



Photograph by R. Anthony Stewart

Prehistoric Animal Effigies Are Grouped About Asphalt Pits in Southern California

Oil seepages may turn to asphalt. Thus La Brea Pits, in Los Angeles, were formed. Saber-toothed tigers and other now extinct animals, accidentally mired in this sticky asphalt, were thus preserved. Effigies represent animals perishing here from 20,000 to 50,000 years ago.

thodic protection; galvanic corrosion; plastering behavior—what a strange language!

To you and me, all it means is that science is simply finding new ways to do things better in the oil business.

Fossil remains of saber-tooth cats, camels, mastodons, mammoths, and other prehistoric animals, also birds, found in Rancho La Brea asphalt pools, in Los Angeles, have been preserved there for 20,000 to 50,000 years. "Seldom, indeed," says the Los Angeles Museum of these famous tar pits, "are conditions found so favorable for the reconstruction of a life record of the past."

Asphalt—from Mummies to Levees

At creation's dawn, when so much world was under water, life consisted of microscopic animals and plants.

These died, through the ages, leaving sediment on ocean floors. When lands formed, the ocean beds shuffled, and heat and pressure turned the sediments to petroleum and gas, says one theory.

When oil finally seeped up on the new-formed continents, its volatile parts—kerosene, etc.—evaporated into the sunlight; left behind by inspissation were the hydro-

carbon solids from primeval days—asphalt.

How indestructible asphalt is! Ur of the Chaldees had gutters lined with asphalt, built 5,000 years ago—and they're there yet!

Egyptians used asphalt to embalm mummies; in fact, the Arab word for mummy is the same as that for asphalt. Assyrian kings built asphalt dikes to keep the Tigris out of Nineveh.

Today Army engineers use asphalt mats to keep the Mississippi River from breaking through its levees and swamping New Orleans (page 743).

Early American use of asphalt was a paved sidewalk about the old Merchants' Exchange in Philadelphia. London paved Threadneedle Street in 1869. Washington, D. C., paved some streets with asphalt in 1876—and they're still so paved.

First commercial asphalt came from that natural lake in Trinidad, which may *not* have been discovered by Sir Walter Raleigh in 1595, as often said.

Now most asphalt used here comes from oil refineries. At first, however, asphalt, as a residue at refineries, was a sticky, dirty nuisance; oil men didn't know how to get rid of it.



Photograph by Rex Ahlson

Majestic Mount Hood, from Cloud Cap Inn, Here Fills the Southern Sky

Comfortable resting place on the Timberline Trail (page 792) is this lodge, three miles from the snowy summit of Oregon's highest mountain. The conical peak, decked out in ermine cloak and hat, was first seen in 1792 by Lieut. William R. Broughton and named by him in honor of Lord Hood, a hero of the British Navy. Oregonians, to whom Mount Hood is "our mountain," often use the Indian name, *Wy'east*.

spectacular 57-mile run down Kicking Horse Canyon from Lake Louise to Golden (page 753).

In this beautiful region moose lift long, dripping muzzles above lush feeding beds (Plate III), and bears beg for sweets. Here lie the mighty glaciers that feed many rivers, and over these Rocky Mountain passes ran the arduous trails of the fur brigades from Fort William and Montreal.

From Windermere Lake (page 774) to Golden the Columbia is a quiet, absent-minded stream, aimlessly meandering between homestead and haystack. But at Golden the easy-going Columbia comes to life under the swift impact of the Kicking Horse, a raring, tearing river down whose canyon the Canadian Pacific trains roll from the Great Divide.

To this point the Columbia has dropped only 72 feet in 124 miles. Now, combined with the milky-green Kicking Horse, it be-

comes headstrong and powerful. An American civil engineer, who descended the entire river alone in a 17-foot rowboat in 1921, lists 29 rapids between Golden and Revelstoke.

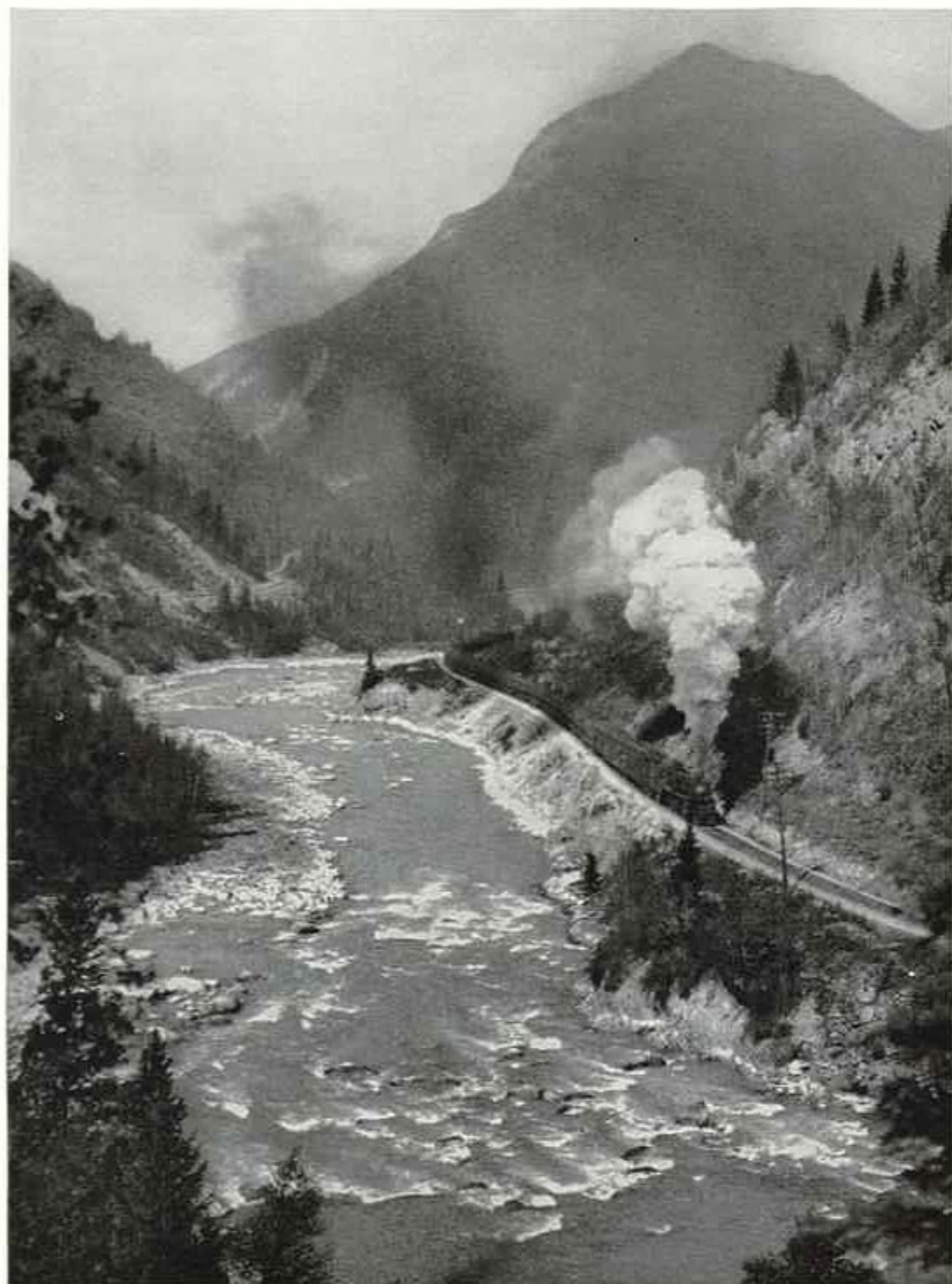
In this hydraulic escalator, the Columbia drops 1,087 feet in 207 miles.

