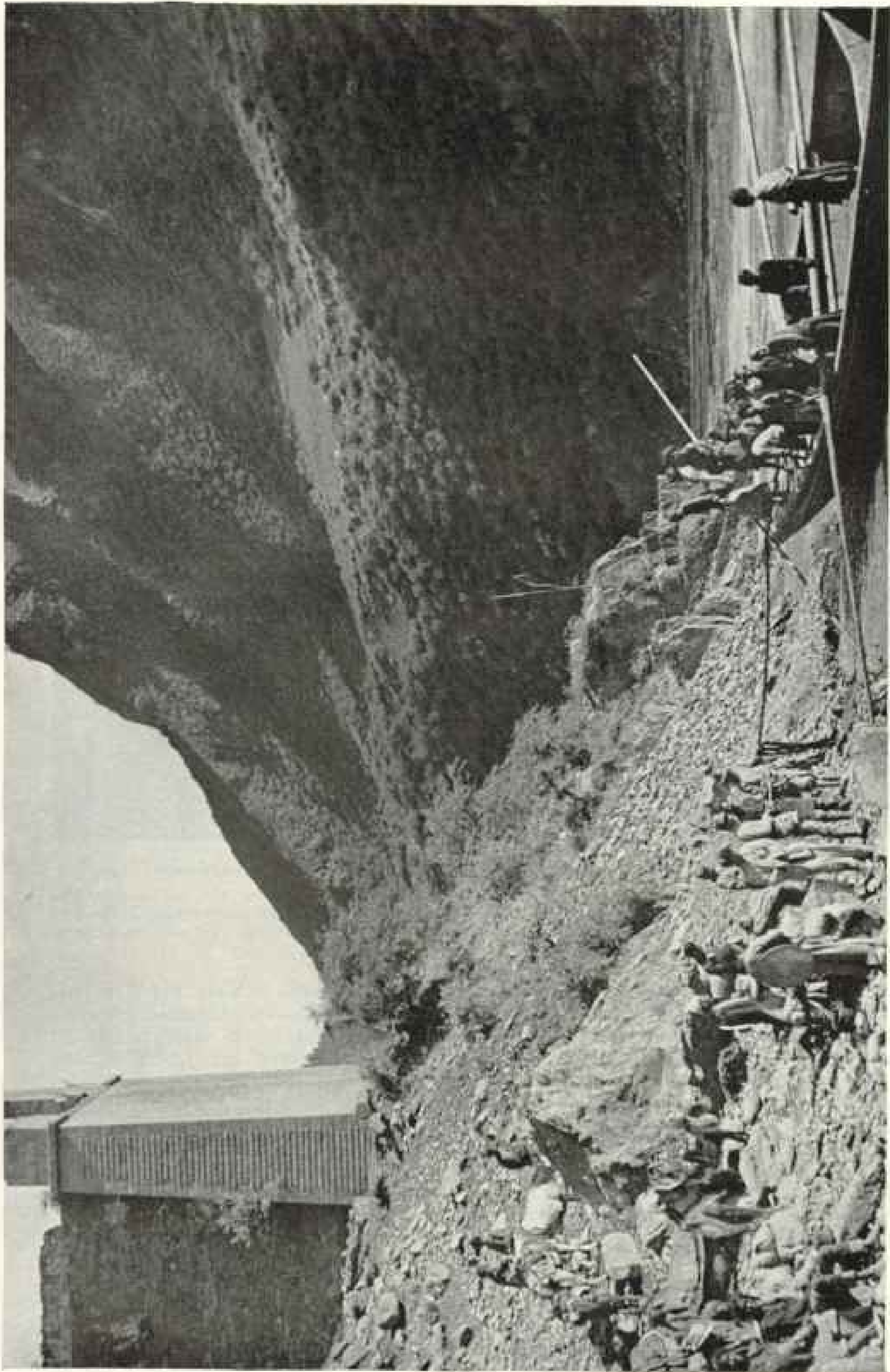
Tibet's Yaks Are Cousins of the American Bison

The young cow and her calf are quality specimens. The yak is used chiefly for transport, but also gives some milk. Its hair goes into tent and rope manufacture (pages 731, 735).



Taofu's Lamasery Dwarfs Taofu Town, Huddled outside the Temple Walls at Right

Two hundred families live in the town; 3,700 lamas dwell in the lamasery. Women till the fields in foreground to supply the lamas with food. When the author interviewed a prospective laundrywoman here, he found her price for washing a pair of socks was \$4 a sock; so he washed his own (page 237).



War-torn China Hasn't Had Time to Replace the Bridge at Yakiang, Destroyed in Communist Fighting before the Japanese Invasion

All that remains is the pier. The ferry is about to take the author's party across the rushing Yalung River. Only span over this wild upper tributary of the Yangtze is the huge cantilever bridge at Chantui (pages 738, 742). This Sikiang Province landscape is reminiscent of Snake River terrain in parts of Idaho and Oregon.



Barley and Peas Grow at Winter Headquarters of a Wandering Grasslands Tribe

Elevation of this Tibetan settlement is about 10,000 feet. In spring, summer, and fall most of the tribe moves with the livestock to higher pasture areas. Yaks and sheep make up the principal flocks, but there also are horses, cattle, goats, and *pien-su*, the latter a cross between the yak cow and the Chinese yellow cattle bull. Timber skids scar the hillsides.

tall and graceful, with wind-bronzed faces, were fine specimens. All wore felt hats and felt boots. Their odor we soon recognized as partly that of rancid butter.

At noon we reached Kangting. We had set a record by coming through in two easy traveling days.

This little stone city, settled on both banks of the Tatsienlu River, is the true trade terminal between the Chinese and Tibetans. It is the provincial capital and most important trade center between Yaan and Lhasa, two months by caravan to the west.

Below Kangting a Tibetan is a foreigner; up the river ten miles, the true Chinese is a foreigner. In the city the two peoples are mingled. Kangting is the gateway to the grasslands.

We were quartered with Dr. and Mrs. Vinckel of the Seventh-Day Adventist Mission. Lunch was served by a colorful Tibetan woman. We admired her jet-black hair, braided with dark-red yarn; great silver earrings; bracelets set with coral and turquoise; and her large blue gown, as well as her cooking. Her clothes were as colorful as those of the Basques in holiday attire; I recalled the Jordan Valley community of Basques, east of Steens Mountain in Oregon.

At Kangting we left the automobile and outfitted with saddle and pack animals. A string of 24 head was obtained for the start of the trip—750 to 800 miles by trail over some of the world's highest mountain passes.

For members of the official party there were small Tibetan horses that showed signs of

passing through a near-starvation winter. But they proved tough and wiry, and good climbers at high elevations. The pack animals were those left after the more likely had been picked for the saddles.

A Versatile Guide

Helpful provincial-government officials assisted us in obtaining a guide and interpreter. Nam Ka Soong, a true Tibetan, was born in the grasslands region (page 724). In Kangting as a boy he learned Chinese. His sister married a British consul, after which Nam Ka had seven years in England where he learned English.

Although he slept with me in my tent on his fine Lhasa rugs, in early morning he was out with the *woola* men getting saddle stock ready to travel. He could speak three languages and write two, and had guided several exploring parties, but he retained native beliefs and customs. He muttered his prayers: *Om mani padme hum*. His Buddha box was with him always.

His very pretty wife had persuaded him to stop hunting to prevent the gods from harming their child, but he backslid on this trip. He really believed that a bullet hitting a rock caused the gun to kick, and that small plants were suckled by larger plants.

Nam Ka was perhaps the best break of the entire trip, especially since we had to travel by *woola* (page 722). *Woola* is a tax system. Each Tibetan is required to furnish a designated number of saddle animals a stated number of days a year to the Government service at a fixed price.

The nomads do not like any tax, and the farther out from centers of government the greater the resentment. Pack strings provided as tax payment are not likely to be the very best in size, condition, or temper.

Nam Ka understood the system. He nearly always managed to produce a full quota of good animals at each change, even when at first we were an animal or two short. One set of animals would perhaps be with us as long as three days. One day we changed twice. *Woola* proved to be something best handled by the initiated.

We were accompanied from Kangting by a guard of eight Chinese soldiers. The Government always furnished guards when we were in the vicinity of garrisons. Six to eight was the usual number. Farther out, Tibetans belonging to a volunteer guard were assigned by the community through which we were traveling, and the community next ahead was supposed to provide the relief for them.

These men were a happy lot, singing and

shouting as they played tricks on each other.

Impromptu horse races were staged on every level spot until the riders were satisfied as to whose horse was best, or until the horses were too tired to run. The men always went ahead and inspected high passes before permitting the party to approach. Both renegade Chinese and Tibetan bandits prey upon caravans which they believe are carrying guns, ammunition, gold, or other goods of high value and small volume.

Chinese guards each carried a blanket; Tibetans generally carried no extra bedding. At night they would curl up in their great coats of wool or sheepskin on their felt saddle blankets spread on the ground.

Yak Caravans Carry Mixed Cargoes

While we were waiting in Kangting, several yak-caravan trains came to the edge of town to unload packs of wool, medicinal herbs, deer horns, butter, hides, and furs (page 725). They would pull out for the return trips in early afternoon, loaded with tea and salt.

Yaks are long-horned cattle which grow wool, have a tail like a horse, and a hog's grunt instead of an orthodox cow bawl (pages 727 and 740). They make up in steadiness what they lack in speed, compared with horses. In soft, boggy country they can plod surely through spots where horses and mules do not like to venture.

After five days, on June 3, we were loading for a short shakedown stage to the foot of the Cheto Pass. Mr. C. C. Liang of the Sikang Provincial Experiment Station and one of his Tibetan horsemen had joined us.

Our trail soon left the valley floor and pointed up the north side of a mountain, now denuded of forest but overgrown heavily with low scrub. This mountain 75 years before had yielded the two-foot logs now in the lamaseries around Kangting.

I could recall large floral pieces, but never before had I seen a bouquet 2,000 feet high and a mile across. Upon rounding a turn under a high, steep outcrop, the outlook before us was the entire face of the opposite mountain densely covered with bloom.

There were rhododendrons in reds, pinks, roses, and whites; yellows and lavenders were splashed on by the smaller azaleas. Large single peonies filled spaces in the openings under the more open shrubs.

I would have felt that I was in a dream had it not been for the rattle of horses' feet on the rock-covered grade and the scolding of the Lady Amherst pheasants we continually, yet unsuccessfully, tried to see.

Our Tibetan caravan men took on arms at



To This Tibetan Highland "Cowboy" a NATIONAL GEOGRAPHIC Opens New Vistas

Snow-clad mountains have always limited his homeland horizons. From his neck are suspended prayer beads and charms. Sheepskin coat and sword mark him as a relatively wealthy man.

lunchtime in the small mountainside village of Cheto. They disappeared briefly and returned smiling, each with a gun strapped to his back. Kangting officials do not permit guns in or near town; so firearms were cached up here for safety.

We soon found that no man in this region considered worth his salt goes about without his rifle strapped to his back, even though the gun may be a hundred years old. Some seemed to be nearly that old. Others were up-to-the-minute.

"There Will Be Blind Men Tonight"

A "down" sleeping bag with saddle blankets underneath was welcome that night as we camped at 12,600 feet in a loosely constructed resthouse. Next morning the landscape was white and becoming whiter by the minute.

It took two hours to reach the top of the Cheto Pass, 14,600 feet high. Sixteen inches of snow and a glaring diffused light troubled

the lead man. Soon a horse walked off the grade into deeper snow. Then our lead man stopped. He could not see—snow blindness. Even men with glasses were having trouble.

"Mr. Johnson, we must camp early today. There will be blind men tonight." Nam Ka knew what to expect from the morning's experience, so we hurried on to make Sui Chiao to camp.

A Tibetan guard of honor, preceded by two men as a warning, met us shortly after noon. They were to guard us for two days. These men on the snow skyline reminded one of *Lost Horizon*.

Although it was only midafternoon and we were 30 li short of our intended stop, we had to camp at Sui Chiao. Eyes required rest. Our horses were worn from bucking the snow and from lack of feed. I was glad to get down and treat a face that seemed on fire!

Packs were removed by muleteers on the first—and very muddy—floor of the house, where animals are stabled. Then up the



Midget Sister of Guernseys and Jerseys Is This Tibetan Milk Cow

The tiny animal, eight years old, belongs to the La Kuo Lamasery. "She was typical of all we saw there, and of others farther south at Yakiang," writes the author. "She could not have weighed more than 450 pounds!"

notched pole ladder to the second floor to check preparation of the cooking fire, while some of us went on up to the third floor where we could arrange our beds on a part of the threshing floor and have fresh air, free from smoke. The local residents' sleeping quarters were on the second floor.

Now came the repair jobs: boric acid for eyes, aspirin for aches, and sunburn salve for faces and hands.

Word spread among the guards that medicine and white "doctors" were in. Soon we were besieged by patients with all the ailments, actual and imaginary, known to the region. Soda-mint tablets, varied with aspirin, or a touch of bitter quinine powder satisfied them temporarily.

Mastiffs Trained to Attack

Each Tibetan tent, or family, has one to four large mastiffs as guards. Tied to a wooden peg by a hair rope, they often pull

the peg, bite a rope into pieces, or even break it.

Trained and selected for generations for one purpose, to attack strange men, these dogs are ferocious. One charged Nam Ka, utterly disregarding his horse, and lunged to drag him from the saddle. Good luck, plus a well-aimed blow at the dog's head with the wooden-handled quirt, caused it to miss.

Then it made a run toward me. How it missed a 6-foot 4-inch man on an undersized horse 12 hands high is still a mystery.

Next day was a hard one on the men and we covered only five miles. Dr. Swen and our cook were so completely blind that their horses had to be led.

Real grasslands extended as far as the eye could reach. Everywhere the forage had been grazed close; no old feed was left. New grass was just starting. Although too early for closely detailed forage analysis, moss and unpalatable feed were prominent, indicating



This Guard's Mount Is a Stocky "Sining" Saddle Horse from Tsinghai Province

Only a few of these animals were seen by the author. They are deeper-bodied than Tibetan horses. The rider uses the Tibetan stirrup, much shorter than those favored by horsemen of the Western World.

continuous overgrazing. Dwarf rhododendron and willow reminded one of the low sage bushes of the Rocky Mountains.

The snow-capped mountains held us spellbound. The magnificent Minya Konka far to the south seemed fully matched in majesty by Jara 10 miles to our east.

Game was plentiful. Gazelles were frequently jumped close to the trail ahead. These small game animals have tiny goatlike horns and are similar in habits to our American antelope.

Nam Ka and I hunted while the party rested. We soon spotted a flock on top of a small ridge, not a mile away.

Riding up a sheltering draw to within 200

yards, a hurried 100-yard walk brought us out in full view where each had one shot. There were no hits, but a good lesson on hunting at 14,000-foot elevation resulted from our "greenhorning" this game.

A man gasping for breath can't shoot. Twenty feet of slow walking uphill at this elevation will wind him. A hundred yards covered in a hurry may result in extreme fatigue and vomiting. A whirling head means a whirling gun barrel. There is value in a Tibetan's two-pronged rest for guns in these high areas (page 720).

We were now in a livestock area. Cattle, yaks, horses, goats, sheep, and hogs grazed in every open meadow we passed. The cattle

were small and undernourished. Mature ones weighed less than 450 pounds at this season.

Yearlings looked like our poorest "skim milkers" at home. Everything indicated that the stories of spring starvation of livestock are true. It is late May or June before snows cease and grass starts to grow.

The horses, around 12 hands high, are rather coarse-headed, round-bodied, hog-backed ponies. On level ground they proved fast walkers, while on steep trails they moved surefootedly along at a steady, distance-consuming plod with few rests.

The sheep are short-tailed and coarse-wooled. Both sexes have long spiraled horns which cause most people to confuse them with the many common hair goats which make up at least a third of every flock. This coarse wool, badly mixed with hollow medullated fibers, is too stiff and scratchy to make good cloth, but is a good carpet wool.

The goats have little use except for milk, and for their hides when they die.

A Cousin of the American Bison

Yak, the characteristic animal of these grasslands, is used mainly for transport. It yields some milk. The hair is used for tent manufacture and for making ropes. This close cousin of the American bison is a hardy, cold-resisting animal suited to winter travel at high elevations and to summer travel through the wet meadowlands.

The long-nosed hogs, characterized by enormous ears, were essentially grazing animals. Chinese experts told me these swine have intestines several feet longer than those of American swine.

Wild peas, buttercups, a small violet, a yellow snow poppy in sheltered spots, and a single red peony were in bloom. Low azaleas showed lavender blooms. It was apparent that in another month this place would be a wonderland for the livestock man.

There are few fences. Low stone and brush fences protect most of the pea and barley patches in the lower elevations of the canyons, but grazing land and meadows are bounded by imaginary lines, all run out on a survey of metes and bounds. Small stone cairns mark ownership and warn "stay off."

All types of livestock are controlled entirely by herders. This is work for the 8- to 14-year-old boys and the women of all ages.

We spent three days visiting with nomads and in looking over the Sikang Livestock Experimental Farm at Pamei.

I enjoyed our questioning of one wealthy nomad family, because it was so evident that we were playing a game of question and evade.

Nam Ka told me later that we could get no facts because of the presence of officials and the old-time "cowboy" fear of taxes. That sounded like early days in western United States, when it was most undiplomatic to ask stockmen about the number of livestock they were running.

To a great extent, wealth is measured by numbers of animals: bank accounts are unknown. The wealthy will have a larger tent and more dogs. Their women will have more and bigger silver ornaments. There will be more camp followers, a resident lama, better guns, and, for good luck, the inevitable idiot.

No attempt is made to grow and store supplementary livestock feed for the time when temperatures drop to 14 degrees Fahrenheit or less, and sharp winds sweep down from the Gobi. Some straw is fed to the weak animals, with grain, plus straw, going to one or two saddle horses. All others must forage for themselves. Yet this is an area where temperatures do not go so low as in western United States.

Forage-growing conditions look more promising than in many well-established livestock areas in our West. Prospects are favorable for growing meadow hay on many of the more level lands by diverting the creeks for irrigation. With profitable markets these people can produce large quantities of surplus animal products so badly needed in China.

In this Pamei area the hills were covered with many kinds of wild legumes: alfalfa, wild peas, trefoils, and a type of wild vetch. A plant-production man could well afford to gather seed in this area.

Found—a Promising Plant

The Tibetans pointed out one legume in particular as being especially well liked by livestock. It grew 18 to 24 inches high when on soft grasslands.

We dug one out. Aboveground it appeared much like the annual trefoil found in western United States, but had a spreading underground root system—a perennial with 41 subcrowns. The subcrowns were spread across 110 centimeters of ground surface.

Here were all the characteristics of a pasture legume one hopes to find. Arrangements were made for cooperation in an exchange of seeds between China and the United States.

Traveling north from Pamei through the Taining region and Kuochia to Taofu, we went through a series of broad, open valleys flanked by round-topped hills. Grasslands are high up on these hills. Spruce, juniper, and rhododendrons grow in the draws below.



Jewels Worth a Million Chinese Dollars Grace Lihwa's Goddess of Love

Headpiece and face of the 45-foot idol are encrusted with gold (page 739). Turquoise, amber, and coral stud crown and neckpiece. The image is the principal object of devotion in the lamasery of this old Tibetan city, 13,800 feet above sea level. Here at Lihwa, trails from Yunnan, Kantse, Kangting, Paan, and Lhasa converge.

As we rode down off the 13,000- to 14,000-foot grasslands to the valley floor at Taofu (9,600 feet), we dropped rather abruptly through alpine forests of spruce and then fir. At the last, oak took over the hillsides, as the general slope of the country eased off to hit the main valley where Taofu is located.

In the oak belt we again marveled at the shrubbery and low trees: spiraeas, gooseberry, wild cherry, wild crabapple, currant, rose, pink lilac, hawthorn, apricot, and peach.

Rhododendrons were bursting into bloom under the conifers on the side hills where snow persists in winter.

Winter is the dry season when travelers and new settlers often burn off the countryside for heat, to create ash for fertilizer or to clear land for farming. South slopes exposed to the sunshine and wind become dry. The fire destroys the conifer-rhododendron combination. North slopes remain snow-covered and are more moist. Here Nature protects the conifers until man's ax moves in.

Cultivated land lies along creek beds and in bottoms. It yields seven to eight times the seed sown, but can be used almost indefinitely. Erosion is not much of a problem and Chinese tillage methods can be used.

Homesteading is possible in this area. A man can take up all the land he can seed and use it for three years tax-free.

One is struck by the forethought and courage Generalissimo Chiang Kai-shek is showing in his orders to cease burning forests. Forestry and land conservation comprise a major part of the program for development.

Taofu is a Chinese town squatted down against the wall of a large lamasery in the valley of the Taofu River (page 728). All around are Tibetans—some farmers and many nomadic or seminomadic "tent people," as they call themselves. This is the town of second size on the road from Kangting to Kantse. Two hundred families live in the town, while 3,700 lamas live in the lamasery.

Making Money in the Wash Tub

Town officials made us comfortable at the Catholic Mission compound. We tried to get a woman to wash our clothes while in Taofu, but the magistrate could find no Tibetan women who knew how to wash white clothes! At last we found one who would try at \$4 per piece, counting a pair of socks as two pieces. I made money with my own hands in the wash tub that afternoon.

Here we turned due west across a series of high passes to the Yalung River at Chantui. The next five days took us over the most remote part of our entire journey. At Taofu

we left the established trade route for a little-used track through a nomad-inhabited mountain-meadow and high-ridge country. Few if any white men had traveled here before.

On the slopes rising from the valley, vegetation was profuse. For the agronomist there were prostrate alfalfas, a true sweet clover, spreading rooted trefoil-like plants, strange astragali, a promising vetch, two different needle grasses, and a sod-forming wheat grass.

For the botanist there was a low red trumpet flower one sees all over the country, a flower that demands attention as you pass. There were also columbine without spurs, astilbes of blue and brown, violets, ranunculi, primroses, pink peonies, tree peonies all podded out, spiraeas, a bell-shaped clematis, and roses—whites, blues, pinks, and reds in riotous array.

A Scene Reminiscent of Montana

After lunch on a hillside overlooking a mixed timber and open-grass Montana mountain scene, we climbed on up to cross the Nuze Pass, elevation 15,400 feet. Timber is in the draws here, mainly spruce, oak, and birch. Grass is on the slopes on the south and west, extending up and over the top.

As we left the timber going up, we again saw huge thickets of large and small rhododendron, all in best display, and for the first time what appeared to be a daphne in bloom. Daphne stayed with us to the summit and down the opposite side. My plants at home are going to experience a new site or two, for they thrive in the rough in this high country.

Once down the mountain on a meadow beside a stream that should have fish in it, tents were put up ahead of a thundershower. We were late in selecting our camp because of lack of nomad tents or settlements. We already had some evidence that our guards did not wear guns only for decoration.

Woola men and guards stirred restlessly all night as they attempted to rest while dodging the rain and a changing smoke drift from a wet fire. The men awakened us early as they began talking to and about the saddle stock. Our horses that looked good yesterday were not taking any prizes today. They were wet, humped up, cranky, and hungry.

Our escort told us that attaining the next pass would unfold magnificent sights. The morning approach was through mountain meadows and grassland parks in a country almost untouched by the ax. We saw more livestock than on any day before. We were in a summer grazing area where snow must pile deep in winter, according to Nature's snow gauge of moss on the tree trunks.

At midday we were visiting a nomad camp at 14,500 feet, starting point of the real climb for the top. Two Tibetan women came furtively upcreek to look me over. Nervously they stood still for one picture to be taken, then ran away. These girls had never before seen a village, a camera, or a white man.

Up the creek a woman and naked child appeared. The woman gathered yak manure from the bed ground of the night before, handling it with her bare hands to pile it up and dry it for fire.

Now came the San Jung Pass, at 16,400 feet. Our aneroid would go to 5,000 meters, and this hill stretched its capacity to the utmost. Grass extended all the way to the top, broken, of course, by more rock patches than heretofore. The last 300 feet of the trail is a 4-foot-wide rock chute which was difficult for the animals with the wide packs, especially when done on extra-empty stomachs.

As our first men broke over the top, they saw a band of blue sheep. After a pause to enjoy the sight, we dropped down through scrub rhododendron and prostrate juniper to the San Jung Lamasery for the night—elevation 12,100 feet.

THE GEOGRAPHIC Arouses Wonder

We camped in the center of the compound. What a group of poor, dirty, ragged, inquisitive, pathetically beggarish boys were here! They were young, 11 to 17 years old mainly. They stared at me.

At last I distracted attention by producing three copies of the NATIONAL GEOGRAPHIC. Photographs serve as an international language, even if print is unfamiliar. The head teacher of these young lamas tubed his hands and looked at the page through them. Each of the boys tried it, and some used this means of looking as long as they had the magazines (pages 732 and 741).

This night we went to sleep to the slow, low chant of the lamas all around us. There rose the low *burrup* of the horn and the hollow drum rolls.

Game was plentiful. *Ma ck'i* (horse chicken), or Tibetan eared pheasants, were everywhere, and I managed to get a close shot at a male musk deer. Good luck and a short range added about 30 pounds of meat to our larder. This small Asiatic deer has no horns or antlers. Its only means of protection is a pair of 4- to 6-inch caninelike tusks. The males have scent glands which are dried and sold to perfumers of the outside world to be used as a base for expensive perfumes.

Three days were spent in this kind of coun-

try, during which we crossed two more passes, La Kuo at 16,000 feet, and Gali, 16,300 feet. Then we came out at Chantui on the Yalung River.

Gift Goods Make Up for Lack of Cash

This region is little traveled. National currency is not acceptable. The Tibetan rupee, metallic money, is the medium of exchange. Official rate of exchange in Chantui was \$10 national currency to one rupee, but we couldn't find a money-changer. Luckily we had a good supply of gift goods, and \$30 worth of needles, garlic, red yarn, and snuff took the place of \$90 in cash.

At Chantui one of the largest cantilever bridges in West China crosses the Yalung River. It is the only span across this wild upper tributary of the Yangtze in more than 200 miles.

Chantui is a Chinese garrison center mainly for protection of this bridge. Ruins of forts are on the ridge above the town, and ruins of the old garrison house stand near the present three-storied center of Chinese authority.

Surrounding hillsides, steep and scrub-covered, were grazed by underfed dwarf cattle, sheep, and goats, which were brought into town nightly.

We stayed here just long enough to procure new caravan animals and a change of guards, leaving for downriver the next afternoon.

The following day we left the canyon and headed west. We climbed 1,640 feet the first hour and by 11 o'clock were in grasslands and crags at an elevation of 16,300 feet. We dropped down to a nomad camp at noon for fresh milk, a fire, and hot water.

Our special group of 20 local horsemen continually studied the horizon. Trouble was brewing, and apparently we were a part of it or perhaps the cause of it. Shortly after noon we reached the crest of the pass (16,400 feet).

Descending, we entered a large valley of timber and grasslands in which barley and peas were growing in brush-enclosed fields along the bottom lands. Wuhua Lamasery was in this valley. It was a small lamasery turned over to us for the night.

The head man greeted us. All was in order, servants and fuel available. The main temple had been swept clean for our beds.

Our campfire was built under the porch roof, in front of the big temple door. While my bed was being set up, a lama burned incense of green juniper boughs before the grim-faced 15-foot idol with a beltful of human heads.

Next day we reached the highest and westernmost point of the trip. We estimated that



Tibetan Women Hand-pluck a Sheep before Shearing

Their ill-made shears cut so poorly that they must thin the coat first by pulling out all the loose wool. Even then, cutting is a difficult task.

we were something over 17,000-foot elevation after the aneroid reached its limit. Here we came to the edge of the grasslands, and rock took over.

The usual afternoon storm lashed at us. Hailstones ricocheted off our chins as we fought the strong-willed ponies to keep them pointed into the storm. By evening we were again in grasslands.

This is a magnificent grazing region but overgrazed, the grass eaten close to the ground. We saw no timber. The grass-covered, round-topped hills extended as far as one could see. Dwarf rhododendron, 18 inches high, was encroaching upon the grasslands as a weed on many of the hillsides. Nomads were gathering medicinal herbs from which elderly Chinese brew teas of rejuvenation. We camped at 15,400 feet in round-topped, rolling grasslands.

We spent three days above the timber line in grass of varying values, after which we traveled an old trail down to Lihwa, a

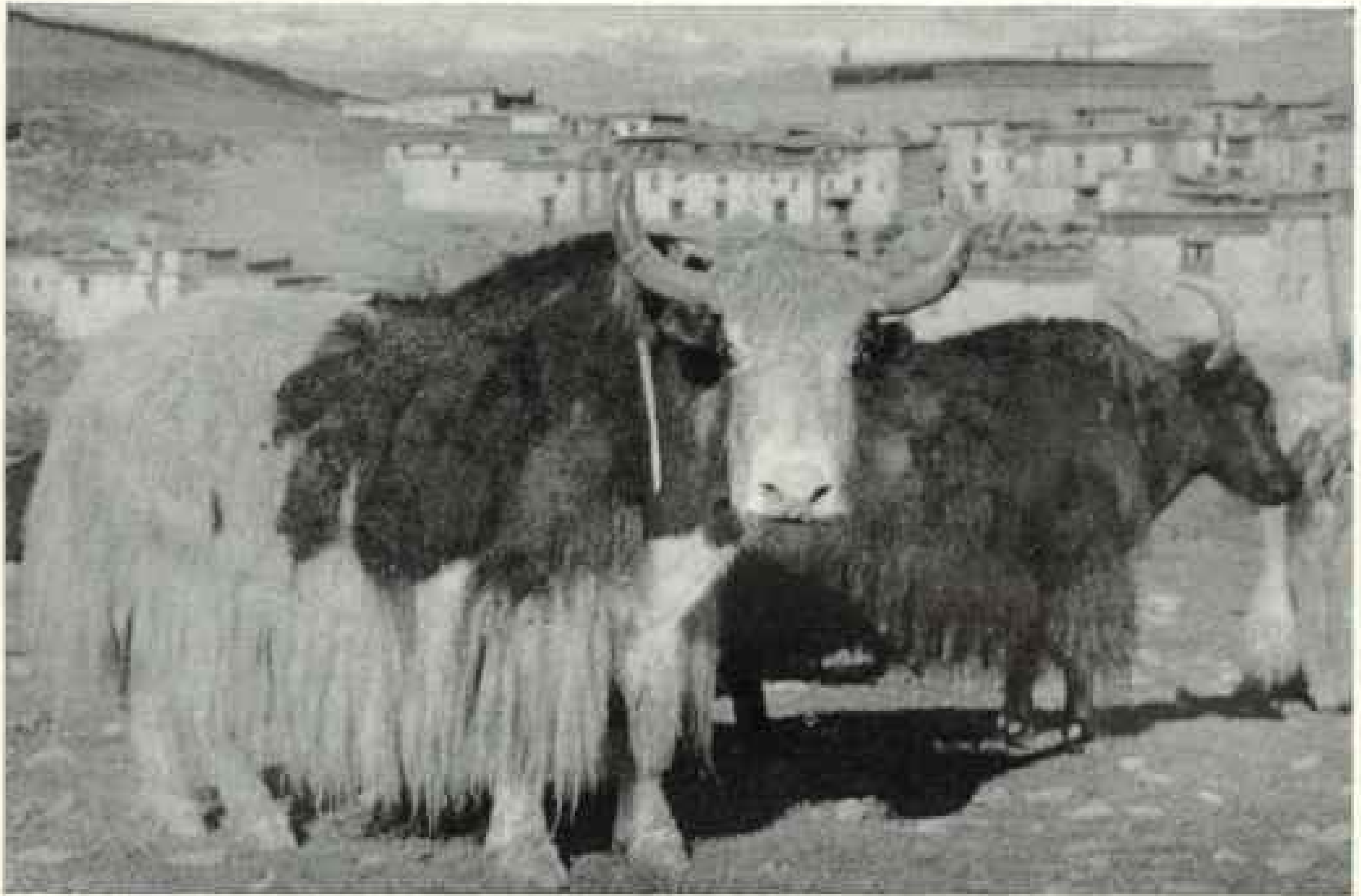
city at 13,800 feet elevation—one of the highest in the world. Mr. C. Hull, the magistrate, met us at the edge of town, accompanied by his retinue of officials and by representatives of the Lihwa Lamasery, including the father of the leading candidate for Panchen Lama.

Calling Cards of "Cheesecloth"

We exchanged *katas*, the silken "cheesecloth" scarfs, used by Tibetans as calling cards. Mr. Hull had arranged to quarter us in government offices in an old Buddhist temple.

The city fathers entertained us at two banquets, Chinese style. We were taken for a tour of the tents now assembling on the flat lands south and west of town for the early July horse races and celebrations.

The leading candidate for the Panchen Lama was living here. This boy was found in a woodcutter's cave near Lihwa by lamas searching for a child who, born at the minute of the former Panchen Lama's death



The Long-horned Yak Grows Wool, Grunts Like a Hog, and Has a Tail Like a Horse

This big fellow is a choice bull of the Lihwa Lamasery (background). Selection of a bull to improve the lamas' herds seldom is based on scientific principles. This specimen was highly regarded chiefly because it was nearly all white, whereas the predominant color of the lamasery yaks was black (page 742).

(Nov. 30, 1937), might be his reincarnation.

Mr. C. Ting, a Living Buddha from Lhasa, who is to train the young lama, met us. He is a keen, traveled Tibetan gentleman. He raised questions about the efficiency of the Tibetan sheep as compared with American sheep. How could Tibetans benefit by the knowledge of improved livestock production in other parts of the world?

I asked him what he would think of having Tibetan leaders take a trip through range-livestock areas in Australia and America. He was enthusiastic at the prospect.

Interview with Candidate for Panchen Lama

We visited the temples and saw the 45-foot goddess of love wearing a million-dollar crown of gold and jewels (page 736).

Finally we were taken to meet his holiness, the Panchen Lama.

This 6-year-old with the grave demeanor of a grown man seemed unnaturally mature until we forgot him for a time in conversation centered on some rare articles of worship. Suddenly childish prattle and the sound of running feet startled us. He was a child after all. Forgotten by his teacher and with a playmate, he was a normal, healthy boy.

"The selection of the Panchen Lama, spiritual leader of Tibet, has narrowed down to three boys, one in Tsinghai, another west of Lhasa, and this boy," said this member of the inner circle of Tibetan high priests.

"We have been studying them, and this boy apparently is the true reincarnation. He recognizes for his own all of the personal possessions of the lama preceding him, even when these possessions are mixed with other articles. I have recommended to Lhasa that this boy be the recognized Panchen Lama, and I am spending my time training him for his work."

In Lihwa, lands lay flat along winding streams, an ideal combination for production of wild native meadow hay.

In discussing this with Tibetan leaders, including the head prince of this area, it became plain that there was little market for livestock products, a condition which made it uneconomical to expend effort and money for costly hay production.

Their problem is little different from that faced in the early history of livestock raising in western United States. Little change toward modernization can be accomplished until there is an economic benefit assured from improvement of conditions or blood lines.



NATIONAL GEOGRAPHIC Pictures of Great Barrier Reef Fascinate Tibet Hillmen

Photographs of horses and cattle didn't interest them nearly so much as the color plates showing under-sea wonders off the Australian coast (see "Fantastic Dwellers in a Coral Fairyland," NATIONAL GEOGRAPHIC MAGAZINE, June, 1940).

Many caravans of yak and *pien-nu*, "the mules of the high grasslands" (page 730), passed here. One morning six caravans were in sight at one time.

This is the center of the trails between Yunnan, Kantse, Kangting, Paan, and Lhasa. On a short trip on horseback south and west of the town I counted 64 nomad tents.

Buttered Tea on Tibetan's Menu

I ate a morning lunch with the patriarch of one tent, sitting crosslegged on a green and red swastikaed Lhasa rug. The standard meal of *tsamba* and buttered tea was made a festive spread by adding clabbered milk, dry casein, and a joint of dry beef.

Buttered tea is made up by emulsifying rancid yak and sheep butter in strong red tea by means of a long slim churn. *Tsamba* is made by mixing parched barley flour and buttered tea to a hard dough consistency. It is eaten in that form, without cooking. Caravan men eat nothing else unless a family encountered en route provides some clabber.

Fresh meat is seldom at hand unless a saddle or pack animal dies. Tibetans eat all dead carcasses except those of animals which have died from anthrax. Experience has taught

them that man contracts this disease unless the meat is thoroughly cooked, and at these elevations complete cooking is impossible.

I never learned to relish buttered tea or *tsamba*. Our party carried rice as a staple food. We shot rabbits, pheasants, and deer, or slaughtered sheep for meat. Dried bread, tinned, was used for noon lunch with fresh butter and tinned jam as a spread. Vegetables were supplied by greens from native plants and from the young leaves and tendrils of field peas.

Our pressure cooker cooked all items in a short time. For drink we had tea, boiled water, or boiled fresh milk purchased from a near-by tent. Our Tibetans had their own supply of tea, strong butter, and parched barley flour.

Slaughtering of cattle and yaks is done at Lihwa for the only meat export I learned of in this entire area. Bloodless slaughter is the practice in the few cases where animals are killed for meat. The animal is smothered by tying his mouth and nostrils with a cord.

Although the Tibetan, because of religious beliefs, is averse to taking the life of animals, some sheep, goats, and cattle are slaughtered by the less devout.

At Lihwa beef drying is practiced to supply a local demand and some demand at Kangting and as far north as Kantse.

Around 3,000 head per year are slaughtered. The meat is dried in very large chunks. It hangs from ceilings, where the drying effect of high elevation draws out all excess moisture. Dust, smoke, and flies coat the outside.

The lamasery in Lihwa had a few choice yak bulls to improve herds owned by the lamas. The morning before we left for Kangting, I reached the cowgirls before they had taken the bulls to the hills and made photographs. Two especially large bulls posed easily.

The question arose: Were these animals selected for size or for color? Predominant color of yaks on the hills is black; yet both of these were nearly all white. Livestock men told me that what little selection is practiced in this region is based on noneconomic factors. This color preference is an example.

Traveling an Ancient Tea Highway

After three days of crossing high grass-covered ridges and the adjacent timbered canyon heads, we began to drop rapidly to Yakiang, 9,400 feet, on the Yalung River, arriving across the river from town at nightfall (page 729).

We had started down from the last grasslands in early afternoon from 14,500 feet. The route was along the highway between China and true Tibet, over which tea caravans have been passing for centuries.

One day we met many strings of pack yaks and pien-nu, all laden with tea. By noon I had counted 250 head.

Massive cottonwoods lined the trail. Occasional gardens of corn, potatoes, and squash looked good to us after so many days of travel in a frosty country. We saw parrots and monkeys.

Terrific rainstorms upstream had transformed the Yalung into a boiling torrent of muddy water carrying the chaotic debris of floods. The modern suspension bridge had been destroyed a few years ago during Communist Army days, and a ferry was carrying all traffic. A night crossing was impossible.

We remained on the west side of the river, crossing over the following morning to Yakiang. Monsoon rains, alternating with splashes of hot sunshine, made us very uncomfortable after the cold of the past four weeks' travel.

It took a day here to arrange transportation; then we started up again over high grassed passes to complete our circle of travel near the Cheto highlands just above Kangting.

Trail conditions were difficult. Woola animals were too heavily loaded to make maximum speed in mud and over flowing streams. Woola men were wet and dispirited, and sought excuses to stop or turn back.

The End of the Trail

On July 5 we completed the circle and arrived at Kangting after 33 days on the trail. We were welcomed at the south gate by Acting Governor C. W. Chang. Before we had time to bathe and shave, other officials came to pay their respects.