Crossing minor valleys where early trails once lined down off the roof of the continent, we passed Bush Lakes and crunched to a stop. Other motorists were looking steeply down to the river, its smother of rapids split by a tree-topped islet.

"What a surprise!" breathed a smart youngster in slacks.

"Surprise Rapids" they were named long ago.

To motorists this tumble of white water, the roughest, toughest rapid on the Columbia, has fantastic allure. But it sucked many an unwary *voyageur* (French-Canadian trapper) to sudden death.



Photograph by Byron Hatman

With a Huff and a Puff a Canadian Pacific Train Climbs Kicking Horse Canyon

Bound for the Continental Divide, big locomotives, between Golden and Field, lift long trains 1,500 vertical feet in 35 miles. The swift Kicking Horse turns the sleepy Columbia into a wild and powerful river blocked by rapids and packed with power. This pass lies in Yoho National Park, west of Lake Louise.

"Too bad you weren't here fifteen minutes ago. We just had a nude party."

Not a blush on the young faces about us. In honor of a large group of visiting Molokans—also dissenters, whose name and strength come from milk—the Dukhobors had undressed. Before Adam and Eve donned fig leaves, they say, the world was Paradise.

Along narrow benches, far above water level, they have laid out well-tended farms and orchards. Portable motor pumps putt-putt-putt. Automatic sprinklers water their colossal cabbages.

Seeing a memorial inscription in Russian on a rugged boulder, I mumbled off a few words. This was not the thing to do. The young Dukhobor girl who was showing me around protested, "I can read," for the Dukhobors, resisting government schooling, are often accused of illiteracy.

Beside the Dukhobor apple orchards at Brilliant, the clear, dark-green Kootenay, having spent much of its force in the power stations at Bonnington Falls, humbly joins the Columbia.

From Castlegar to Trail's smoking smelters there are only minor rapids. Trail is one of the chief industrial centers of wartime Canada, and armed guards inspect every car, reinforcing their sawed-off shotguns with disarming courtesy. Even here, a United States license plate is a passport to friendliness.

Detouring through Rossland to Northport over an unfortified international boundary marked by a firebreak, we returned to the railway bridge at Waneta, below which the Pend Oreille joins the Columbia.

Some geographers assert that the true source of the Columbia is up this river, on the watershed below the billion-dollar hill of copper at Butte, Montana. But where the Columbia and Pend Oreille unite, the Columbia contributes 77 per cent of the combined flow.

Since Grand Coulee Dam backs up the water to the Canadian boundary, one might think that flood damage in the upper valley would be increased. But our engineers, removing obstructions in the Little Dalles, have actually *lowered* the flood level.

Bulldozers and Big "Cats"

Around the 500-mile shoreline of the still-unnamed artificial lake above Grand Coulee Dam, we found W.P.A. workers tidying up the banks so that debris will not impede navigation or clog the trash racks.

While last-minute placer miners rescued bright flakes of gold, we watched bulldozers push over tall trees and saw great "cats" claw off high spots, dump the dirt, and repeat, while

dusty surveyors squinted through transits and waved their arms.

From 50,000 acres of prospective lake bottom, 30,000,000 board feet of commercial lumber had been cut. Twelve hundred buildings had been razed or moved uphill. Roads and railways had to scramble to higher ground. After a final dance at one riverside town the guests turned the whole shebang into a bonfire.

Felt-hatted "braves" solemnly witnessed the decent transfer of the bones of their ancestors, described in dramatic pages of Lewis and Clark, and Washington Irving.

Indians Hold Farewell Powwow

Before rising water stilled the roar of the cascades the Indians celebrated a final powwow at their historic fishing station beside Kettle Falls.

From this beauty spot, cluttered with the material for two bridges, one road follows the Columbia, passing labor camps, bunkhouse barges, and drowned town sites.

The other passes through Chewelah, undeveloped center of the large magnesite deposits. It continues to Spokane between rolling hills where 16 horses, harnessed in fours, were reaping golden grain (Plate VIII).

Long ago an ice lobe, creeping down the Okanogan Valley, blocked the Columbia River channel. The impounded water, finding an outlet over the left bank, began carving a second channel—the Grand Coulee, or Big Spill. When the ice dam melted, the Columbia returned to its original chasm (page 775).

Many men dreamed of replacing the vanished ice dam with concrete, but cost and international complications intervened. Such a dam would flood vast areas in Canada. Engineers wrestled with the technical details. A mere power dam would be too low for irrigation. The ideal dam would furnish enough hydroelectric power to pay for itself and also drive the necessary pumps for irrigation.