Heavy rains had fallen since our departure on June 3. The highway to Yaan was flooded and washed out in many places. Automobile travel was impossible; the truck which had brought us had been unable to return. Arrangements had been made for us to be taken out to Yaan by sedan chair. This would require five days' travel in place of the two days planned, so our stay in Kangting was short.

Government officers arranged a tea the following day, attended by all the official family, where I was asked to discuss what I had seen.

I told them that the grasslands we had seen compared favorably in basic resources with those in the Rocky Mountains of the United States.

The problems that the American stockman had had to face and solve were surprisingly similar to those observed here: need for an economic stimulus, then provision of supplemental winter feed, followed by control of disease and improvement in blood lines.

Although their grasslands were ecologically good, they were not fully utilized. The area would not carry more animals; so increased production must come from greater efficiency per animal. Current high death losses could be decreased.

The low rates of reproduction could be raised just as soon as it was profitable to incur the expense of doing so. Better management should soon be profitable, with the great market of China now becoming available because of modern transportation.

I told them that, potentially, this was not a very valuable dairying area because of the short "green grass" season and because of difficult transport in the interior.

Their livestock would be a suitable base for improved strains of imported breeding animals, but they are now inefficient converters of grass into the primary needs of humans. In short, here was a resource to develop, but it would require a balanced program of providing improvement of markets, modern transportation, adult as well as youth education, and ample winter feed for livestock.

Manipur—Where Japan Struck at India



Penetrating India from Burma, Japanese Reached Logtak Lake in March, 1944

Manipur, home of these fishermen, is an Indian State wedged between Burma and the strategic Province of Assam. Populated by half a million people, Manipur is slightly smaller than New Hampshire. Striking in several columns, Japan was the first major power to enter India since Britain has been responsible for her defense. Manipur became a British ally in 1762 when its Raja asked protection against a Burmese invasion.



Major G. F. Healey (Moulale)

No Wonder Kitty Wears a Sad Expression—She's a Food Display in a Naga Market



Dogs Can't Bite Through These Leashes—They're Bamboo

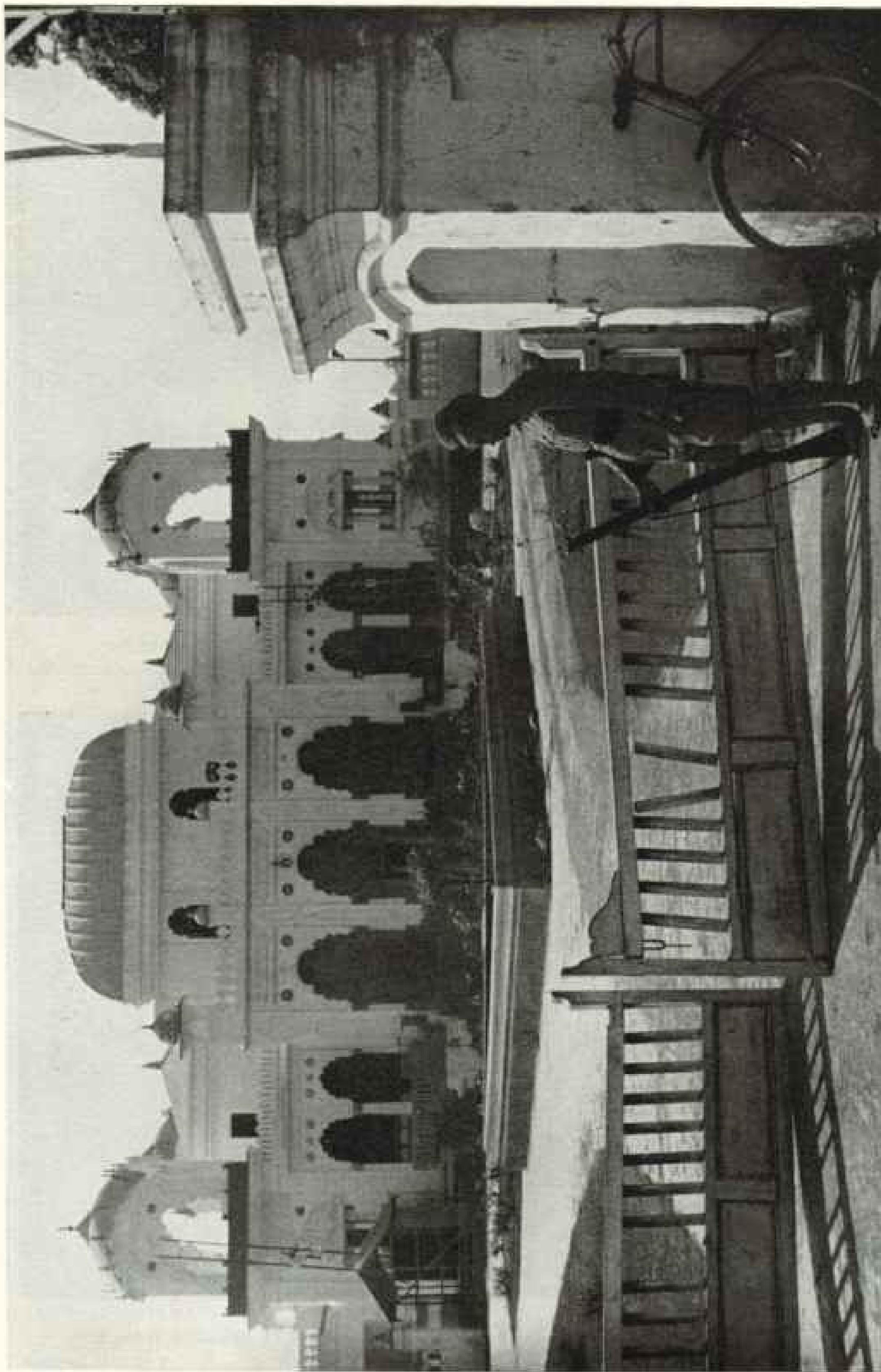
Brought to market, they are not sold, but their puppies are. Hill tribesmen relish puppies for food, but valley Manipuri, nearly all of whom are Hindus, eat no flesh except fish.



Miss G. F. Brown (Mundulie)

Dancing in Her Cambrous Tinsel Headdress Requires Balance

Heavy bracelets and necklaces also are part of the Naga Hill girl's costume for the annual centennial dance of her village. Long hair on her forehead shows she is unmarried. When she weds, she must fasten it up.



Major G. F. Bremer (Mushabot)

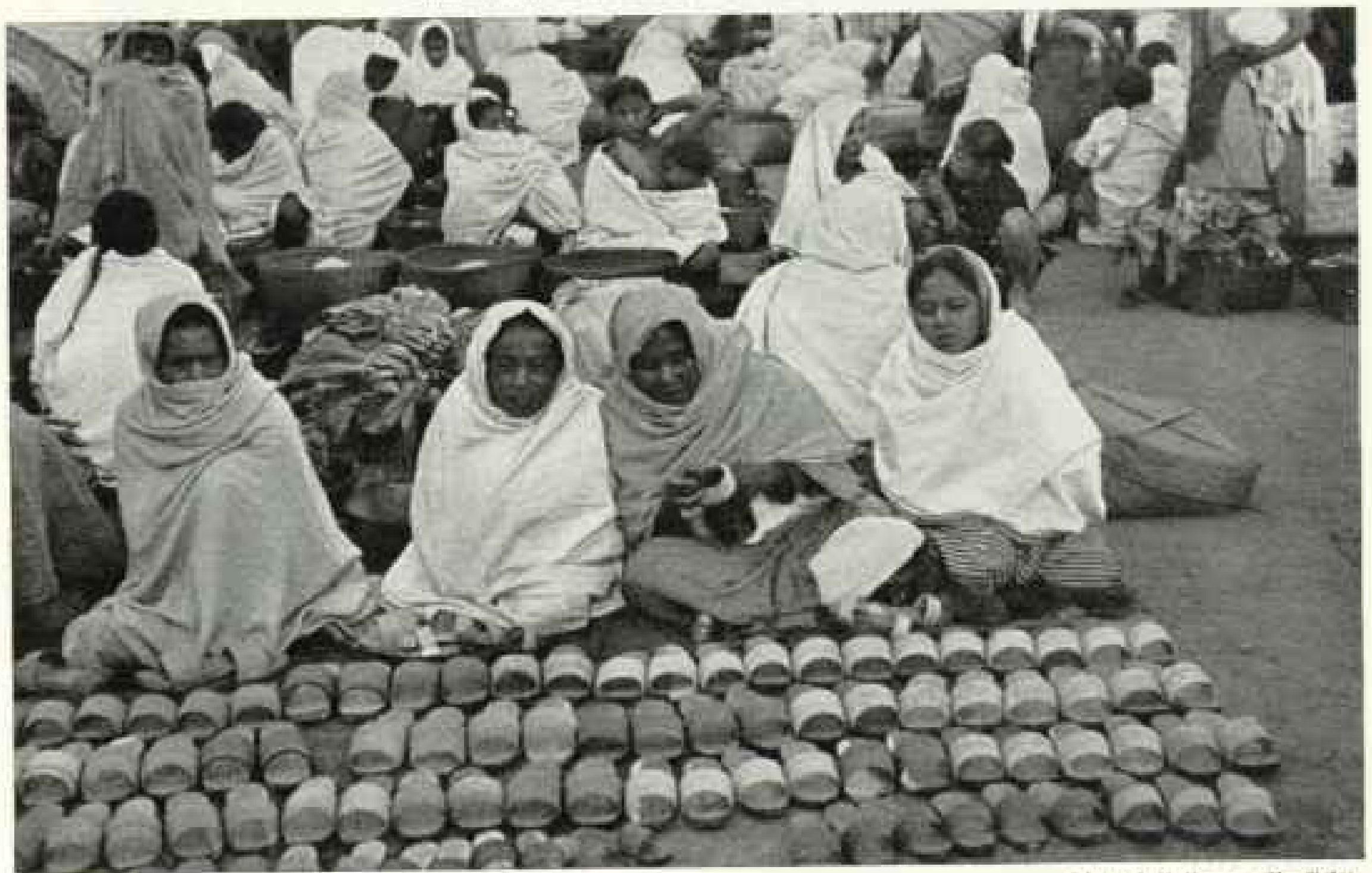
Symbol of Manipur Power, the Raja's Palace at Imphal Is Guarded by a Lone Sentry and a Decaying Gate

Imphal, a supply base, is 35 air miles from Burma, but several times that distance over mountains, jungle, and swamp. In such terrain the Japanese were reported using elephant transport. They were accompanied, according to their own unverfied boast, by a band of Indian quirlings.



These Strollers in Imphal's Main Street Made Their Own Shawls and Skirts

In a typical Manipuri household, all the women help produce cloth. Mother spins the cotton, grandmother bleaches and stiffens the thread, and daughter weaves.



Major G. F. Hesser (Monsiaki)

Hindu Women Selling Clogs Patiently Wait for Customers at Imphal's Bazaar

Before May, 1942, travelers seldom saw and the world scarcely heard of their quiet city. In that month Japanese fliers bombed Imphal and General Stilwell passed through it on the retreat from Burma.



In a Village Market, Food Is Sold from Four-legged Hampers

Hindu women merchants allow those of other faiths in the bazaar but not in their homes, which must be torn down if "defiled." Their countrymen, the Naga Hill tribesmen, only recently abandoned head-hunting.



Major G. F. Fraser (Montreal)

This Manipur Mother Wears *Fanek* and Shawl; Baby Wears Nothing at All

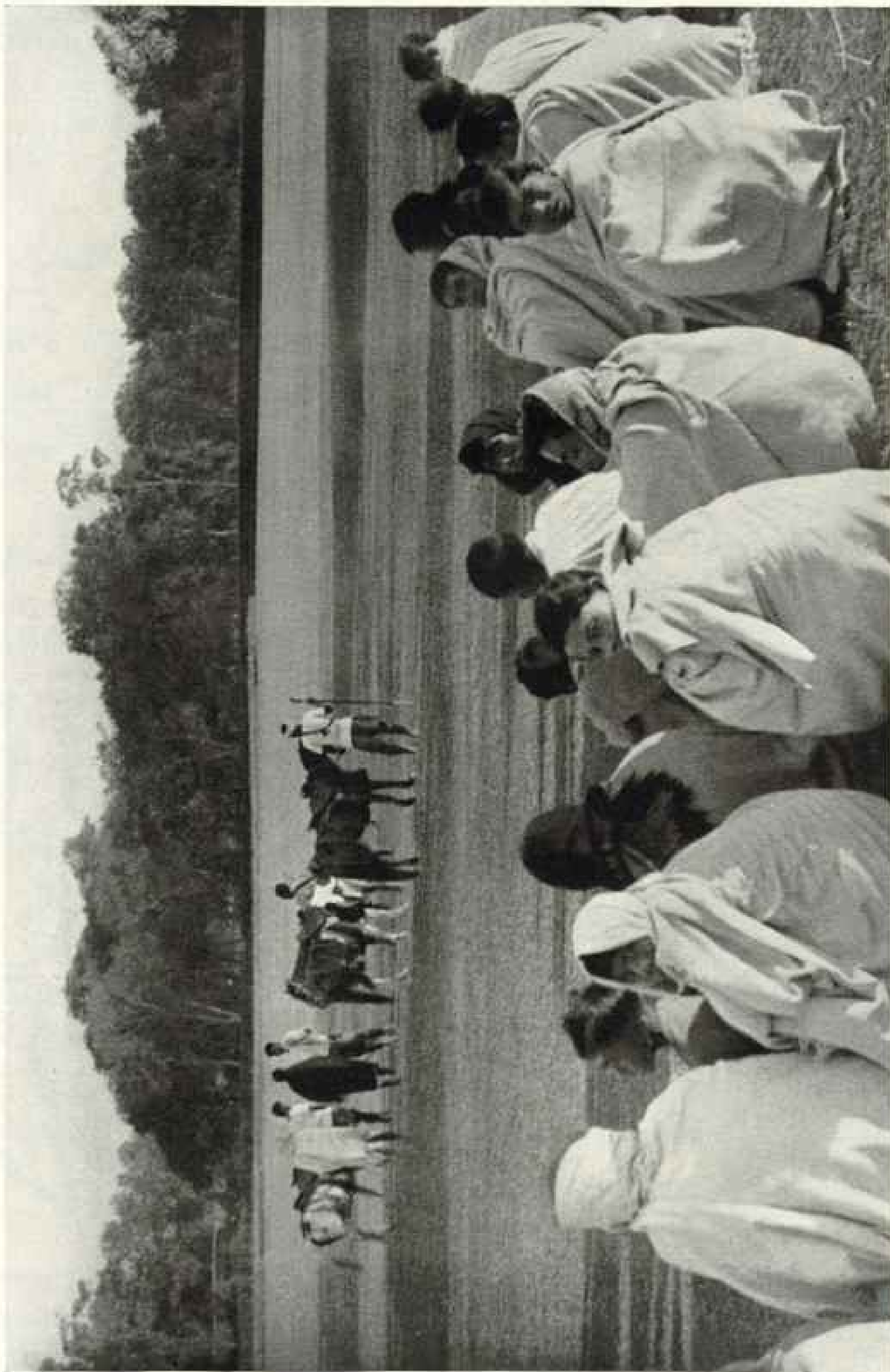
A *fanek* is a wide skirt in one piece. Drawn tightly about the body under the arms, it is then folded over and the ends are tucked in. Manipur women learn to spin when they are young girls.



Major G. F. Hunter (Manchester)

Vendors of Cotton Quilts, Sitting in Company Formation, Show How Close Competition Is in Imphal Bazaar

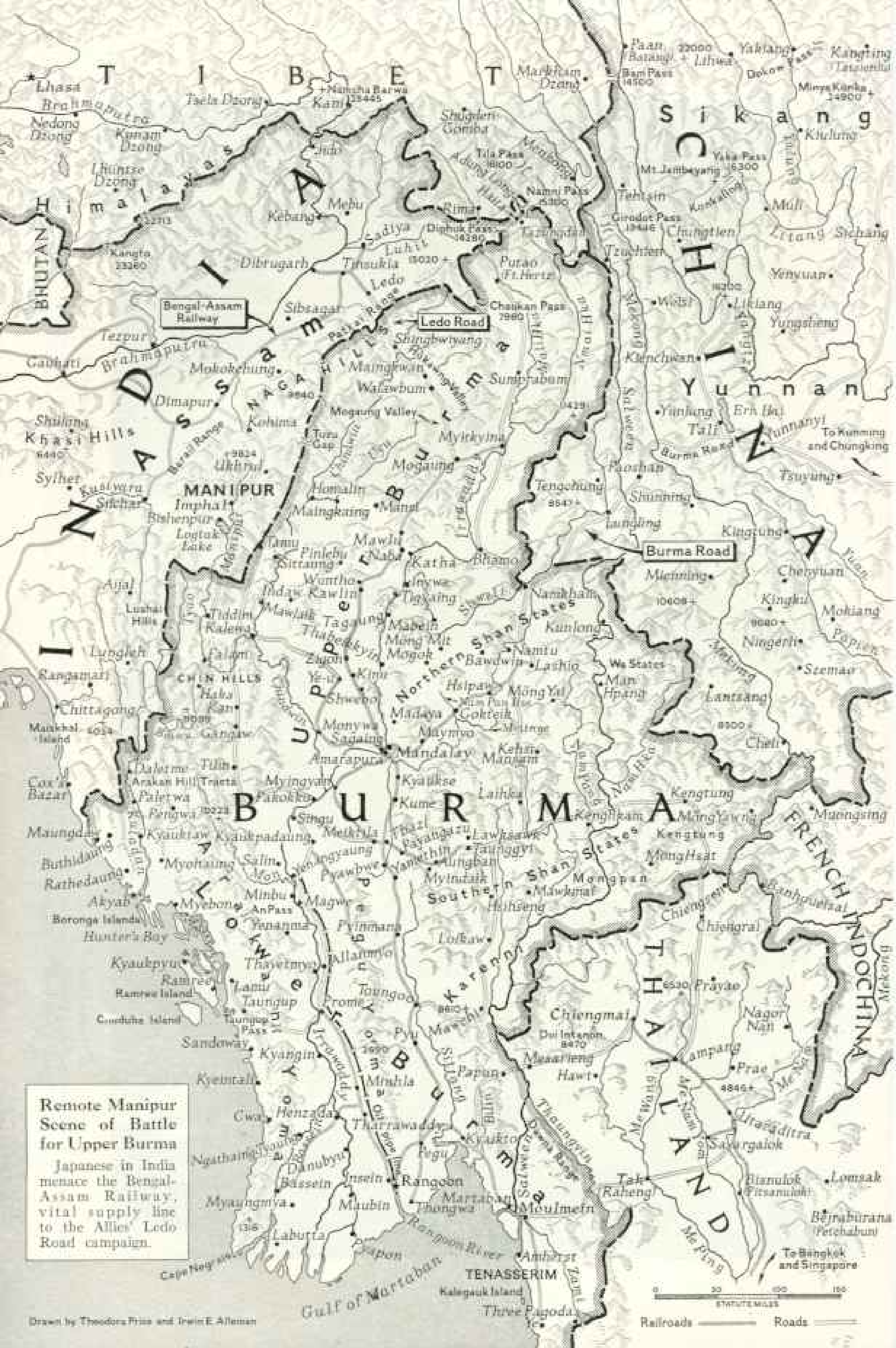
In peacetime, cloth buyers came to this market from many parts of India, and department stores in London sold Manipur goods. Women, who do nearly all the buying and selling, have an important voice in business affairs.



Major G. F. Hooper (Rifles)

Professional Polo Players of Manipur's Raja Give Their Mounts a Rest between Chukkers

National sport of this Indian State, polo was kept alive here for two centuries while the ancient game was neglected in other parts of Asia. British soldiers first saw it played in Manipur and brought two teams to Calcutta for a match in 1863. Nine years later, the 10th Hussars introduced polo into England.



**Remote Manipur
Scene of Battle
for Upper Burma**

Japanese in India
menace the Bengal-
Assam Railway,
vital supply line
to the Allies' Ledo
Road campaign.

Wales in Wartime

BY ISOBEL WYLIE HUTCHISON

THE train pulled out of Chester and crossed the Dee. Presently the red-brick miners' rows of Flintshire swung into the picture, the sun glittering like quicksilver on their slate roofs.

Soon the mining villages gave place to dappled woods backed by gray crags. The stations had names that sang—Mostyn, Rhyl, Conway, Penmaenmawr (map, page 754).

The fat man in the corner of the hot compartment wiped his brow and smiled at the soldier and his bride seated opposite.

"Well, we're in Wales now," he remarked. Then he added irrelevantly, "Would you care for a bottle of beer? I've two in my bag up there."

"Thanks," said the soldier; "better keep 'em. You'll need 'em in Wales. The place is crowded out."

"I did hear it was little old England's refuge room," said the fat man happily. "Well, they're sending me to India next week, and I'm leaving the wife and kid at Conway. It's a tiptop place for the boy."

"A tiptop place for the boy," gives the key to Welsh activity in wartime. This musical land rejoices in one of the few unrestricted seaboards south of Scotland, and accommodation is taxed to the uttermost. Besides the children, civil servants and Government officials have taken possession of Wales.

At Conway the fat man, after consuming one of his beers himself, departed with his still-clinking canvas bag for beaches crowded with sun bathers and deck chairs.

The honeymoon couple left at Penmaenmawr (Head of the Great Rock), where the porphyry outposts of Snowdon meet the sea.

Bangor Exports Slate and Professors

My own destination was the university city of Bangor, whose principal exports are slates and professors.

I knew little of Bangor, except that it has a mayor of the feminine gender who is a definite live wire. At the request of a helpful Welsh friend, this lady had arranged hospitality for me in the home of one of Bangor's leading citizens.

When I visited her next morning in the picturesque Town Hall, which was once a bishop's palace, she brushed aside my gratitude with a laugh. "That's nothing," she said. "A mayor has a lot of funny jobs to do. Welcome to Wales!"

"Welcome to Wales" it was!

"The Welsh," wrote George Meredith, "are

hospitable to teach the Arabs a lesson. I do believe their life is their friend's at need. Seriously, they would lay it down for him."

The home into which I had so abruptly intruded gave me a truly civic welcome. It was a charming villa overlooking the blue waters of the Menai Strait, which twisted, scarcely wider than the Thames at Chelsea, far down between wooded banks.

In the distance the Menai Suspension Bridge, graceful as a thread of gossamer, linked the two shores. Thomas Telford built the bridge in the days when the stagecoach was at the height of its glory (pages 758-9).

A few years later the stagecoach was superseded by steam, and Robert Stephenson's masterpiece, the Britannia Tubular Bridge, was constructed close by, to carry the main railway line from London to Holyhead in metal tubes weighing more than 10,000 tons.

These two marvels of engineering skill harness Anglesey to the mainland like a child in leading strings.

A wartime wit reports the islanders are afraid, should the bridges be bombed, that Anglesey will float out to sea!

"A Fo Penn Bid Pont"

The old city of Bangor lies in a valley. On the northern height is the residential quarter, dominated by the University College. This fosters the city's association with bridges, for above the fireplace in the Council Chamber is inscribed the old Welsh saying, "A Fo Penn Bid Pont." This, literally translated, means, "To be a head (or leader), one must be a bridge."

A Prince of Cambria, tradition says, once helped his followers out of a tight place when they were being overtaken by their enemies. He stretched his tall body across a chasm in the path of the refugees and on this human bridge the others crossed to safety.

The role of Wales as "little old England's refuge room" is no new one. Tacitus describes Anglesey as a common refuge for all the discontented Britons who were driven westward by the Romans. On Mona, as the island was then called, the Druids made their unavailing stand against the conquering legions of Suetonius Paulinus, who prevailed against them by such modern tactics as the use of flat-bottomed barges to carry his infantry across the strait.

This lovely pastoral island is still one of the most sequestered corners of Wales, retaining the Welsh language as its everyday speech.



© Fox, British Corning

Penclawdd Belles Sort Cockle Shells

Women fill their baskets at the cockle shoals along Burry Inlet, Gower Peninsula, at low tide. Astride donkeys, they ride back to this collection center where the edible shellfish are sorted and graded. The cockles will be sold to restaurants and fish bars and at Swansea's Saturday market.

Here is to be found the little village with the big name. Llanfairpwllgwyngyllgogerychwyrndrobwllllandysiliogogoch! The post-office authorities have, however, shortened this to Llanfairpwll (page 757).*

Base for Postwar Commercial Planes

An Anglesey prophet of today suggests a new and interesting future for the island as a base for the postwar planes of commerce, which will presently be weaving like shuttles to and fro, linking the Old and New Worlds.

There are no mountains on Anglesey. Better still, for a pilot, fog is almost unknown, for even when the shores of Caernarvon are wrapped in mist, Anglesey is usually clear.

"It would be an ideal location for this purpose," said the prophet. "After all, Anglesey is the traditional home of Madoc, who discovered America before Columbus. Never heard of him? Well, Good Queen Bess was of Anglesey stock, but the history books don't tell you that! Would you like to see what the wartime drive for salvage brought to my office the other week?"

The prophet lives in Beaumaris, the charming Old-World capital of Anglesey, across the strait from Bangor. He took me along to his office, opened his safe, and carefully extracted a tattered volume.

"The Burgh Records for Beaumaris for the year 1796, found in an attic amongst papers for the dust cart!" he explained gleefully. "And here are a couple of the ancient standard weights for the Burgh that have escaped the drive for scrap iron. I noticed one of them propping a door as I was passing down the street one day. And I believe I'm on the track of a third. War brings

some weighty matters to light!"

Though both Bangor and Beaumaris can look back for more than a thousand years, they are at present looking forward far into the postwar world.

Bangor's new housing schemes are among the most advanced in the Principality. They entirely escape the grim monotony of Victorian days, for scarcely two blocks of these pleasant two-storied dwellings are alike, and each has its garden.

The best sites on the outskirts of the city have been selected for these working-class homes, and the slate quarryman, as he returns

* See "Short Visit to Wales," by Ralph A. Graves, NATIONAL GEOGRAPHIC MAGAZINE, December, 1923.



Welch Fusiliers Are Known by the "Flash" on Their Tunic Collars

The cluster of black ribbons was designed in the days of powdered wigs to keep the tunic free of grease. This venerable regiment proudly wears it today, although wigs have long been discarded. (page 755).

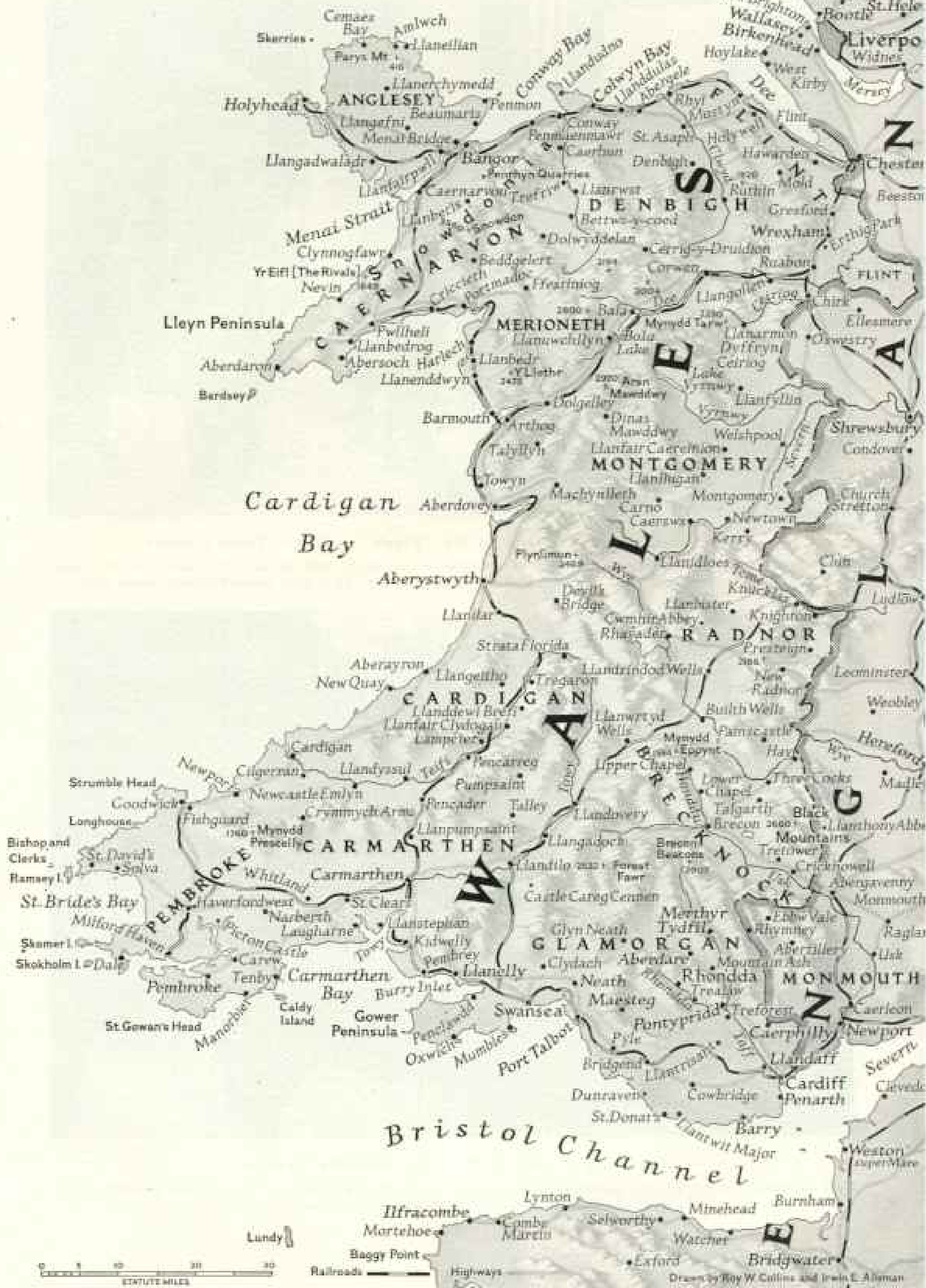


© Fot. British Columbia

Tea Time Comes to Britain's Guerrilla Trainees

Pack companies preparing for mountain fighting find the Welsh highlands an ideal training ground. Here a Y. M. C. A. Tea Car gives each man a spot of his favorite beverage.

IRISH SEA





© Fir. British Columbia

Six Little Maids from School Dress Up for Their Bit in an Eisteddfod

Wearing the glossy beavers of their grandmothers, girls of Aberayron National School take part in a music and poetry festival at Aberystwyth. Older competitors converse under the tent in background.

from his toil in the vast Penrhyn quarry, may view from his windows every peak in Snowdonia, all for a modest weekly rental.

Tall Tales of Train Travel

There is a leisured—almost a Victorian—atmosphere about railway travel in Wales, even in wartime. Trains do not always, or even often, connect.

The Welsh enjoy tales against their own train service. A friend relates that once her train halted for half an hour at a small way-side station. When a worried passenger with a connection to catch inquired the reason, she was told that it always did so.

"You see, the engine driver lives here and he must get his tea, poor man."

From Bangor I journeyed in a day down the beautiful Welsh seaboard to Haverfordwest in Pembrokeshire, the most remote and charming of the 12—or 13—Welsh counties. (Monmouthshire, though technically part of England today, is still definitely Welsh in character.)

Our train was crowded, for a company of Royal Welch Fusiliers had joined it unexpect-

edly amid the mountains of Caernarvon.

They wore the historic "flash," a bunch of black ribbons tacked to the back of the tunic collar, which gives this famous regiment an unusual distinction. The flash was worn in the days of powdered wigs to keep grease from the tunic (page 753).

For many years the regiment was absent on the Continent. When the soldiers returned to Britain, wigs had gone out of fashion. Nevertheless, the Fusiliers retained their ribbons. They are so much attached to the flash that one officer, upon retiring to private life, is reported to have had it sewn to the collar of his civilian dinner jacket!

The troop was in charge of a young London officer, who lauded Welsh hospitality.

"At the last farm they actually asked me—quite serious, mind you—'How many eggs would you like?'" He gave a shout of boyish laughter. "'How many eggs!' It makes a fellow feel a bit ashamed, though," he added more soberly, "when you go on leave and the wife tells you she's saved the week's ration for a treat. I just couldn't tell mine about all those Welsh eggs!"



South Wales Echo

Each Bright Face at Pontypridd Proclaims "I Love a Parade!"

Children of Taff and Rhondda Valley coal miners await a "Wings for Victory" procession. Under the July sun, they wear light coats and sweaters. Pontypridd means "Bridge of the Earthen Hut."

The soldiers left us at Aberystwyth, where I broke my journey to visit the National Library of Wales, a fine building in the classic style, on a magnificent site overlooking Cardigan Bay. Work goes on behind closed doors, for only the reading room of the library is at present in public use.

Here throbs the vivacious heart of Wales. Here dreams are born which will animate the new world struggling in such fiery throes of birth. Books are everywhere, three-quarters of a million of them.

Long books, low books, thin books, thick books, new books (the Library is entitled under the terms of the Copyright Act of 1911 to a free copy of almost everything published in the British Isles), and books so old that there are none in Wales older. For the finest ancient Welsh manuscript is the 12th-century *Black Book of Carmarthen*, the Library's greatest treasure.

Downstairs in the bindery an absorbing work is carried on. To enter this wizard's chamber is a refreshing experience in a toppling world. Priceless manuscripts are repaired here by the fingers of a Norwegian artist so dexterous that his handicraft savors of the black art. He can split apart pages almost too fragile to handle, insert a

strengthening sheet between the front and the back of the lettering, and weld the whole again into a perfect page where only a microscope can detect the join.

It was good to ponder on this work of reconstruction as the train bore me down through the flowery hollows and hills of which Dudley Davies wrote with homesick longing from India—

Carmarthen hills are green and low
And therealong the small sheep go
Whose voices to the valley come
At eve, when all things else are dumb.

"Givvies Have Too Much Money"

Dusk was trailing her umber paintbrush across the fields when suddenly the ticket collector entered from the corridor and subsided on the opposite seat of the compartment, empty now save for myself and a black-coated Welshman. He took off his cap and wiped his brow; then he lighted a cigarette. His face was pale.

"Just had a bit of a scrap back there," he remarked in explanation of his rather surprising behavior. "A fighting-mad drunk! He kept trying to open the door."

"What have you done with him?" asked the Welshman.



Philip D. Gendreau

Full Name of "Llanfairpwll" Has 58 Letters, 19 Syllables!

Welsh fondness for the old Cymric language preserves the name of this Anglesey village (page 752). It means "Church of St. Mary in a hollow of white hazel, near to a rapid whirlpool and to St. Tynllo's Church, near to a red cave." This long name is variously spelled.

"Locked both doors. He's all right in the meantime. Trouble is, these civvies have too much money. Wages are too high, and they don't know how to spend them."

"I could tell 'em," said the black-coated one. "We were bombed out of Swansea last year and the family is living on a farm. A farm's the place for kids. They don't want to go back to city life. Butter, milk, eggs!

"Lots of things to spend money on in the country. It's in the towns you can't get rid of it nowadays. Take my own hobby now—it's bowls. Our team had just arranged to visit Scotland when the war knocked everything on the head."

"You didn't act like Drake then," said the ticket collector, winking at me. "He finished his game of bowls first and tackled the Spaniards afterwards."

"P'raps Drake wouldn't have carried on so easy, either, if the Dons had dropped a blockbuster plumb in the middle of the green. Lovely bit o' turf it was, too," he ruminated moodily. The ticket collector finished his cigarette in silence and went off to see to his prisoner.

Leaning far out to within 48 miles of the Irish coast, Pembrokeshire is washed on three

sides by the sea. Here are to be found the relics of a prehistoric civilization. On its windswept headlands, the first invaders of Wales landed from the shores of the Continent. Just when this first invasion took place, no one can say, but it could not have occurred until the Neolithic Age was well advanced.

A Cradle of Welsh Christianity

Visitors to this far corner of Britain are usually surprised to learn that the little "city" of St. David's—the smallest cathedral city in the Kingdom—is a cradle of Welsh Christianity.

Its beautiful old cathedral of purple stone, dropped in a deep hollow like a flower at the bottom of a jar, occupies the site of a place of pilgrimage older even than Iona. It was founded by Dewi Sant, better known as St. David, about the middle of the sixth century. Here came pilgrims from distant lands, including William the Conqueror himself.

A few months ago, after a reverent service, there lay all night in one of the side chapels the bodies of five American airmen. They had crossed the gray wastes of the Atlantic only to founder, by a cruel mischance, on one



© British Council

Spanned by Two Famous Bridges, Narrow Menai Strait Opens Northeastward on Conway Bay

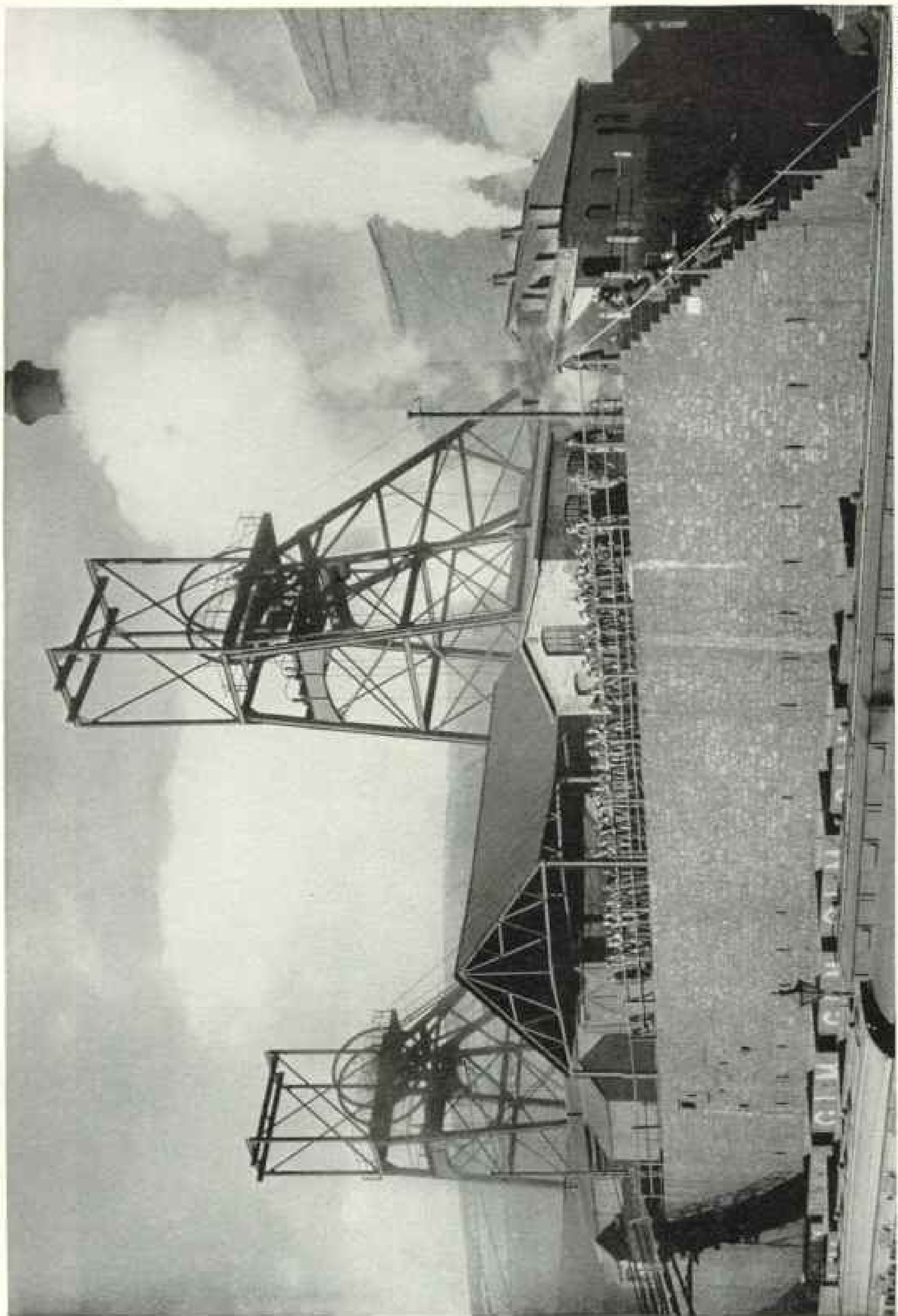
Much England-to-Ire traffic crosses north Wales to Holyhead, there embarking for Dublin. The highway route runs over the Menai Suspension Bridge to Anglesey Island at Menai Bridge village, left foreground (page 751). Bangor, Caernarvonshire, lies shrouded in valley fog, right background.