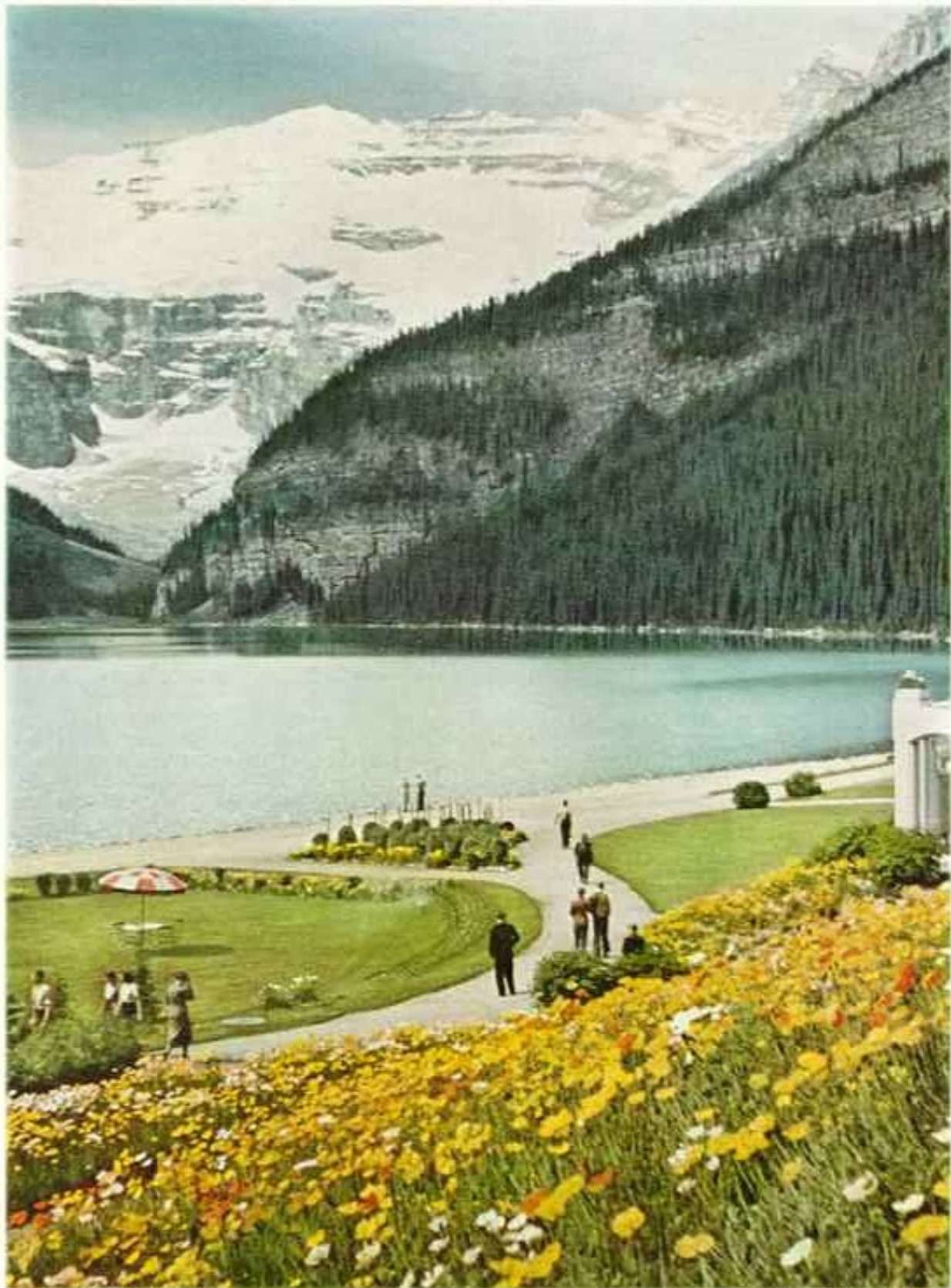
In the end, the altitude of the river at the Canadian border determined the height of Grand Coulee Dam, which raises the water 355 feet, to 1,292 feet above the sea.

This level is still far below that of the irrigation reservoir to be built in the prehistoric spillway—Grand Coulee—which gave the new dam its name. To lift water the necessary 280 feet, engineers designed such pumps as the world has never known.

Spokane has been power-conscious for decades, since it owes its very being to midcity waterfalls. Electrical gadgets filled Spokane store windows when older cities were still turning their toast by hand (page 777).

Using Spokane River water for generating

The Columbia Turns on the Power



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Photographs by Marnard Owen Williams

Like an Emerald Set in Diamonds Is Lake Louise, Cupped in a Ring of Snowy Peaks

Seen from the gardens at Chateau Lake Louise, Mount Victoria, five miles away, seems shrouded in a light fall of snow; yet the white patches are glaciers 100 to 250 feet thick. Discovered in 1882 by a Banff guide, the lake was named for Princess Louise, wife of the Duke of Argyll, then Governor General of Canada.



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Kodachrome by Marnold Owen Williams

"Ride, Tenderfoot, Ride" Might Be the Theme Song for the 36-mile Timberline Trail Around Mount Hood

Like a wide-looped lariat around Oregon's highest peak, a horseback trail circles Mount Hood. From it one has inspiring views of distant peaks, the Hood River Valley fruit bowl, and the deep gorge of the Columbia River.



© National Geographic Society

Kiosk-trone from Photo-Art Studios

Favorite View Up the Columbia Is This Wide Gorge Between Washington and Oregon, Seen from Crown Point

Far up the river is Bonneville Dam, at the head of tidewater. Highways, railroads, and airplanes now follow the route carved by the Columbia ages before it served as a water trail for pioneer settlers coming to Oregon Territory.