Twitts from European

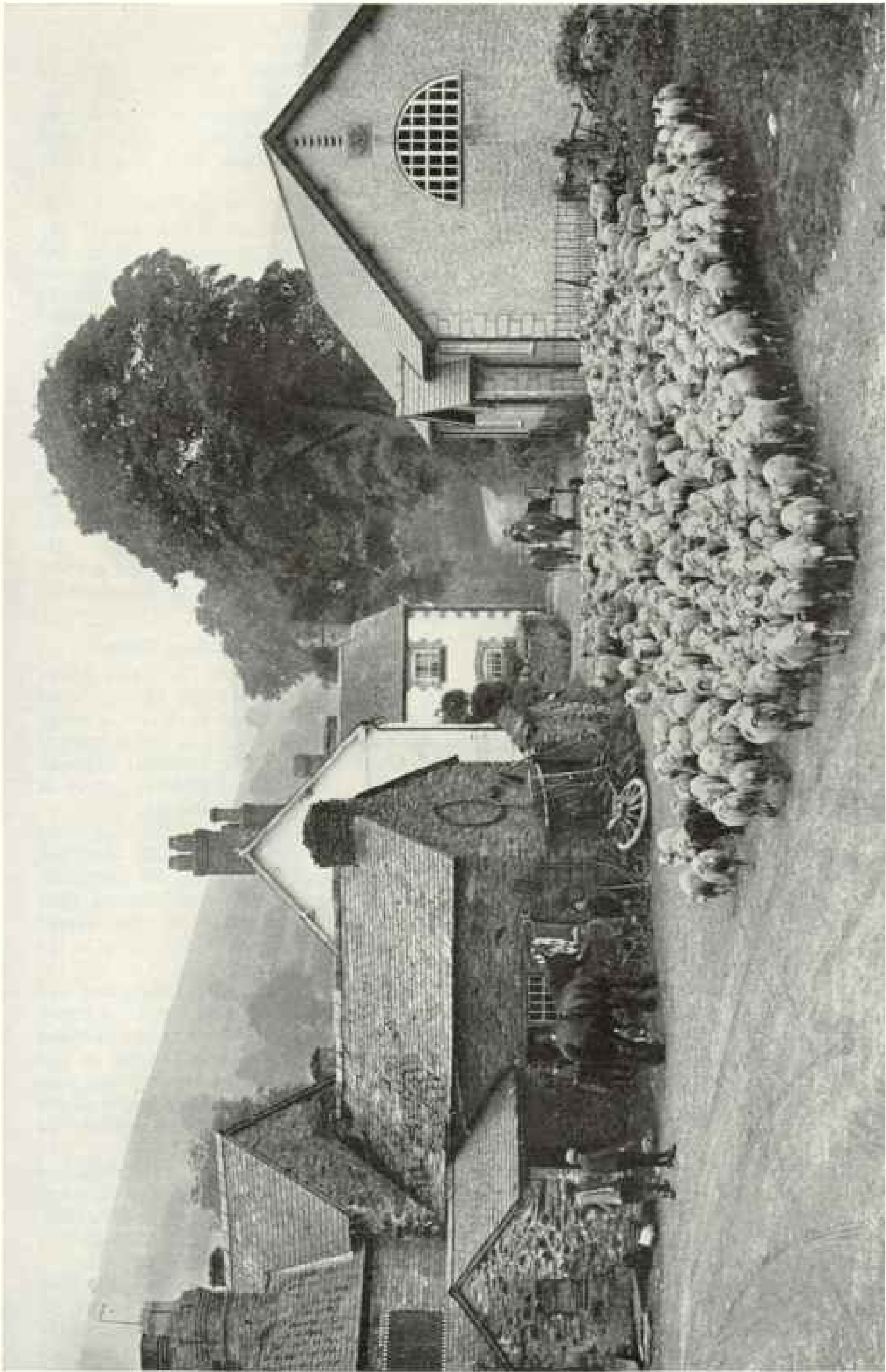
Marvel of Stagecoach Days, Menni Bridge Is Still the United Kingdom's Longest Suspension Span

Thomas Telford, British engineer, crowned a brilliant career by building it 118 years ago (page 751). Its main channel span is one-sixth that of the George Washington Bridge across the Hudson River. Modern motor vehicles move patiently behind plodding, horse-drawn traffic along the two narrow carriageways.



© J. Dunn-Scott

Miners, Between Shifts at the Duffryn Rhondda Colliery, South Wales, Sample the Sunshine That Is Rarely Their Lot



© Smart and General

Masonry Varies, but Sheepherding Is Constant at Llanarmon Dyffryn Ceiriog

Dry and pointed stone, rough plaster, plain and whitewashed brick compose the rustic cluster of buildings at the foot of Mynydd Taryw (2,250 feet) in the upper Vale of the Ceiriog. Six miles to the northeast lies Llangollen, famous for its annual sheep dog trials. A checker-edged sign advertises tea.

of the mist-enshrouded headlands of this rugged coast, within an ace of safety.

The inhabitants of Pembroke are partly of English, partly of Welsh blood, with an admixture of Flemish. Colonies of Flemings settled here in the days of Henry I and have left their work.

"Look at my big cheekbones," said a lady in the country bus which carried me from Haverfordwest to St. David's. "That's my Flemish origin. And look over there. Do you see that little cottage with the curious round chimney stack at the side of the wall? That's a Flemish chimney. There are still one or two of them around here."

Our driver was twisting dexterously through narrow lanes sunk deep in the warm red soil, their banks overgrown with many unusual varieties of wild flowers. Down their red ruts have passed all manner of men.

The Building of Stonehenge

Two thousand years before Christ came the Neolithic peoples. By some means not yet known, authorities believe they transported across land, from Mynydd Prescelly (in Welsh *mynydd* means "mountain") on the skirts of Pembrokeshire, the great blue monoliths of which Stonehenge is built.

Other monuments they have left on these seagirt shores. One stands on the edge of a field leading down to the sea between St. David's and Fishguard.

The gigantic table stone is supported on the tips of three others whose feet are embedded in the red Pembroke earth. It has stood there, say the scientists, for about 4,000 years. The midsummer sun, pouring on it, warms the stone.

High above, out of the blue, comes the faint drone of a plane, the sun smiting silver from its fuselage. The silence is unbroken save for the murmuring plane. So still it is one can almost hear the passing of the ages. They have apparently forgotten the dolmen, which has waited whilst Britons and Romans, Normans and Flemings passed by. Now above it fly the Allied airmen who are defending these outposts of Britain.

French Once Invaded Pembrokeshire

It is not the first time Pembrokeshire has been invaded. On February 22, 1797, the French landed a force of more than a thousand in this region. Though the Welsh had but a small troop to oppose them, their captain was resourceful. He marched a body of Welshwomen, in their tall black beaver hats and scarlet cloaks, up and down the distant hills (page 755).

The French, believing these ladies to be the vanguard of an opposing army, agreed to terms of unconditional surrender, their supporting fleet having meanwhile, for some unexplained reason, sailed away! These terms were signed in the Black Bull Hotel, Fishguard.

Thus the last invasion of Britain was defeated by the women of Wales, and if any should doubt a story so strange, he has but to visit a certain old farmhouse a mile outside St. David's. There, in a glass cabinet beside china and silver, he will see a faded rose-colored feather which once adorned the cocked hat of one of those daring Frenchmen!

There are many other interesting things in that charming old farmhouse. Entering the stone-flagged kitchen by a rounded archway known as the Priest's Door, the visitor will notice rows of hooks in the ceiling, from which hang crusted slitches of home-cured bacon—a goodly sight in these times! On the top of a side cupboard is an old pottery jar, whose counterpart may be found today in Egypt or Arabia.

Dogs Formerly Churned Butter

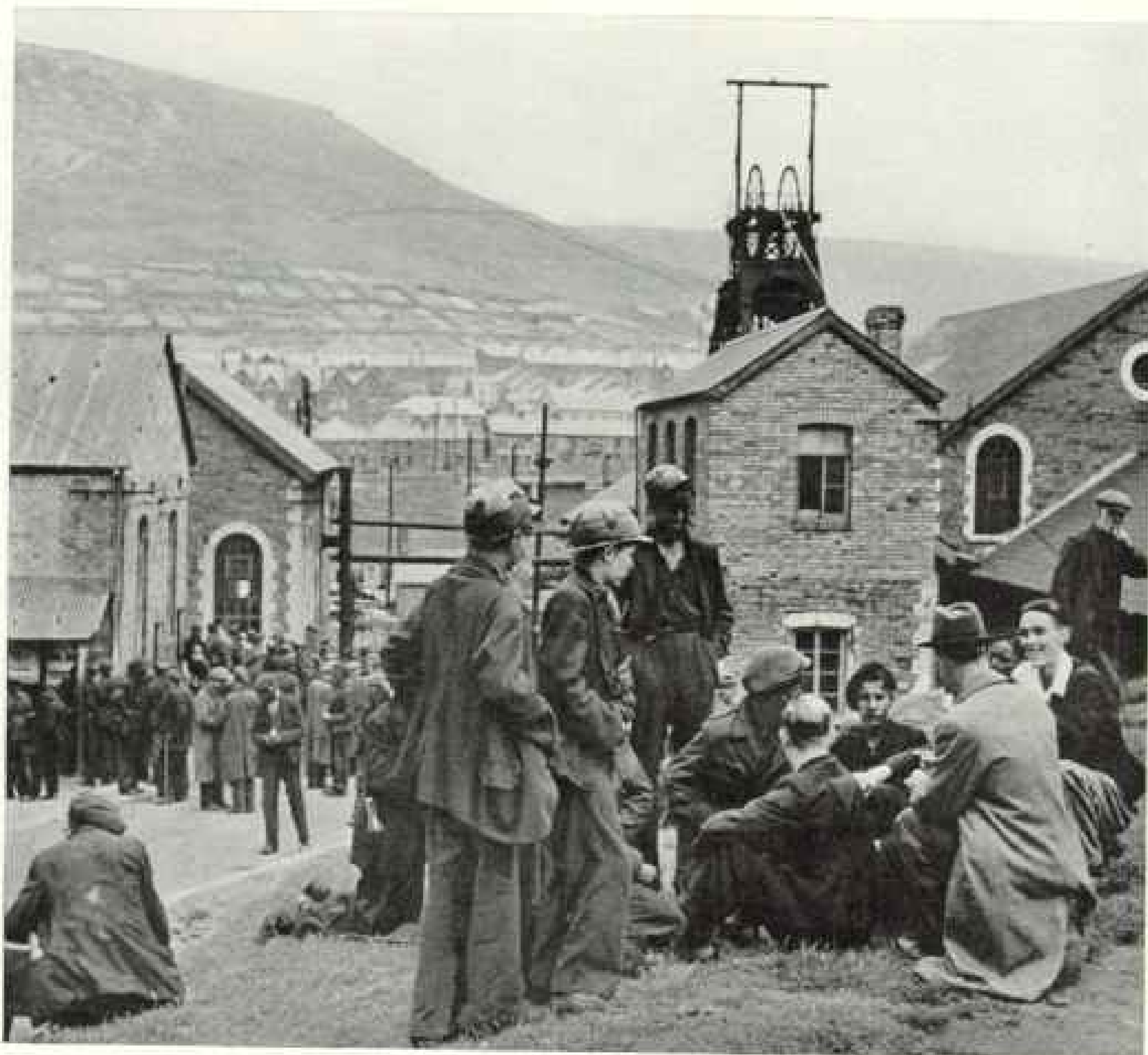
No longer, however, does the Welsh housewife use her husband's corgi (Welsh breed of dog) as her butter churner—a task in which he was said to delight, and of which there is an excellent model in the National Museum at Cardiff. Taffy lies comfortably asleep in front of the cosy fire of Welsh culm.

Perhaps he is dreaming of the dog tongs still on view in several old Welsh churches. With these savage implements his ancestors, who attended service with their masters, were unceremoniously slung out of the sacred precincts should a canine dispute arise in the middle of the sermon.

If the visitor is lucky and the farmer and his wife in good heart with the day's heavy toil over, he may hear Welsh voices upraised in that beautiful part singing peculiar to this land of song, where it seems as if every man or woman has been born within sound of the heavenly choir and carries throughout life some echo of that vast harmony.

The thought of this cosy Pembrokeshire farm, and of the solid Pembrokeshire dolmens, was a comfortable one when, a few days later, I stood by the ruins of Llandaff Cathedral in the industrial heart of Glamorgan.

Llandaff is only half an hour's walk from Cardiff. Built in a deep hollow, as are St. David's and most Welsh churches, this beautiful 12th-century building has attracted all the spite of the Hun and is little more than a



Robert Capa-AP

Rhondda Valley Helps Make Cardiff Britain's Greatest Coal-shipping Port

Black-faced pit boys, up from the mine shaft, stop to chat with white-collared friends against a Glamorganshire background (page 760). Here collieries, slag heaps, and endless miles of mine villages have turned bright, bracken-green valleys into somber troughs of industry.

shell. From one of the broken niches a gargoyle with half a face grinned impishly.

A policeman passed wheeling a cycle. The ruined cathedral was no new sight to him.

"Oh, yes, it's been that way nearly two years now, but they've left us plenty to restore," he said brightly. "We'll get it up again all right."

It was in this spirit that the British Government set out to repair the industrial depression caused by the last war. One of its most successful attempts to cope with the unemployment problem in south Wales is the Treforest Trading Estate in the Taff Valley.

Here, in 1937, by aid of generous Government grants, a trading company was opened which gave renewed life and hope to the out-of-work miners.

In 1939 employment was also found at

Treforest for refugees from Nazi persecution. Continental industries were installed, directed by men of brilliant gifts. Britain found the bread she had cast upon the waters when, in 1940, she was urgently in need of foreign exchange.

Treforest Factories Served the World

The Treforest factories exported to the United States and elsewhere large quantities of goods of every description—electrical appliances for India, fancy goods for Australia, watch straps for Argentina, cigarette papers for the South Sea islands.

The secretary of the Treforest Estate is an enthusiastic Canadian. She can tell many a thrilling tale of these refugees from Nazi terror. Perhaps the best of all is about the



From European

Down to the Sea They March to Maintain Britannia's Naval Tradition

At quiet New Quay on Cardigan Bay, boys of the Rotherhithe Nautical School learn what it takes to become men of the Royal Navy. New Quay crowds the rocky slopes of a headland that looks north across the Bay to distant summits of north Wales.

German who melted his gold nuggets into the shape of mudguards, painted them black, and drove out of Germany under the very noses of the Nazis!

Today Treforest's "luxury" factories have been adapted to wartime use. The famous Goblentz plastic-jewelry works now turn out badges in plastic for the Ministry of Aircraft Production; camouflage netting is being produced where ladies' gowns were once fashioned. The story of Treforest is still in the making. It promises to be one of the most interesting now being written in Wales.

Clean Cardiff Exports Coal

Half an hour's bus ride from Treforest lies Cardiff, a city of surprising beauty. Cardiff was for many years before the war the largest coal-exporting port in the world, but instead of chimneys and coal dust the visitor finds clean wide streets built about a medieval castle, which is surrounded by a moat.

Beyond the moat is a garden bordered by magnificent public buildings, the Museum, the Law Courts, the City Hall. There are open spaces and tree-lined boulevards which give Wales' leading city a somewhat continental appearance.

In the Museum an excellent picture of bygone Wales may be obtained. It has delightful models of the rooms in an old Welsh farmhouse. Here, too, are originals and reproductions of such prehistoric and Roman stone monuments as menhirs and cromlechs. Welsh-Americans have contributed generously to the plan whereby an American wing will be an additional part of this great National Museum in postwar days.

Behind Cardiff, running roughly north and south, lie the mining valleys (pages 760, 763). Without the output of the Welsh miner, who has put his back into his work very literally, it is no exaggeration to say that the Battle of the Atlantic would have been lost. Yet there



© The London Times

Caernarvon Castle Provides a Backdrop for a Welsh Festival of Song and Poetry

In this historic setting where legend fixes the birth of Edward II, England's first Prince of Wales, a pageant of the National Eisteddfod is enacted. This ancient festival, revived on a large scale in 1819, has been held almost every year since then. The Arch Druid stands on a stone to address the Gorsedd, governing body of the ancient bardic festival. The Eisteddfod preserves old Welsh music, literature, and language.

is no Welsh "Black Country." South Wales, if it be black in part, is striped with green and gold.

At Pontypridd, a typical Welsh mining town where the Taff and Rhondda Valleys meet, a climb of 20 minutes round the skirts of the slag heaps brought me to a bracken-covered hillside and a trickling brooklet edged with a rare and delicate campanula whose habitat, according to the botany books, is "moist, shady pasture and woods."

From the banks of the Taff I traveled north again through central Wales to Brecon, strap-hanging for most of the way in a crowded bus. "We took on ninety, one day last week," remarked a passenger. "It's wonderful what you can do in wartime!"

At Brecon, Henry Vaughan, sweetest of all Welsh singers, once practiced as a physician and walked by the willow-fringed Usk, writing of the "country afar beyond the stars."

Here Mrs. Siddons and her brother, Charles Kemble, were born in a house in the quaint High Street. And here, in the fine old Priory, Charles I wrote his famous letter to his son, bidding him "prepare for the worst."

"Chapel of the Red-haired Men"

The Priory Church, now the Cathedral Church of St. John the Baptist, lives in the memory as one of the loveliest things in Wales, with its tall vases of wild flowers placed by some unrecorded artist against the gray pillars of nave and transept, where sleep the Norman warriors in the Chapel of the Red-haired Men.

Close to Brecon runs the old Roman road, the Via Julia Montana, built by the conquerors of Wales in the first century. Along it tramped the legionaries from Isca Silurum—now Caerleon on Usk—driving the British before them into the west.



BRITISH OFFICIAL

A British Mobile Theater Prepares for "Tonight at 8:30"

Young evacuees from bombed industrial centers eat their meal in the Settlement Hall of the mining village of Trealaw in Glamorganshire, indifferent to the crew preparing the stage for an evening performance. Trouping in motor vans, British actors and musicians bring entertainment to remote villages at local movie prices.

On the day of the Allied invasion of Sicily I passed along it, pondering the strange turn of events, and suddenly a convoy of troops and army trucks roared past. The men were in high spirits, laughing and jesting; little flags flew from some of the cars.

Italian Prisoners on a Roman Road

I turned into an ancient church by the way-side, bowered in yew trees. The visitors' book contained the names of half a dozen Italian prisoners of war, Angelo of Ravello, Umberto of Torino, Mario of Civitavecchia, and the rest. They had passed that way, too, a year ago. The wheel of Fortune had turned full cycle on the old Roman road!

I walked out of Brecon with a knapsack on my back. No more crowded buses or trains would I burden; the open road beckoned me, sixteen and a half miles of it across Mynydd Epynt to Builth Wells on Wye.

The road climbed up the pretty valley of the Honddu from the Lower Chapel (called Bethania) to the Upper Chapel (called Ebenezer) and at last I came out on a bare summit with a big notice board. It said that when the red flag was flying the road was closed.