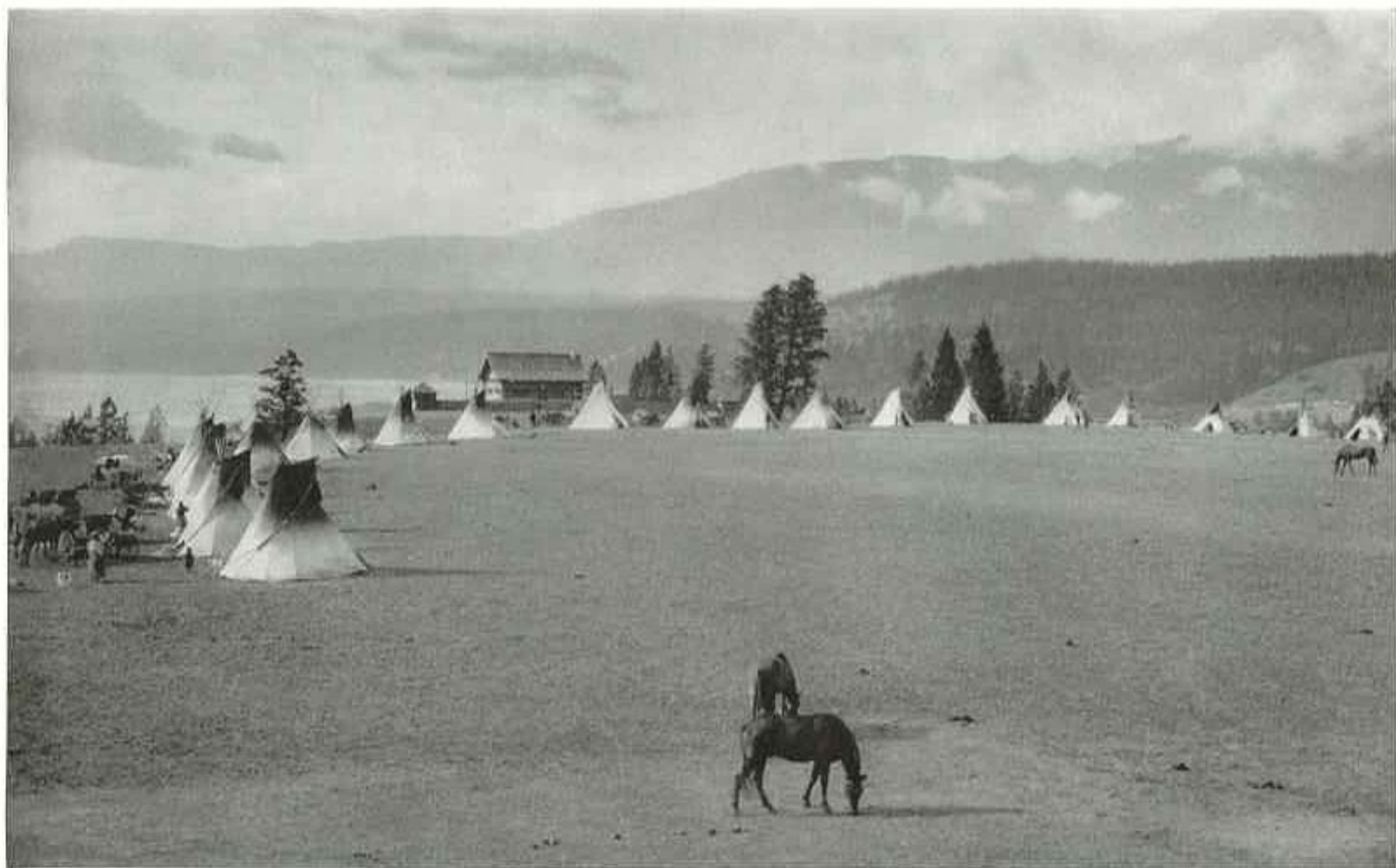
From Snowy "Albatross" to Scarlet "Wurtembergia," Oregon Gladioli Run the Color Gamut. East of Portland are flower fields as colorful as tulip time in Holland or anemones in Gallée.



© National Geographic Society

Kodachromes by Margaret Owen Williams

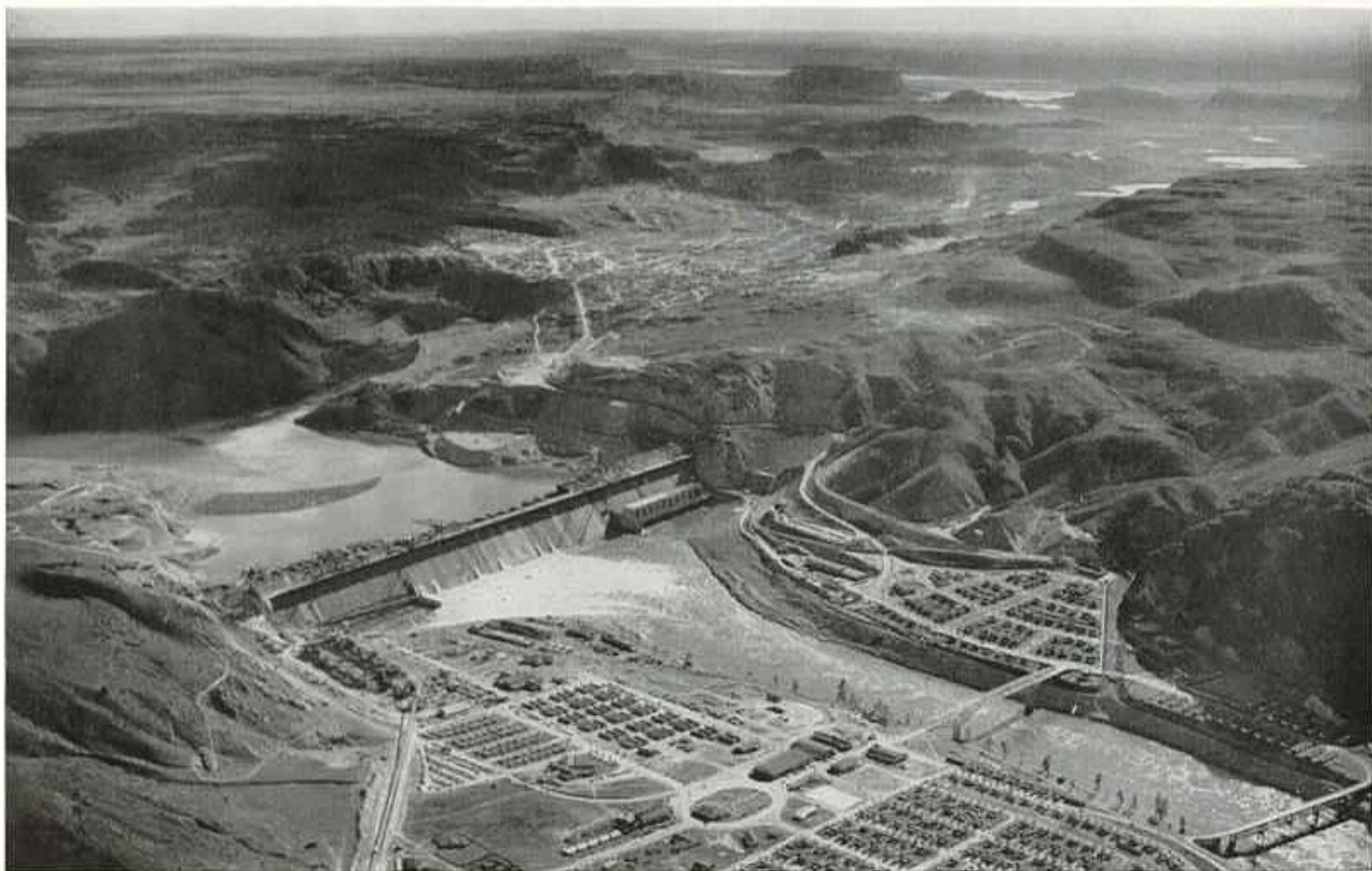
Sixteen-horse Combines Still Reap Golden Grain Near Spokane



Photograph from Douglas Peattie Redoubt

Kootenay Indians Gather to Honor a Great American Geographer and Help Found a Town

On Canterbury Point, overlooking splendid Windermere Lake, David Thompson Memorial Hall, resembling a Hudson's Bay Company fort, was built for assemblies, dances, and badminton in 1922. Thompson, early fur trader and first white man to follow and map the whole course of the Columbia, reached this wind-swept site in 1807 and located the first trading post on the Columbia, "Kootenay House," in a sheltered spot on Toby Creek just north of the lovely lake.



Photograph by U. S. Bureau of Reclamation

Man's Greatest Dam, Its Three Satellite Towns, and the Dry Site of a Future Irrigation Reservoir Pack This Air View

Laid out in the foreground is temporary Mason City. Across the Columbia River is "Engineers' Town" (Coulee Dam). Beyond lies the hilltop town of Grand Coulee. In the Ice Age a mammoth frozen barrier blocked the river gorge here. Its overflow carved the barren valley, Grand Coulee (upper right). There irrigation waters, lifted 280 feet from the new lake, will be stored. Steamboat Rock (upper center) will again become an island (pages 754, 771).



Photograph by U. R. Burson of Rehabilitation

"The Biggest Free Show on Earth" Was the Building of Grand Coulee Dam

Once every hour, all day long, lectures are given in grandstands at both ends of the dam. The construction drama, prosaically known as P.W.A. Project No. 9, has been going on, night and day, for more than seven years. In that time, enough material was removed to build seven Pyramids of Cheops and enough concrete poured into the dam to construct three such pyramids (page 771).

to the side valley carved by floods in the course of the Ice Age.

Thence the water will flow to 980,000 acres, be lifted by auxiliary pumps to 220,000 more, all divided into farms of not more than 80 acres each.

Trek of the Fruit Wrappers

Coming down through the fruit-rich Okanogan Valley one day on a bus, we stopped for a quick lunch amid the latest in hairdos, sport blouses, slacks, and feminine footwear.

"Tenderfeet?" I asked the driver.

"Fruit wrappers. At 4½ cents a box, one of those girls can earn \$9 a day. When the season's over, they go home and wash off their nail polish in dishwater. From early apricots to late apples they make more money than I do."

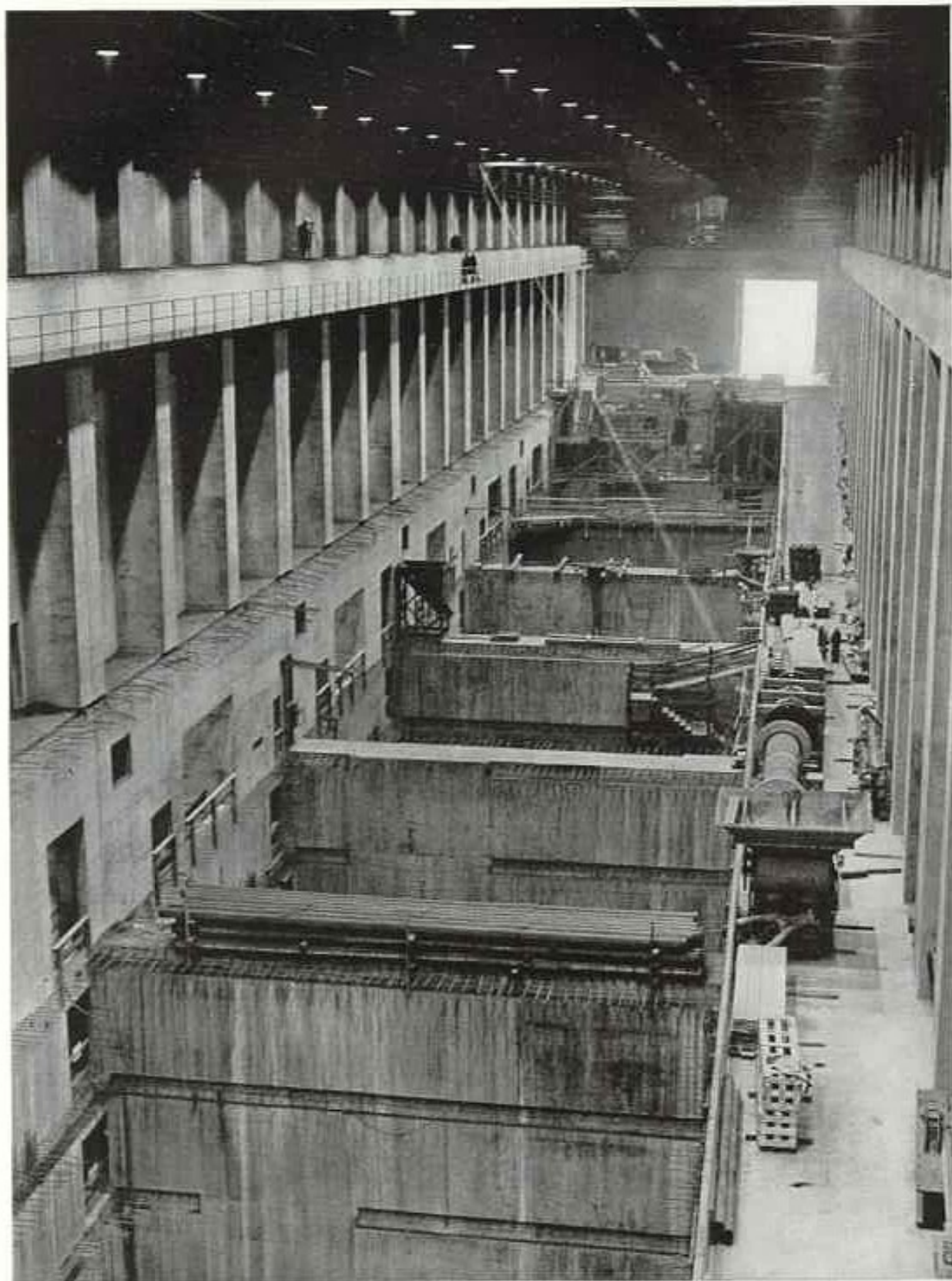
We paid up, shifted gears, and headed for glacier-gouged Lake Chelan.