Fortunately for me, there was no sign of the red flag, and I went on till I came to the first human being I had encountered on that forsaken highway.

He was a soldier seated in an open lorry under a waterproof, for a wild thunderblast had suddenly split the clouds upon us. He regarded me curiously, but said nothing, and I splashed quickly past in case he should suddenly wave his red flag and turn me nine long miles back to Brecon!

The road led down now, with beautiful glimpses of the Wye Valley far below. At last I came to the little town of Builth Wells.



© "Illustrated" from Black Star

Arab Boys of Cardiff's Tiger Bay Learn the Koran

Many Moslems live in the crowded square mile adjoining the docks of this Welsh coal port, together with families of seafaring men of every creed and color. Nazi bombers destroyed the mosque here, but a new one has been built.

and was fortunate to find a lodging for the night in a pleasant boardinghouse beside the Wye, which is spanned at Builth by a picturesque bridge. Lulled by the chatter of the stream, I slept soundly, and next morning visited the deserted pump room to drink a glass of the famous sulphur and chalybeate waters before passing on my way over the hills to the Severn Valley.

The Wye and the Severn

Wales' two famous rivers, Wye and Severn, are twin children of Plynlimon, rising almost side by side in that mountain.

Next night I slept in the country home of friends near Newtown in Montgomeryshire, through whose Old-World garden runs the sunburnt Severn.

At Newtown was born Robert Owen, founder of the cooperative movement. Montgomeryshire, Owen's native county, has a fragrant wartime distinction.

It tops the list for Wales in the collection of medicinal herbs. The drying room of a Newtown tannery, once permeated by odors of a very different type, is an ideal place for the desiccation of sage and foxglove, colchicum and lime blossom.

From the banks of the Severn my winding road out of Wales led me to Dolgelley, which I reached in such a downpour as only Welsh mountains can precipitate. Not a glimpse of the mountains could be seen, and I decided to continue my journey by train along the shores of Bala Lake to Wrexham in Denbighshire.

Bala, nearly four miles long by three-quarters broad, is the largest sheet of natural water in Wales and empties into the Dee. By the time I reached it, the mists were running up the green hillsides and the sun was glittering upon surging streams, dripping trees, and wet bracken.

The railway follows the Dee Valley to



© British Columbia

Human "Hermit Crabs" Carry Basket Chairs down to Rhyl's Seashore

Wartime demand for beach-lolling space is considerable, because Welsh resorts, close to Liverpool, Manchester, and other industrial centers, are crowded. They fringe one of the few unrestricted sections of coast south of Scotland.

Llangollen, famous for its sheep dog trials* and its Two Ladies, the Lady Eleanor Butler and the Honorable Sarah Ponsonby, who ran away from their Irish home in 1776 under the spell of a romantic attachment, to devote their lives "to friendship, celibacy, and the knitting of blue stockings"!

Their devotion, it is pleasant to record, stood the test of time and they died at a ripe old age. They lie buried under one headstone with their faithful maid, Mary Caryll, in the churchyard of Llangollen.

The Home of Elihu Yale

My last night in the Principality was spent at Wrexham in Denbighshire. Here, near the richly decorated tower—one of the Seven Wonders of Wales—of the ancient church, sleeps Elihu Yale, founder of Yale University. As his famous tombstone records, he was

Born in America, in Europe bred,
In Africa travell'd, and in Asia wed,
Where long he liv'd and thriv'd; in London dead.

At the stately red-brick mansion of Erthig Park, a little to the southwest of Wrexham, Yale lived with his parents.

The north porch of the church was restored by graduates of Yale on the two-hundredth anniversary of the founding of the University, which "received its name A.D. 1718 in recognition of the bounty of the Honorable Elihu Yale, a former resident of this parish."

As I stood reading this interesting inscrip-

* See "Sheep Dog Trials in Llangollen," by Sara Bloch, NATIONAL GEOGRAPHIC MAGAZINE, April, 1940.

tion, there floated to me from the choir, where a practice was going on, the sound of boys' clear voices.

They were singing Bishop Heber's famous hymn, "From Greenland's Icy Mountains," which was composed for a missionary service in this church in 1809 by Reginald Heber, while he was visiting his father-in-law at the old vicarage. The vicarage itself is no longer standing.

The Welsh are a musical race; they are also deeply religious, their interest in religion having been fostered by their remarkable adult Sunday Schools.

"Remember," said a director of Welsh education whom I met in north Wales, "that our cultural background is quite different from England's.

"I've heard all sorts of questions discussed in those schools—miracles, psychology, even politics. You might almost call them debating societies. In fact, I've known one, at least, closed down just because it became too discursive. But they taught the people to think and to express their thought."

Wales is a land of mountains.

"Geography," as Sir Owen M. Edwards remarked over forty years ago, "ever triumphs over history, climate affects the bent of the mind as it affects the colour of the skin. The inhabitants of the Welsh mountains will ever be a separate nation—come they as a glacier stream from the north or as the lava torrent from the south. Whatever they are when they come, the mountains gradually and silently give them their own final character."

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Associate Editor of the National
Geographic Magazine

ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

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

Articles and photographs are desired. For material 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 horizon 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, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (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, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

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

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

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

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.

For his navigation today...



For her graduation tomorrow!



A gift that whispers more than words can say

THIS NAVY NAVIGATOR graduated into a world at war. His graduation watch—a Hamilton Navigational Time & Stop Watch. He depends on it to help guide his bomber to the target and safely home. Today every Hamilton Watch is going off to war with boys like this. But tomorrow, when our sons and daughters graduate into a world at peace, the men and

women of Hamilton will once again make watches worthy of this happier occasion. On that great day you'll be able to give your suddenly grown-up girl or

boy the one gift that will express your bursting-over pride, your wordless love . . . a watch well worth waiting for . . . a Hamilton!

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This expansion means that the Airlines will spend millions at a time when the nation's economy most needs such expenditure. But a far greater stimulant will

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THE AIRLINES OF THE UNITED STATES
LEADING THE WORLD IN AIR TRANSPORT

Vital link with the important island, PUERTO RICO



... thousands of travelers, millions of dollars worth of cargo—move to and from Puerto Rico in peacetime years—in AGWI SHIPS

The fame of Puerto Rico as a tropical playground for northern holiday-makers has spread far and wide, but hardly less known perhaps is this beautiful isle's great commercial importance.

In normal times before the war our trade with Puerto Rico reached \$187,000,000 a year! An abundance of sugar, tobacco, fruit, rum and hand embroidered work was shipped north, while steamers from the States brought down manufactured goods, as well as the refrigerated and processed foods so necessary to the island's economy.

Today the cargo and passenger steamers which served Puerto Rico are away on war duty. But when peace dawns, the great steamship organizations, developed through many years of shipping to "the islands", will be ready. Their

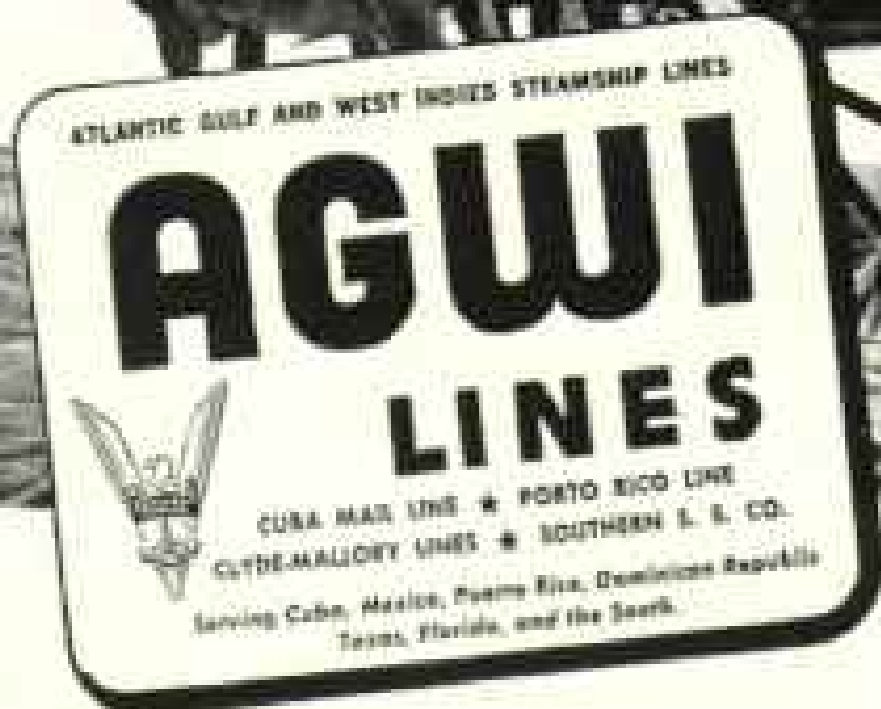
modern docks, warehouses, and shore personnel—experienced in the intricate handling of Puerto Rican trade—will swing into service again!

★ ★ ★

For over 50 years the PORTO RICO LINE has been a vital link with the important island of Puerto Rico, and the nearby Dominican Republic. There'll be a chorus of friendly "Viva Vapores"! when these familiar ships steam back into the harbors of San Juan and Trujillo City, to take up their normal cargo and passenger service between the islands and our own Atlantic ports.

PORTO RICO LINE

Foot of Wall Street, New York 5, N.Y.



**HELP CRUSH FORTRESS EUROPE—
BUY MORE WAR BONDS!**



© 1944, The Studebaker Corporation

Mighty Allied armies mass in India and Studebaker trucks help transport them!

FOR months, the United Nations have been getting ready in India for the big push to defeat Japan.

From the Burma border to the Khyber Pass, correspondents report tremendous activity—with even public parks in big cities serving as armed camps.

Effective mobilization in a land of India's size requires adequate military transport. And many an American boy stationed there could tell you how much dependence is being placed on big multiple-drive Studebaker military trucks.

Those Studebaker trucks in India are counterparts of the powerful, dependable Studebakers that have been doing such a superb transport job for the conquering Soviet armies. And, in addition to trucks, the five great Studebaker factories continue to build huge quantities of mighty Wright Cyclone engines for the famous Boeing Flying Fortress as well as other vital war matériel.

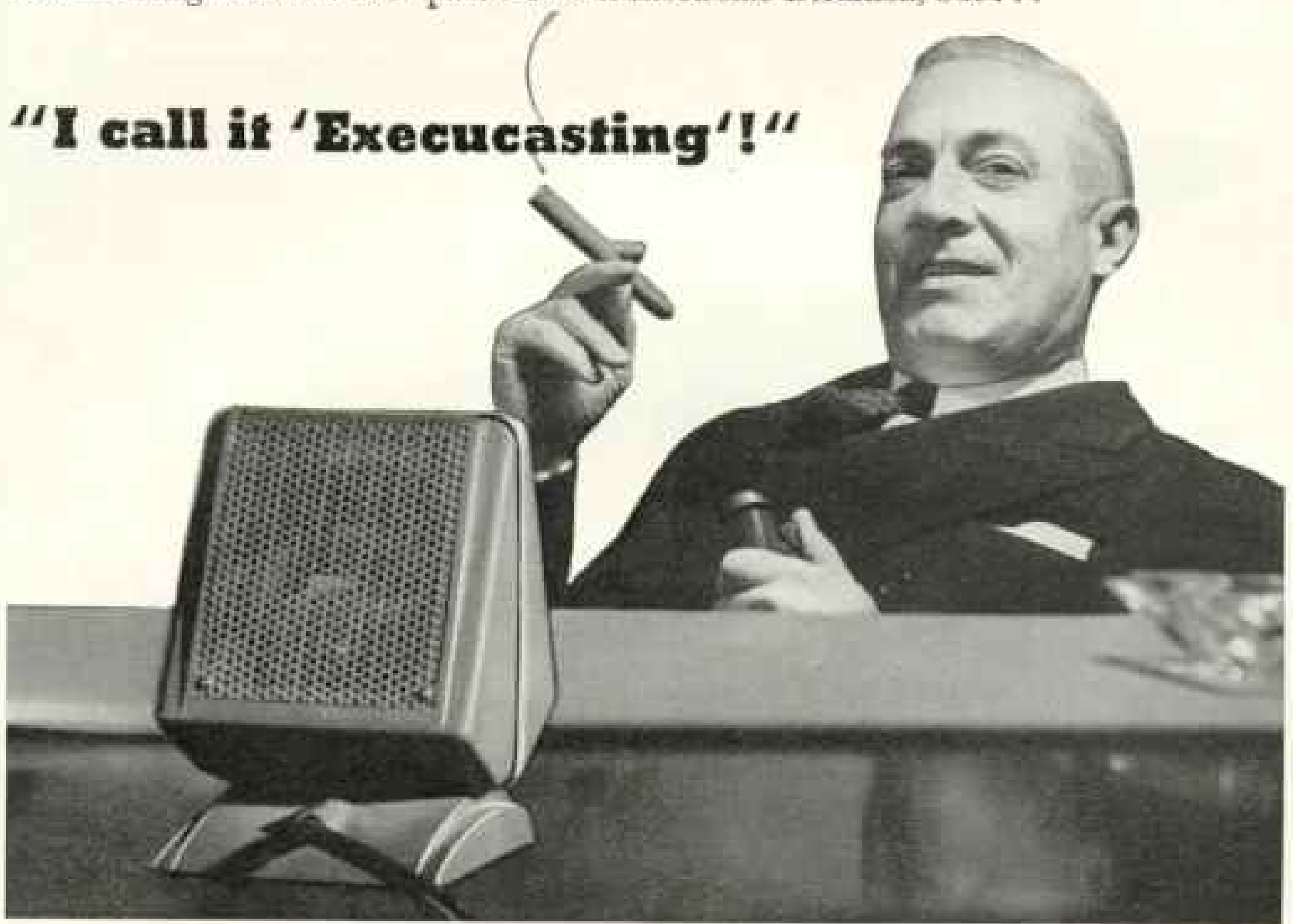


AND THEY'RE BOTH BUYING BONDS!

They're doing it in millions of American families—where sons are fighting and fathers are working on war production . . . they're all buying Bonds . . . to help speed Victory now—and keep our Nation sound.

"IT'S SO EASY. You just settle back, completely relaxed, and in a natural, conversational voice talk your notes, memos and ideas to a microphone on your desk. It gives you new dictating freedom. Dictaphone calls it Electronic Dictation, but . . .

"I call it 'Execucasting'!"



The microphone* picks up every word you speak . . . helps speed your ideas into action. What's more, Dictaphone Electronic Dictation records *both* ends of vital phone calls—facilitating prompt action on specifications, schedules and technical data that would otherwise be difficult to take down and remember. Under proper conditions, it even records across-the-desk conversations.

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other important work for you. Because Dictaphone recording is so clear, she'll find it easy to make letter-perfect transcriptions.

Dictaphone engineers developed Electronic Dictation before the war. It has been tested and proved in Government and industry under wartime pressure. Today this modern business method is available for essential uses.

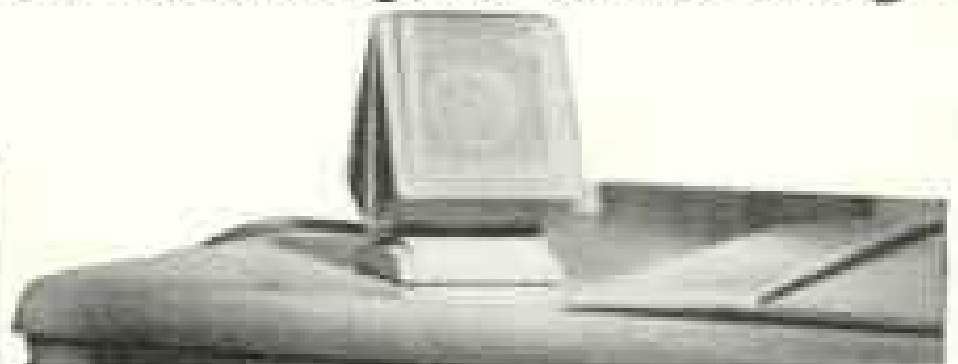
You'll be interested in our new booklet about Dictaphone Electronic Dictation. Write for it.

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DICTAPHONE
Electronic Dictation



The word DICTAPHONE is the registered trade-mark of Dictaphone Corporation, makers of dictating machines and other sound recording and reproducing equipment bearing said trade-mark.



Suppose Copper were a recent discovery . . . *what a stir it would cause in postwar planning!*

IF COPPER and its alloys were just now becoming available, they would be the most talked of materials in industry's postwar plans.

Think of it . . . metals at commercial prices, having all these advantages: Ready workability . . . high resistance to corrosion, immunity to rust . . . exceptional electrical and thermal conductivity . . . dependable uniformity. Tough, malleable, long-lasting, available in a wide variety of alloys, there would be a rush to such miracle metals by engineers, designers and production men everywhere.

Fortunately, of course, copper is not a new discovery, but one of the oldest and most useful metals we have. It has contributed in a large way to almost all of the technical and industrial advances Amer-

ica has known—from the telegraph to television.

A recent check of more than 700 leading manufacturers, whose peacetime production ranges from plated silverware to automobiles, shows that copper and copper alloys will play a major part in the finer products and services they are planning for postwar America. They know that in field after field there is nothing that can fill the place of copper . . . for production efficiency, dependable service and proved durability.

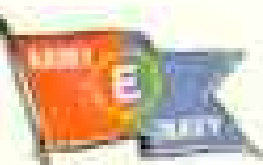


*When the red metal
 gets the green light*

Because of its very properties, all copper has had to go into production of war equipment. But when conditions permit, copper can be quickly diverted to industry. Anaconda Copper, Brass, Bronze and Nickel Silver will be ready.

600011

THE AMERICAN BRASS COMPANY
Subsidiary of Anaconda Copper Mining Company
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The American Brass Company, operating 13 U.S.A. and Canadian plants, has produced record tonnages of copper and brass for war purposes. All U.S. plants earned the right to fly the Army-Navy "E" pennant. While not eligible for the "E" award, the company's Canadian plants have also established outstanding records for wartime production.

LET'S ALL BACK THE ATTACK . . . BUY MORE WAR BONDS



Anaconda Copper & Brass

LET'S ALL BACK THE ATTACK
BUY WAR BONDS



They've got a lot more coming than Medals

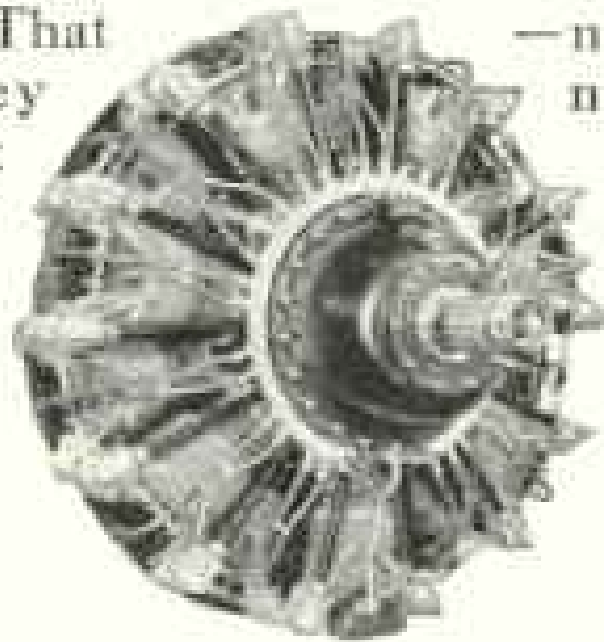


THEY came in at 250 feet, bombs set for delayed action lest the blast rip the tails off their chimney-skimming Liberators . . .

They came out so low that some of their bomb bay doors picked up wisps of hay in passing . . .

But behind them, fire-cored pillars of smoke said that Ploesti, once-vital source of enemy oil and fuel, had been ruined. That was what they had set out to do.

The medals waiting for them are the



least these men of our Air Forces have coming to them.

They deserve more than our cheers — they deserve also the very best we can give them to work with.

That is why Buick engineers have pooled their brains, sharpened their wits, whetted still keener their well-tempered minds.