Apple orchards tuft the banks of deep Lake Chelan, but today's thrill is gold. Concentrates from the new (1938) Holden Mine near Railroad Creek outbid apples for transport. Miners crowd the passenger boat (Plate V).

More than half of Washington's \$3,000,000 annual gold output comes from Holden copper ore at the rate of one-twelfth of an ounce of \$35 gold and 30 pounds of 12-cent copper per ton of ore.

Wenatchee thinks, talks, even eats apples—wonderful apples: Winesap, Delicious, and Jonathan, Yellow Newtown, and Rome Beauty. Orderly orchards marshal their ranks against brown, barren hills. Along railway sidings are packing houses where the hand-picked fruit is washed and dried, sized, sorted, and boxed for export (page 784).

Apples are almost human in their desire for sunny days and cool nights. Washington's "apple bowl" suits them down to the volcanic



Photograph by U. S. Bureau of Reclamation

Grand Coulee's West Powerhouse Is Longer and Higher Than the United States Capitol

Whirled by nine 150,000-horsepower turbines, nine generators here will supply enough power for the industries and homes of more than 8,000,000 people. A similar powerhouse at the east end of the dam will be built when needed. One giant generator begins work August 1, another later in 1941, the third in the spring of 1942.



Photograph by U. S. Bureau of Reclamation

A Streamline Train Might Use These Grand Coulee Tunnels: Water Will

The penstock linings, 18 feet in diameter, were fabricated and machined in Chicago, assembled and arc-welded at the dam site. Eventually through eighteen such pipes will flow each hour enough water to supply every person on earth with a gallon. Turbogenerators will then provide as much electricity as now is used by more than 16,000,000 average Americans (page 772).

sible islands amid smoky Celilo Falls, where Indians perch on out-jutting platforms and net salmon as they have for centuries (Plates XII, XIII).

Robert Stuart of the Astorians thought that here an Indian fisherman "would by assiduity catch at least 500 daily."

Catching two or three tons of salmon a day while standing on a shaky perch would require more assiduity than modern Indians like. Some now work in gangs of five, since four can play poker or bridge while the fifth, with a rope about his waist, sweeps the turbulent stream. In the shade of the rocks are Indian

hide-outs, cluttered with the same magazines and "funnies" as a frat house.

The salmon fishing at Celilo is one of the sights of the river. Visiting motorists sometimes buy a 20-pound salmon while it is still flopping, stow it atop their baggage, and hope it will keep.

Below Celilo the river tilts up on edge between huge basalt blocks which reminded the voyageurs of the flagstones (*les dalles*) of their French villages.

Less than 200 miles inland and 98 feet above sea level, The Dalles welcomes ocean-going steamers. Most of the ascent from tidewater



Photograph by C. E. Burns of Exclamation

A Chief's Daughter Broadcasts at the Grand Coulee Opening

Behind Mrs. Ann George is her father, Chief Jim James of the Nez Perce Indians. She is speaking over station KHQ on March 22, 1941, when two small generators began to "spurt juice." Her people at Nespelem will be served by electricity from the Bonneville-Grand Coulee power grid.

is made in one high jump at Bonneville Dam. This potent aid to river traffic has drowned the Cascades and Cascade Locks in a deep, smooth pool 60 miles long.

Almost overhanging the submerged lock system, a shiny cantilever bridge frames the majestic gorge down which the mighty river forced its way to the ocean, thus draining prehistoric Lake Bonneville and other vast areas.

Seeking permission to walk out on the shining span, which had just been raised 45 feet at a cost of \$700,000, I played my card. For reply, this 23d of August, the tollkeeper showed me his September Geographic.

"Just came," he said. "Go as far as you like."

Here plodding oxen waded through mire, hauling covered wagons.

Then crude trams rumbled on wooden rails, and an iron horse, the *Oregon Pony*, supplanted mules. Now salt-water sailors look down from their sea-going ships on the waterlogged locks.

Ladder-climbing Fish

At Bonneville Dam visitors watch persistent fish flop up the ladders, seeking a place to spawn.

A scoreboard shows the daily run. In 1938, 471,144 Chinooks, bluebacks, silvers, chums, and steelhead trout were counted. In 1940 the number jumped to 734,935.

Once past this dam, the whole Snake River system and tributaries of the Columbia as far as Rock Island Dam are as open to fish migration as ever.

As civic housekeepers, no one surpasses the Army Corps of Engineers, which not only built the Bonneville Dam but still maintains and operates it. Lawns and driveways, homes, clubhouse, and library are

immaculate; yet it is the powerhouse of an industrial area bigger than some States.

Four mighty generators already obey man's slightest whim, two of them added this year. Numbers 5 and 6, out of a total of 10, are now being placed.

Two Famous Highways

Over thin wires agile kilowatts speed forth to brighten farm life or spin the wheels of industry. Opening its 102-foot gates, the largest of single-lift locks swallows ships, barges, or tugs, disgorges them into the pool 66 feet above, at extreme low water (59 feet at normal river stage), and makes a seaport of The Dalles.

Oregon's Columbia River Highway and Washington's Evergreen Highway are far-famed (Plate VII). Railways and airplanes share this gap where a river carved an airway down Columbia Gorge. Here gigantic beds of gravel and flows of basalt mark paragraphs and chapter headings in the earth's prehistoric story.

Hotels and sylvan restaurants, picnic nooks, and winding trails lure city folk by thousands to these evergreen groves.

Huge trunks that were growing when Europe fought the Crusades are being fed to the saws. But experts say that an annual new growth of ten billion feet is possible (Plates XIV and XV).