That's why Buick people — nearly tripled in numbers over any previous peacetime peak — have been taught new

**BUICK
POWERS
THE LIBERATOR**

skills, schooled in fresh exactness, given new standards of meticulous precision in their work.

We know that every shining Pratt & Whitney aircraft engine that rolls from our plant marches straight into a brand-new Liberator bomber.

We never know when any bomber or any engine may be chosen to help strike a blow as crucial as Ploesti.

So we build every one to measure up in character and faithfulness to the men who will look to them to carry them through.

We aim to give that bunch the very best there is.

BUICK DIVISION OF **GENERAL MOTORS**

Every Sunday Afternoon — GENERAL MOTORS SYMPHONY OF THE AIR — NBC Network



ON THEIR WAY



Shades are drawn down. Lights dim low. The landscape is blotted out . . . there's just the hum of the speeding train.

These boys know what it means—the troop train is approaching the troop ships.

Some draw a deep breath. A soldier fumbles for a letter. Another wonders if he can make a last telephone call. Another draws out a crumpled photograph.

No, travelers don't see this—but the trainmen of the Pennsylvania Railroad do, daily. And more so than ever now. As the swelling tide of American youth—fine and fit—streams overseas . . .

Of course, it takes a lot of equipment for these troop movements—but with what remains we are doing our best to serve all essential travelers . . . efficiently, courteously.

BUY UNITED STATES WAR BONDS AND STAMPS



★ 45,194 in the Armed Forces

★ 131 have given their lives for their country



GANGWAY FOR A GOOD SOLDIER!

MAMA has decided that her two young men should meet each other.

And he's off to see his daddy — for the first time!

We may not be able to give them the kind of ride we'd like to. Trains will be crowded. Some coaches may not be as comfortable and convenient as our best equipment. They may have to wait on sidings as troop and munitions trains get the right of way.

But service men and their relatives are good soldiers. They take inconveniences in their stride, understanding that the railroads are doing the

best they can to bring them together.

With traffic so heavy, the railroads cannot always maintain all their prewar standards. But they are keeping their dates with convoys, and fighting all the emergencies that go with the world's biggest transportation job. They're working as they have never worked before and are determined to do their level best to help get the job done, and done as speedily as possible.



ASSOCIATION OF
AMERICAN RAILROADS

ALL UNITED FOR VICTORY



"Swifter than a race horse it flew over the icy streets!"

MANY a mustache cup was put down with a clatter. Many a housewife on this wintry Sunday in 1900 dreamed of a new family carriage—*without a horse!*

There on the front page of the newspaper was the thrilling story. Henry Ford had given a reporter a ride in the first Detroit-built automobile—an experimental model. It had been an inspiring experience.

A speed of 25 miles an hour had been attained. The reporter nearly leapt overboard in fright, but had successfully kept his perch over the three-gallon gas tank.

He was now able to record ecstatically that the "big machine rode with dreamlike smoothness"

despite ruts . . . that it "stopped within six feet" and then was off again "like a frightened ghost".

Mr. Ford had proved himself "an expert in cutting circles and other fancy figures". He turned sharp curves "with the grace and ease of a wild bird". Even a milk wagon and a loaded dray were encountered without mishap!

From these early days, the name Ford has never ceased to be news.

The reason lies in the basic Ford principle: *build a sturdy, simple car priced within the reach of the greatest number.*

When production was stopped on the 1942 models, more than 30,000,000 Fords had taken to the

road. Millions of them are still serving America's vital needs.

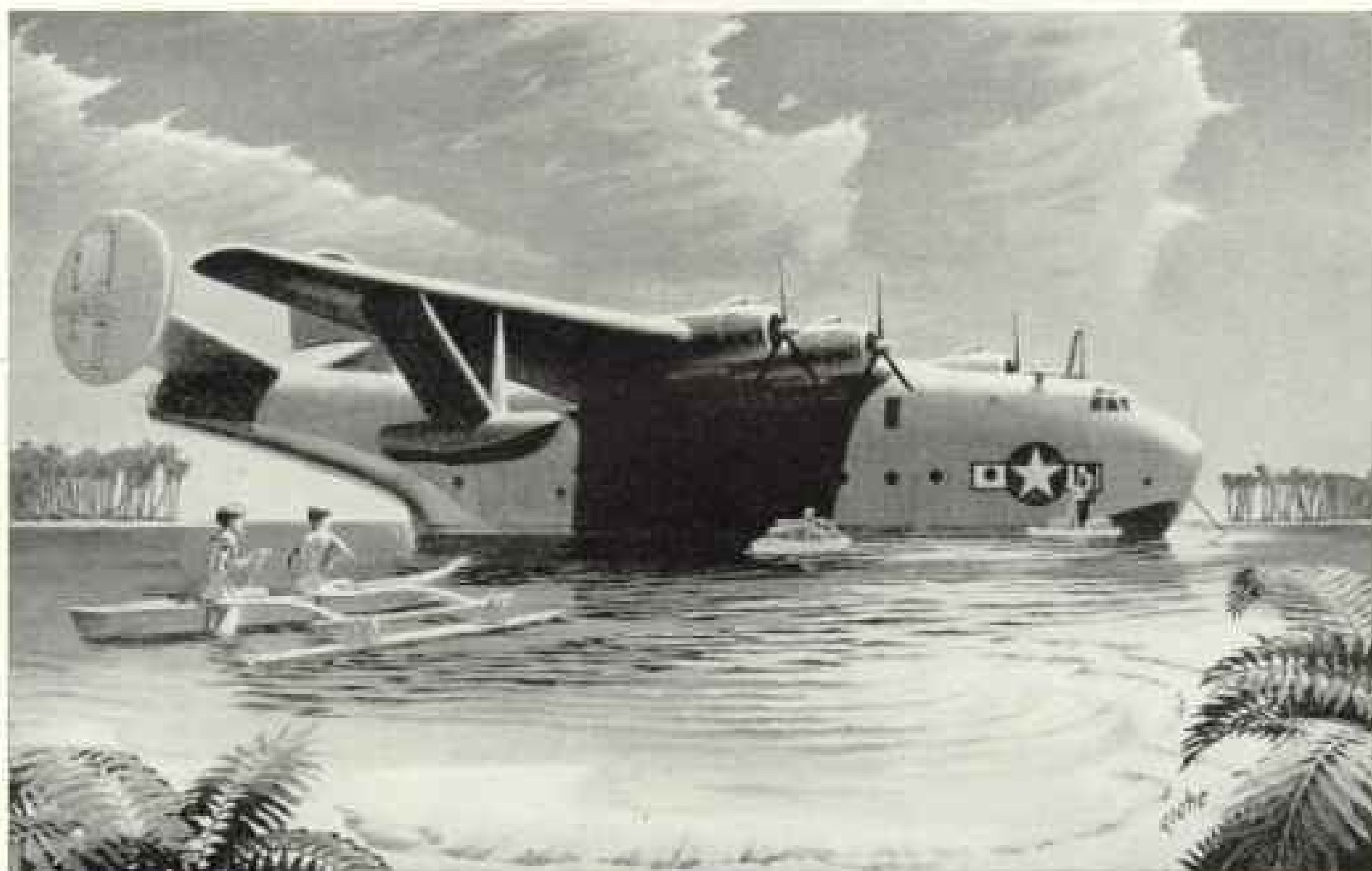
Much current news of Ford is "restricted," for it has to do with mass production of giant aircraft and other tools of victory.

But there will come a day when Ford news will again feature civilian models. You may be sure they will reflect all the ingenuity and precision engineering traditional with Ford.

Yes, the Ford cars of the future may even challenge the descriptive powers of that forgotten reporter who, at the turn of the century, rolled along the streets of Detroit "swifter than a race horse".

FORD MOTOR COMPANY

FACTS FOR FUTURE-MINDED AMERICANS



ABOUT THE MIGHTY MARTIN MARS

At some far-flung naval base, special equipment is needed . . . quickly. Big events are in the making; and the war can't wait while plodding freighters cross sub-infested seas. This is a job for the 72-ton Martin Mars, world's largest flying boat. Our Navy's answer to the cry of "more supplies . . . faster," the Martin Mars can carry 20 tons of cargo to the farthest spot on earth in 5 days or less. Now in regular service with the Navy, the Mars is the most efficient airplane yet built . . . per pound of material used, per horsepower and per gallon of fuel. Twenty more of these giant ships, each 82 tons, are now being built for the U. S. Navy.

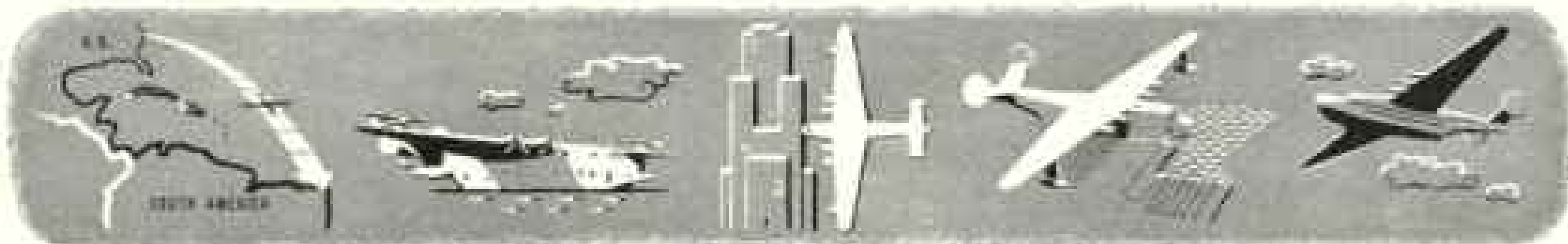
Into the Mars went hard-won Martin knowledge gleaned from construction of the original trans-Pacific Clippers . . . the giant Russian Clipper . . .

and the Navy's long-range patrol bombers. From the Mars have come further important findings which will lead added speed, safety and comfort to tomorrow's greater Martin airliners. The Martin Mars is doing more than help win a war . . . she's blazing the trail to a new and brighter tomorrow!

THE GLENN L. MARTIN COMPANY, BALTIMORE-3, MD.
GLENN L. MARTIN-NEEDHAM COMPANY—OMAHA

Martin
AIRCRAFT

Builders of Dependable Aircraft Since 1909



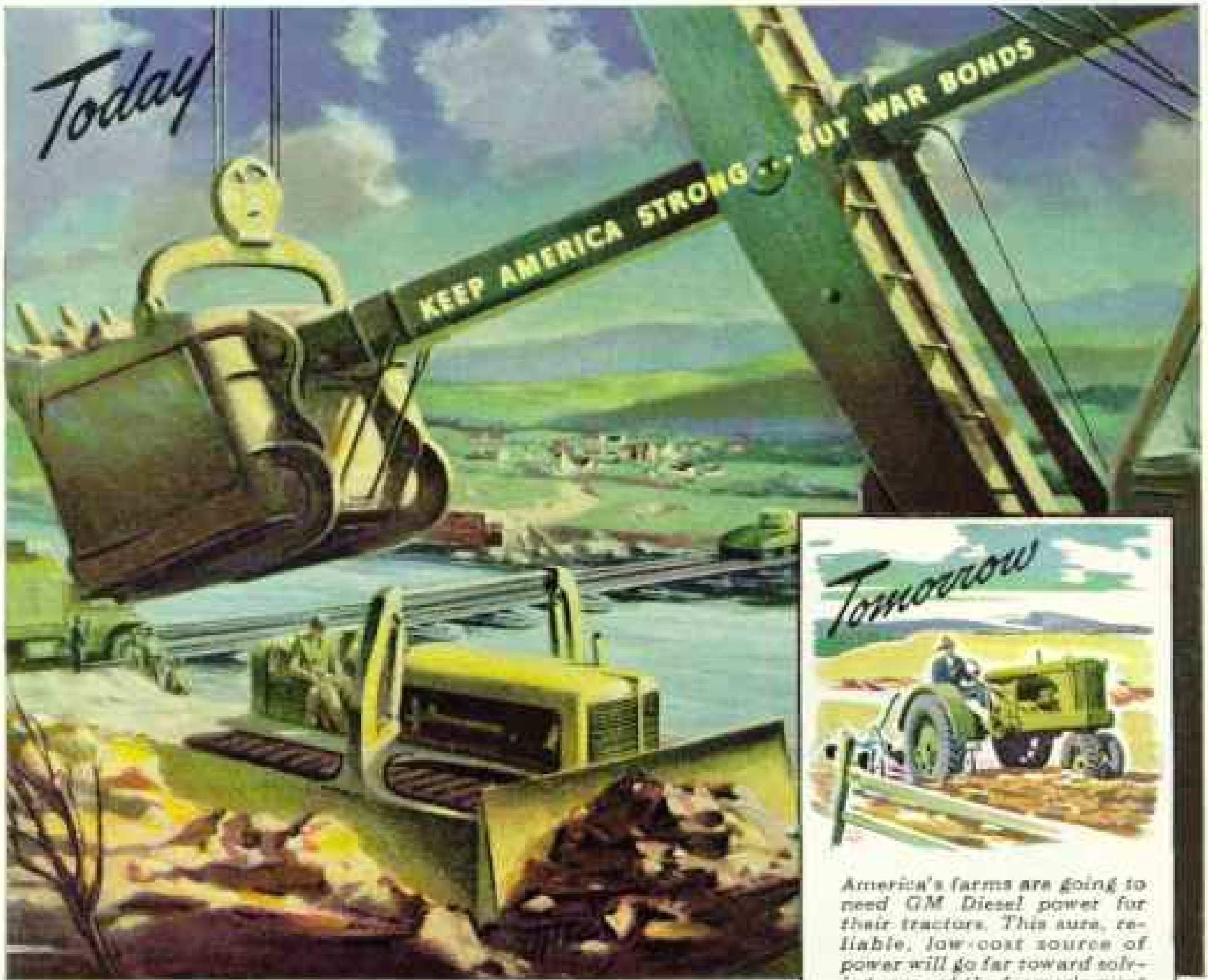
4375 Miles, Non-Stop from Maryland to Natal, Brazil, were flown by the Mars. She carried 16 persons, 11,000 lbs. of mail, broke many records. Four 2200 h.p. engines power the Mars.

From an Actual Photo of the Mars showing a standard sport plane on each wing, this gives some idea of her size. Mars' wings are so thick that crew can enter them to service engines while in flight.

If Stood on One Wing, the other wingtip would tower 200 feet into the air . . . higher than a 30-story building. Mars contains $7\frac{1}{2}$ miles of wiring, 1.9 miles of piping, uses 24 interplane telephones.

150 Soldiers, fully equipped, could be easily transported by the Martin Mars. Her content of 16,865 cu. ft. equals that of a 14 to 16 room mansion. When loaded, she draws 3 ft. of water.

Already Designed, 150 to 250 ton Martin airliners will someday succeed even the Mars. Martin engineers declare there is no practical aerodynamic limit to the size of over-ocean aircraft.



POWER TO WAGE WAR AND TO SERVE PEACE

FROM the very beginning, GM Diesels have been tested in the crucible of war. They power tanks, heavy gun tractors and bulldozers; submarines and subchasers; invasion boats and lighters. And everywhere, always, these weapons are proving worthy of the fine fighting men who are using them.

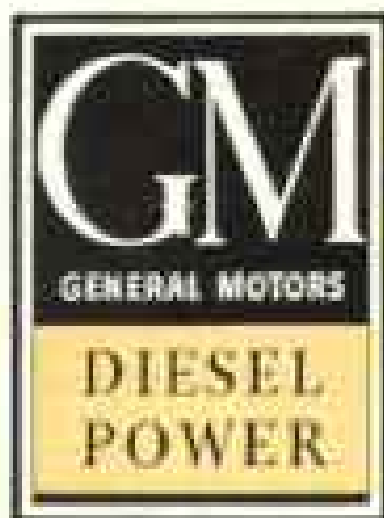
That is because GM Diesel operation is based on simple and sound mechanical principles. GM Diesel construction is ex-

ceptionally strong and uniformly precise — the way General Motors always builds.

When normal life and living are resumed, GM Diesels will be as ready to step back into private life and resume service in peace as they were to go to war. And you will find them as capable of sure, reliable, low-cost performance on the toughest jobs at home as they are on fighting fronts the world over.



America's farms are going to need GM Diesel power for their tractors. This sure, reliable, low-cost source of power will go far toward solving some of the farmer's most vexing problems. And not the least of these problems is to get more work done, faster and at lower cost in labor and mechanical power. GM Diesels will help.



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ENGINES . . . 150 to 2000 H.P. . . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

LOCOMOTIVES ELECTRO-MOTIVE DIVISION, La Grange, Ill.



PRODUCTION, too, is Supercharged



CHULA VISTA, CALIFORNIA
HELPING TO WRITE
THE STORY OF TOMORROW



Supercharge your Mind Having!

One of Rohr's assignments is making parts for and assembling installations of the superchargers that drive Liberators through the stratosphere. Rohr methods save hundreds of man hours on this one operation ★ This is another instance of how American manufacturing is supercharged to drive American production far above the reach of Axis enemies ★ The teamwork of American industry, working together for quicker victory, is exemplified by sixty-five separate firms which contribute their engineering and production skill toward the completion of this supercharger installation. Teamwork for Victory, staying on the job to finish the job... that's as American as Valley Forge... or Tarawa.



BUY WAR BONDS AND STAMPS

The last jar on the shelf!

"This hasn't been an easy year for anybody. But it's been some easier for us because of the things we raised and put up last summer. . . . Working together was fun and we lived better all winter. I'm glad we've got an even bigger garden now."

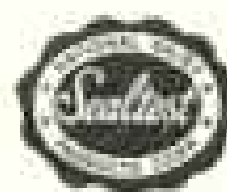
When Americans buckle down to do a job, they usually get results that surprise everybody—including themselves!

Last year's gardens are a good example. Some 20 million families tilled about 4 million acres of ground and harvested 8 million tons of food. They whittled down the country's total food bill by at least \$1,250,000,000—an average of \$62.50 a family.

Even though the national diet may have been limited, think how much worse it would have been without this home-grown help! And for 1944, the need is even greater. We've eaten as well as we have only by drawing heavily on reserve stocks that must be replaced. Our expanding armed forces and the peoples of freed lands will call for more food, too.

But if the need is greater, so is the opportunity. Seeds, tools and fertilizer are more plentiful. Experience gained last year will make this year's gardens more productive. And Uncle Sam expects several million more families to learn for themselves the satisfaction of growing and eating their own food.

Dedicated to the wider use and better understanding of dairy products as human food . . . as a base for the development of new products and materials . . . as a source of health and enduring progress on the farms and in the towns and cities of America.



**NATIONAL DAIRY
PRODUCTS CORPORATION**

AND AFFILIATED COMPANIES

Report No. 5 on
HONESTY ENGINEERING
—a new idea in
Personnel Relations



**“and it’s a big help in cutting down
employee turnover”**

STATEMENTS like that are typical of what personnel managers say about Honesty Engineering. Because by helping employees resist the temptation to turn dishonest, it prevents loss of hard-to-replace employees. One food processing concern, for example, found that this new Personnel-Protection Plan cut manpower losses due to dishonesty by more than 75%.

Based on experience, the U.S.F. & G. Personnel-Protection Plan not only insures you against financial loss through employee dishonesty but:
(1) discloses undesirable personnel and prevents

waste in training; (2) applies tested methods that keep good employees from going wrong; (3) helps employers eliminate leaks, pitfalls and careless acts that may lead to employee dishonesty.

Whether you employ 10 people or 10,000, your U. S. F. & G. agent will be glad to show you how the Personnel-Protection Plan helps you keep your employees by keeping them honest. Consult him today.

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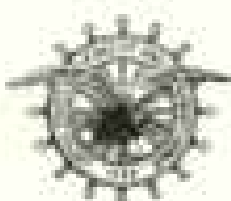
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"BEAR DOWN, MISTER... BEAR DOWN!"

I don't have to look at her . . .

I don't have to watch my ship die . . .

All my life long I'll see her in my mind's eye . . .

And always I'll hear the high, faint roar of planes circling . . . circling . . . circling . . . as their gas runs low and they've nowhere to go and the guys at the sticks look down on their ship and tears spill over the lids of their eyes and they stiffen their lips.

Ever lose your ship, Mister?

Ever lose your mother?

Ever lose your girl?

Your heart cracks and the weight on your back seems to push you under and you think you'll drown but you don't. You carry on, not for yourself but for the rest of the folks . . . for the family . . . the kids . . . for guys like these swimming around, circling around with night coming on and no ship to come home to and around and below only the empty sea.

But we don't want pity!

We'll come through! . . . We'll find another ship! . . . We'll get back! . . . Because we're free men, born to be on our own . . . brought up to fight on a team or alone . . . trained to live for our country, not to give up and die!

So, bear down, Mister . . . bear down . . .

For every drop of blood they spill . . . for every heart they break . . . for every tear that's shed . . . for every ship that's sunk . . . for every plane it costs . . . for every man of ours who's lost . . . they'll pay with ten of their own!

Bear down, Mister . . . bear down . . .

So the freedom we want . . .

So the futures we want . . .

So the country we want . . .

Will be there when we get back!

Here at Nash-Kelvinator we're building Pratt & Whitney engines for the Navy's Vought Corsairs and Grumman Hellcats . . . Hamilton Standard propellers for United Nations bombers . . . governors, binoculars, parts for ships, jeeps, tanks and trucks . . . readying production lines for Sikorsky helicopters. All of us devoted 100% to winning this war . . . to speeding the peace when our men will come back to their jobs and homes and even better futures than they had before . . . to the day when we'll build for you an even finer Kelvinator, an even greater Nash!



The Army Navy flag awarded to Nash-Kelvinator Corp., President Lincoln.

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TILL IT HURTS!

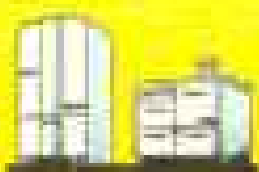


NASH



AUTOMOBILES

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REFRIGERATORS - ELECTRIC RANGES

FALSE TEETH WEARERS

Why
risk Double Danger
by brushing with
makeshift cleaners

BRUSHING your plates with tooth pastes, tooth powders or soap, may scratch the denture material which is 60 times softer than natural teeth. These scratches cause film, food particles, and stains to collect faster and cling tighter . . . resulting in unpleasant breath. Remember, you may not know you have it, but others do! Besides, brushing with makeshift cleaners often wears down the delicate fitting ridges designed to hold your plate in place. With worn-down ridges, of course, your plate loosens.



DO THIS EVERY DAY!



PLAY SAFE... SOAK YOUR PLATE IN POLIDENT. Place denture in Polident solution for 15 minutes, or longer if convenient. Rinse—and it's ready to use.

No brushing

A SAFE, MODERN way to keep dental plates, partial plates and removable bridges sparkling clean is to soak them in Polident every day.

Polident is approved by many leading dentists and the leading makers of modern denture materials.

No brushing, no danger, yet the daily Polident bath works into the corners and crevices no amount of brushing seems to reach—keeps your denture sparkling clean.



"NOW WE GO OUT . . . meet friends . . . have fun together." Millions call Polident a blessing. No fear of unpleasant breath due to unclean dentures—no risk of wearing down and loosening the plate due to brushing. Polident used daily helps maintain the original, natural appearance of your dental plate for less than a penny a day. Today—get Polident at any drug, department or variety store. 3 oz. size—30¢; 7 oz. size—60¢.

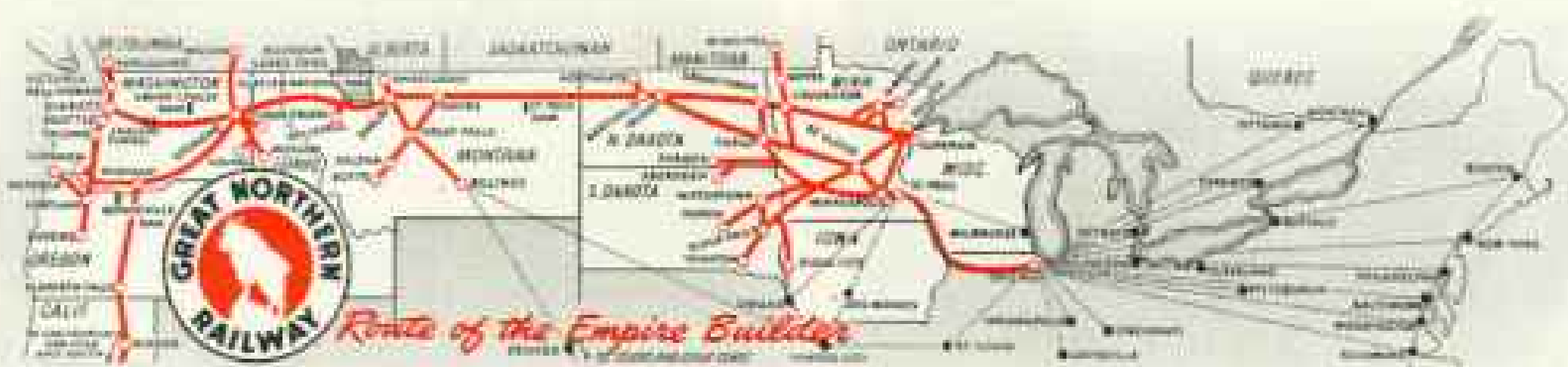
FREE—Booklet on Care of Dentures. Write: Hudson Products, Inc., Dept. M-64, 8 High St., Jersey City 6, N. J.

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Proper Maintenance Assures Physical Fitness—Keystone of Dependable Service

Great Northern locomotive shops and roundhouses aren't very glamorous places. They don't make pretty pictures. The men and women who work in them know the smell of smoke, the feel of grease, the heat of welding torches, the incessant rumble of machinery.

They know, too, the necessity for the constant inspecting, servicing, repairing and overhauling of the big iron horses which pull Great Northern trains.

Maintenance of a gigantic locomotive fleet entails difficulties in peacetime; but, stir in a war, mix with serious manpower* and material shortages, and the task becomes enormous and seemingly insurmountable. The railway is licking that job with knowledge, determination and resourcefulness.

*On April 1 there were more than 5,900 G. N. employees in the Armed Forces

Great Northern never has compromised on providing adequate, reliable motive power. Traditionally, the railway always has insisted on peak locomotive performance—the keystone of dependable service.

That tradition is one of the many things which make Great Northern great.

Polishing the headlight is a natural job for women workers.



The mechanism which provides even distribution of steam in a locomotive is a multiple valve throttle and superheater header. It weighs 1½ tons.



The front of a locomotive boiler is known as the "smoke box."



Tired iron horses undergoing repairs in one of G. N.'s several large locomotive shops, strategically located along the 8,000-mile system.



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Buy War Bonds — to Have and to Hold

Through the Roof

The whole of conquered Europe is a Nazi stronghold. Massive walls and powerful fortifications defend it—all as nearly impregnable as Hitler can make them.

But overhead there are no walls. It is *through the roof* that Allied bombers have inflicted the heaviest blows on Germany's war-making machine.

To the valiant young Americans who man the Boeing Flying Fortresses, "through the roof" now has an added significance. On days when there was a thick overcast, Europe was once safe from precision bombing. Today new navigation devices enable the Fortress bombardier to hit his target

through dense cloud cover with almost the same uncanny accuracy as when the air is clear. The first raid by the Forts on Berlin was made under just such conditions.

The deadly bombing done by the big Boeing planes has become a matter of wonder, not only to our Allies but to the enemy. After Flying Fortresses had demolished the Messerschmitt plant at Regensburg without allowing a single bomb to fall on a hospital which was practically a part of the factory area, our Eighth Air Force fliers got a radio message from the Luftwaffe. The net of it was: "Congratulations on your accuracy. We don't know how you do it!"

The Fortress crews know the answer. It is done by cool courage, skill and training, and by the extraordinary bombing stability of the steady-flying Forts themselves.

Some day Boeing's design, engineering and manufacturing skills will be turned once again to products of peacetime. And you can have full confidence in any such product . . . if it's "Built by Boeing" it's bound to be good.

NEW AIR FORCES COMBAT FILM

The Army Air Forces motion picture, "The Memphis Belle," shows heroic crews of Boeing Flying Fortresses in actual combat over Germany. See it at your local theater.

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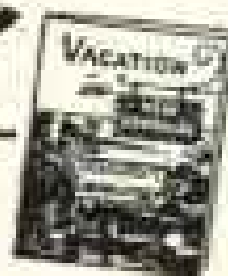
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Stomach-ache or Appendicitis?

—it's not for you to say



DON'T DO THIS: If you have an unusual abdominal pain—don't take laxatives or home remedies; don't take food or liquids, except water.

WHY NOT? Food or laxatives might rupture the appendix, if it's inflamed, and, thus, spread infection—the cause of most deaths in appendicitis. These complications are four times as frequent among those who take laxatives.



DON'T DO THIS: Don't try to go about your business. Don't rub the spot that hurts, or apply an ice bag or hot-water bag.

WHY NOT? Physical exertion or massaging may be dangerous if the appendix is inflamed. Heat or cold might kill the pain and give the idea that the attack has passed. It may be "only a stomach-ache." But that's not for you to decide.



DO THIS: If the pain is puzzling and persistent, if it's accompanied by nausea or vomiting, call a doctor at once.

WHY? Only a doctor is qualified to say whether you have appendicitis. He may want to take one or more blood-cell counts, watch your temperature, and wait for pain to localize. Chances are it isn't appendicitis. If it is, and an operation is advised, quick action may save life, time, money.



DO THIS: Stay in bed, resting comfortably until the doctor comes.

WHY? If you *do* have appendicitis, complete rest may help prevent serious complications. Prompt attention, together with the recent advances in medical science, have reduced by half the deaths from appendicitis in the past few years.

Send for Metropolitan's free booklet, 64-N, entitled, "Appendicitis."

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His Front Door is a Waterfall

THE WATER OUZEL, or dipper, (*Cinclus mexicanus unicolor*) is quite an ordinary-looking little fellow.

But, actually, he is one of the most interesting birds of North America.

He lives only near high mountain streams and has the strange habit of diving into the stream and walking on the bottom while he feeds.

The ouzel's choice of a place to live is unique. The female often builds her nest under and behind a waterfall.

Where a stream drops over a cliff, it pitches outward a short distance as it falls, leaving a mist-filled space between the waterfall and the rock. There, on some jutting ledge, the nest is placed.

This strange location has two distinct advantages for the water ouzel. Not only is the nest well hidden, but it has only one approach: through the falling water.

The water ouzel has no difficulty in flying through the waterfall to his nest. But this barrier proves quite effective in preventing most enemies from discovering the nest, invading it and stealing the eggs.

And so the water ouzel's home is well protected from danger.

Now, obviously, it is not convenient for the average man to protect his possessions by hiding his house. And though his home, with its strong walls, its locked doors and windows, may seem as safe as the water ouzel's nest, actually it is far from invulnerable.

You may become the victim of prowlers who steal your possessions and damage your property. Unless you have insurance to cover the value of your loss and damage, you may suffer serious financial consequences.

Today, the value of your property is increased by wartime shortages. You need Theft insurance more than ever before—insurance that covers your possessions while they are in your home or when you have taken them on a trip. And it is important that you make sure the policies you already hold, now give you enough protection. Your local Travelers man will be glad to help you with this problem.

MORAL: Insure in The Travelers. All forms of insurance and surety bonds. The Travelers Insurance Company, The Travelers Indemnity Company, The Travelers Fire Insurance Company, Hartford, Connecticut.

Have a Coca-Cola = Howdy, Neighbor



... or greeting friends at home and abroad

One of the first places they head for, when they get back, is the neighborhood soda fountain and all its old associations... among them, Coca-Cola. Many places overseas, too, your American fighting man meets up with that old friend... ice-cold Coca-Cola. It's always like word from home to hear the friendly greeting *Have a "Coke"* in a strange land. Yes, around the globe, Coca-Cola stands for *the pause that refreshes*,—has become a symbol of our way of living.

* * *

In news stories, books and magazines, you read how much our fighting men cherish Coca-Cola whenever they get it. Luckily, they find Coca-Cola available in over 35 allied and neutral countries 'round the globe.



It's natural for popular names to acquire friendly abbreviations. That's why you hear Coca-Cola called "Coke".

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IN 1938 Kodachrome sheet film led to full-color photographs as magazine and newspaper illustrations.

IN 1941 Kodak introduced Minicolor Prints from miniature Kodachrome Film transparencies—the first direct full-color photographic prints.

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*Some day...
when I come back*



SOME DAY WHEN I COME BACK, we'll travel together on this Olympian—we'll take it on the honeymoon that war does not give us time for now.

Hand in hand—just you and I—we'll wander through the mystic wonderland that's Yellowstone Park and see its spouting geysers, its bubbling paint pots, its multi-colored terraces, its breathtaking canyon.

We'll visit a Montana dude ranch, too—and sit a-top a corral fence and plan our years together in the moonlight as a cowboy in the distance chants a plaintive but oh, so peaceful, song of the range.

We'll go westward and sail across Puget Sound.

From a snow-capped peak on the Olympic Peninsula we'll watch the sun sink in the blue Pacific.

We'll stay in a chalet in Paradise Valley at towering Mount Rainier—stroll through flower-decked Alpine meadows to glaciers and ice caves and snow fields.

It won't be too long till we realize this dream, I hope. It's one reward victory will bring—to us.

THE MILWAUKEE ROAD

MANOIR RICHELIEU *and Collège*

MURRAY BAY • QUEBEC



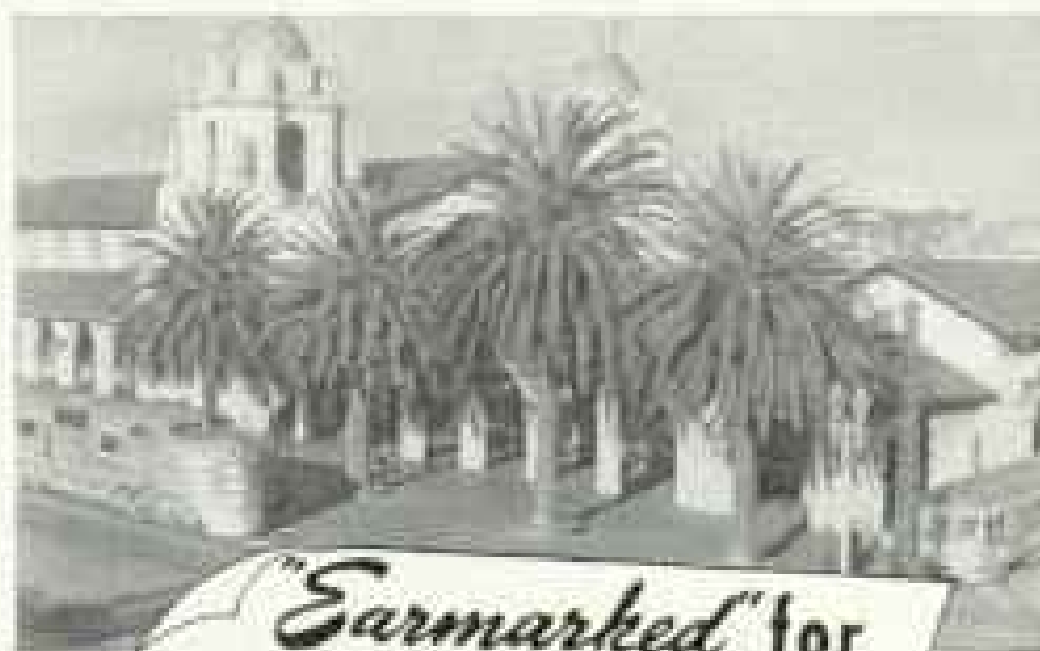
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This beautifully illustrated 372-page book, edited by John Oliver La Gorce, contains 105 pages of FULL-COLOR plates showing 251 species of fish and other forms of marine life; 162 action photographs; 102 biographies; 11 chapters of authoritative narrative. The most comprehensive full-color presentation yet published of the better-known salt- and fresh-water fishes of North American inland and both coastal waters. Light blue cloth covers, 7 x 10 1/4 inches.

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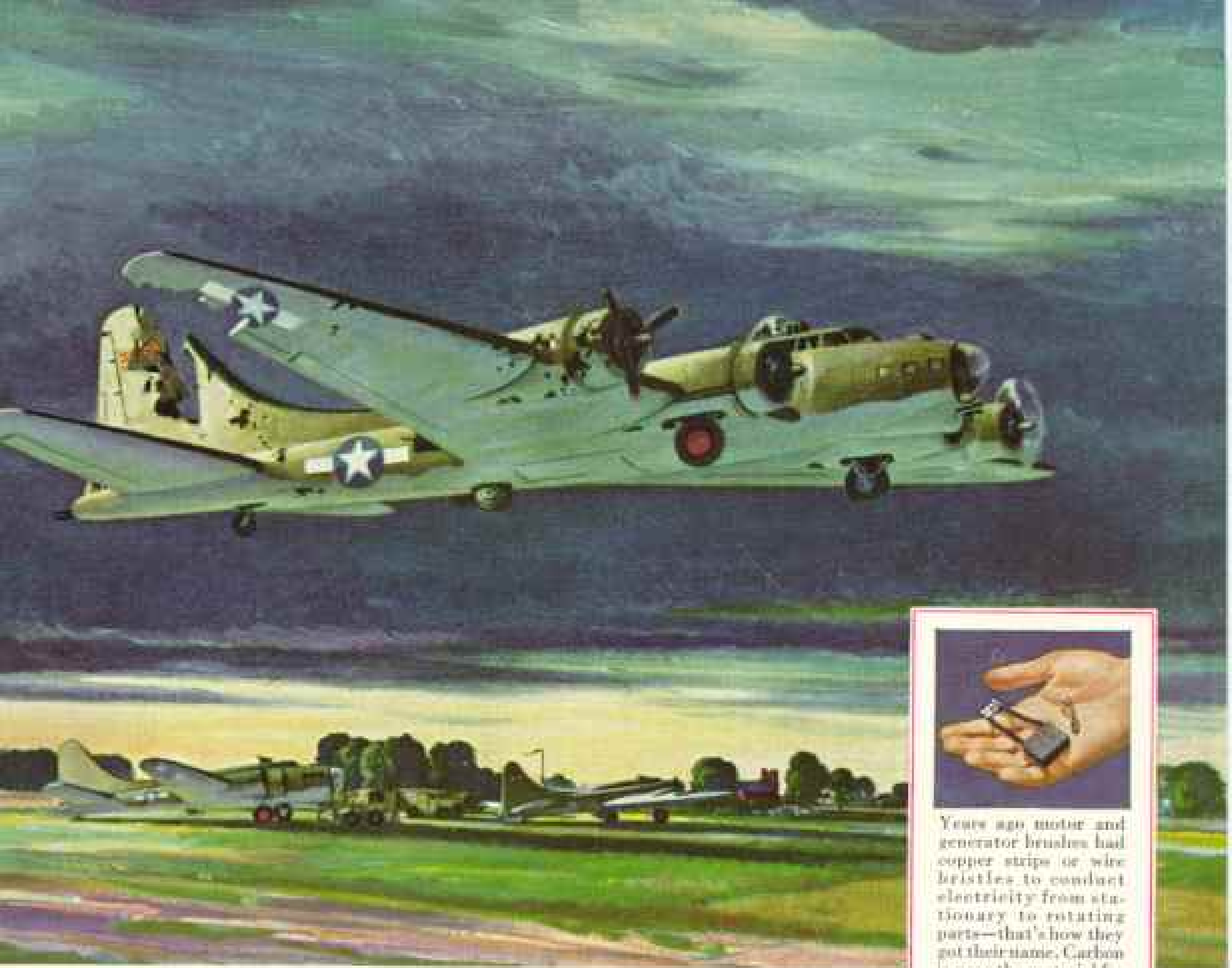


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