At built-to-plan Longview, where aluminum is about to share the spotlight with lumber, I visited two of the world's largest sawmills. Wild deer roam amid ultramodern piling trucks or rest in the shade of golden lumber stacks.

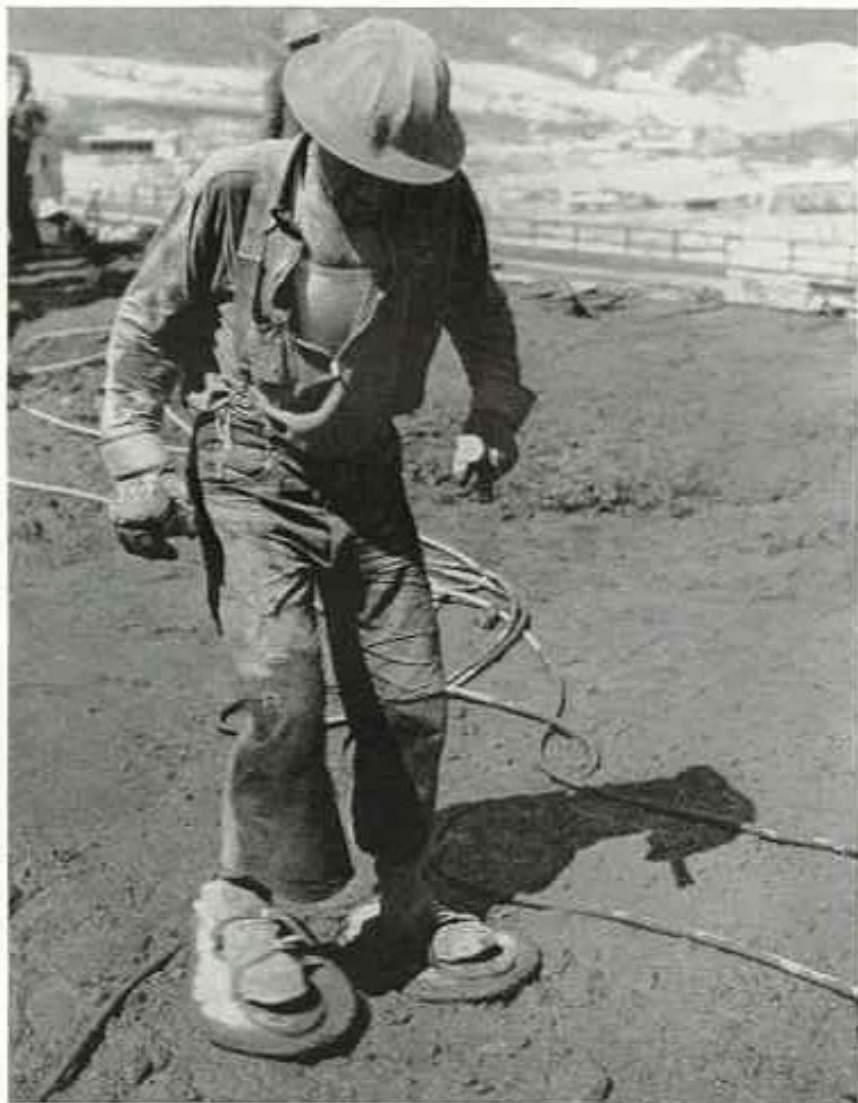
I jumped from log to floating log, saw swift jets of water comb bits of gravel from the time-ridged bark, watched giant trunks sweep back and forth against swift saws, heard lumber played on by trimmer blades, and saw satin-smooth boards tied in bundles.

A "Lumber Dentist"

What impressed me most was a lumber dentist.

In choice, straight boards his eager eye detected a cavity dark with pitch. Down swept his whirring tool, the cavity was cleaned, and from a handful of splinters one was selected to match, much as a dentist chooses the proper shade of inlay.

With a casein glue the splinter was inserted,



Photograph by U. S. Bureau of Reclamation

Men Wear Wooden Shoes When Walking on Fresh Concrete

Working in three shifts, 24 hours a day, 362 days a year, thousands of workers pushed Grand Coulee Dam to completion two years ahead of schedule. Safety was stressed throughout. But, during 55,000,000 man-hours of work, 35 men gave their lives to this greatest masonry structure ever built.

and a tiny power plane smoothed the spot where the cavity had been.

Wood waste fires the boilers, and metal-hard cylinders of pressed sawdust are sold to hearth lovers as termite-free fuel.

The ticket taker at Longview Bridge made me doubt my ears when he said:

"Be sure to park on the bridge and enjoy the view."

Far below flowed the wide, majestic Columbia, on whose surface an ocean liner seemed a mere toy. Along its banks docks, sawmills, and log ponds hardly disturb the sylvan scene. Off to the east rose majestic Mount St. Helens.

The man who took me across Spirit Lake, which mirrors Mount St. Helens at twilight,



Photograph by Spencer

Bonneville Dam Produces Power, Helps the Movement of Fish and Ships

To the right of the powerhouse is the largest single-lift lock ever built, which raises ships 66 feet in one operation. Between the two a fish lock is provided for those salmon which do not climb the water ladders on the Washington bank (left) and on Bradford Island (center). The dam, locks, and power plant were built and are operated by the Corps of Engineers, U. S. Army, whose neat houses are set in velvet lawns. One hundred and forty miles of tidal river reach from the ocean to the foot of this dam, above which a pool deep enough for navigation extends to The Dalles, about 45 miles farther upstream (page 780).

John Paul Jones shared his plans. He was a confidant of Ambassador Thomas Jefferson in Paris. Many feel that the Louisiana Purchase and the Lewis and Clark Expedition were born in the vagabond brain of John Ledyard, citizen of oblivion.

He Saw "Sea Horses"

"They say" that a destroyer officer, bound for Portland and seeing horses munching hay in a big red barn just outside his porthole, signed the pledge before hitting the deck.

The horses which draw in the large nets here live all season in a floating hulk. As the tide ebbs and the salmon "climb" the river, horses haul in the seines (Plates IX, X, XI).

The bunkhouse where I dressed reminded me of a crew float. Many of these athletic seine handlers are college lads who earn their

way through school by going fishing. Chunky skipper of my seine boat was a football player from Willamette College.

Time and tide don't "hold it," even for photographers. Neither do seine fishers. I would have shot from the hip, only my hips were under water. It takes snappy work to make three draughts in one ebb tide. When the water is shallow enough, the horses begin to haul the nets. When the water slides off the bar, fishing is over.

As the seine closed in, big fish flopped over the rail in a shiny stream, and one launch, two seine boats, twelve horses, and 20 or so men netted about 3,000 pounds of salmon that tide.

Astoria's Salmon Derby

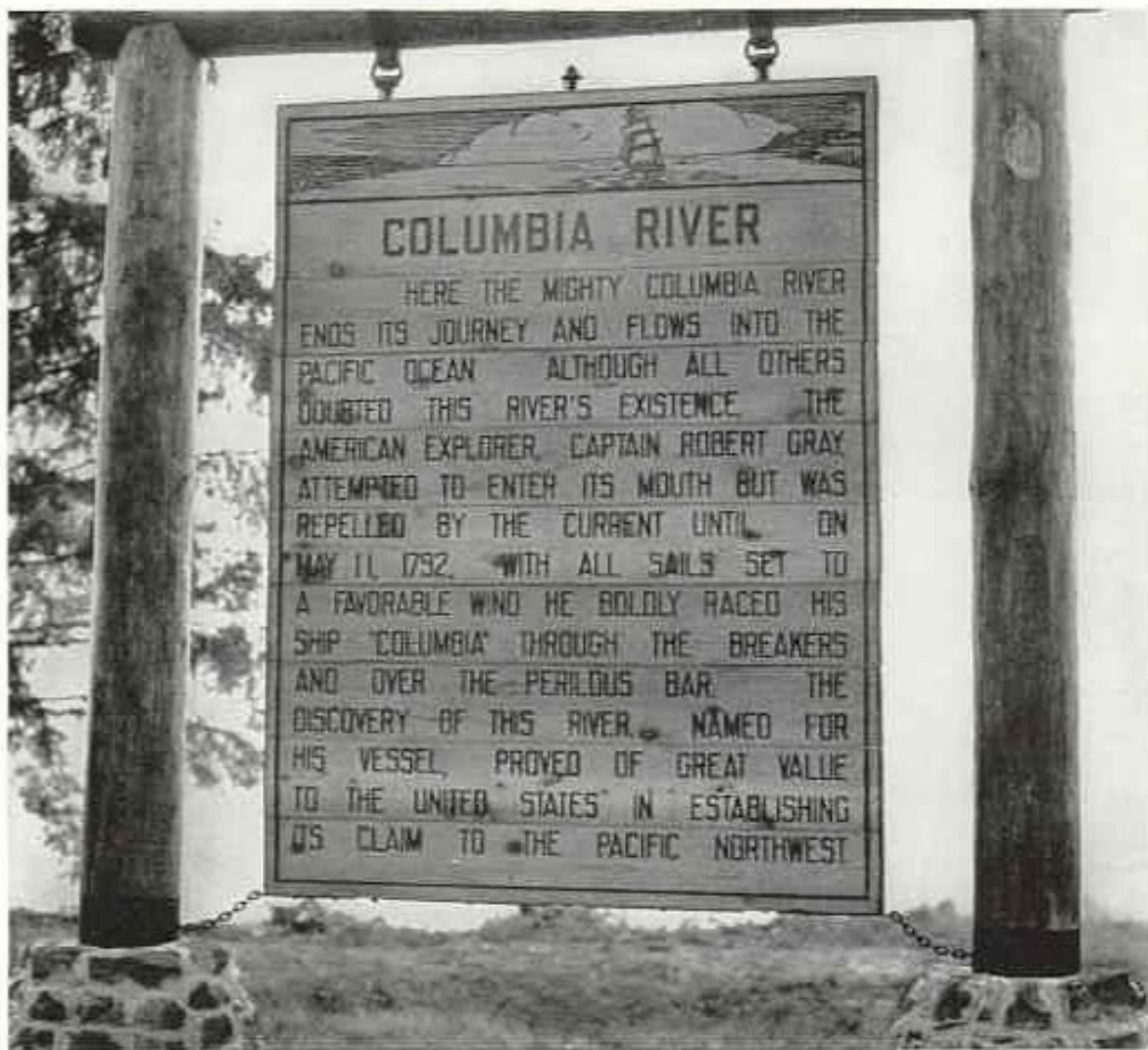
At the close of the commercial fishing season the amateur has his week of fun at the



Photograph by Photo-Art.

International Turkey Champions Come from an Indian Council Island in the Columbia

On Sauvie Island, where Lewis and Clark conferred with Indian chiefs, turkey farms now flourish. Fewer than a thousand people inhabit this idyllic island, but duck hunters have blinds along its shores, and fishermen cross on the small ferry to try their luck with still-water fish.



Photograph by Maynard Owen Williams

A Signboard Near the Columbia's Mouth Tells the Story of Its Discovery

Scattered through the Evergreen Empire are such artistic signboards which record the history of the land. This "information board" is on the Washington bank near Ilwaco.

Astoria Salmon Derby. All fish must be caught with rod and reel. The grand prize is a four-door sedan; the daily prize, \$100.

A "queen" smiles. An "admiral" salutes. There are fireworks, sailboat races, and log-rolling. But the hero is the captor of the biggest salmon (pages 789 and 792).

A trip through the cannery of the Columbia River Packers Association is an appetizer. Red-fleshed salmon and white-meated tunny are attractive, even in a packing house.

We motored down to Fort Clatsop, where nearly all winter long Lewis and Clark began their daily diary entries with the same word: "Rain." We went to Seaside, where the explorers' "farthest west" plaque is close to pinball, restaurant, and dance hall.

At Fort Stevens an expert mine layer thinks it quite natural that early explorers, conning

heavy surf and menaced by unfavorable winds, failed to enter the Columbia.

We saw fog-bound Cape Disappointment live up to its name. After motoring along Washington's "Longest Beach in America," we returned to Portland, metropolis of the Columbia, which isn't on the Columbia at all.

In 1939, with 27 miles of deep-water frontage, Portland handled more than nine million tons of water-borne traffic, was the leading wheat-and-lumber-exporting port of our Pacific coast, and one of the greatest fresh-water harbors in the world.

Gold Dust and "Beaver Money"

Asa L. Lovejoy, of Boston, Massachusetts, and Francis W. Pettygrove, of Portland, Maine, flipped a coin in 1845. Pettygrove won Portland its name.