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# THE NATIONAL GEOGRAPHIC MAGAZINE

JULY, 1932

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SIXTEEN PAGES OF ILLUSTRATIONS IN FULL COLOR



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THE NATIONAL GEOGRAPHIC MAGAZINE



# COLORADO, A BARRIER THAT BECAME A GOAL

## Where Water Has Transformed Dry Plains Into Verdant Farms, and Highways Have Opened up Mineral and Scenic Wealth

By McFALL KERBEY

AUTHOR OF "TOILERS OF THE SKY" AND "GENOA, WHERE COLUMBUS LEARNED TO LOVE THE SEA," IN THE NATIONAL GEOGRAPHIC MAGAZINE

COLORADO was a barrier once. Its vast eastern plains formed a typical part of the Great American Desert, that geographic libel thrust onto American maps by forest-minded pioneers, there to stay for two generations.

And beyond the "desert" rose an immense rampart of "impenetrable" peaks with barren, rocky crowns. Appalling sights they were to men who had grown up among the friendly, rounded, verdure-blanketed mountains of the East.

So it came about that the early rush of trade and emigration that beat out paths to the West passed Colorado by. Its mountain barrier split this westward-faring tide of humanity as a huge bowlder in midstream cleaves the waters of a river. The Santa Fe Trail* turned to the south, traversing only the southeast corner of the area that was to become Colorado. The covered wagons of emigrants Oregon-bound in the early forties, the great hegira of thousands of Mormons in '47 and '48, and the rush of the California forty-niners passed chiefly to the north. Save for a handful of white trappers, Colorado was left to its few bands of wandering savages.

But not for long. Gold, always a magnet for men, dragged a horde of fortune-seekers to the edge of the mountains almost overnight in '58 and '59, and soon sent restless prospectors with picks and pans scurrying like ants over the whole mountain area. They found the mountain region was *not* a land of arctic wastes and icy solitudes. On the slopes of bare-topped peaks were noble forests; between were smiling valleys with grassy meadows. "Plenty-jerked-elk meat," the Ute Indians had named one that lies to-day in the Rocky Mountain National Park.

Here and there the valleys widened into spacious parks. Streams gurgled on every side, alive with fish. The forests teemed with game.

Into this land of unexpected beauty trickled the van of the emigrants, some to find other goods than gold. The barrier had had its first real breach.

The "desert" now is a land of growing crops and fat cattle, crisscrossed by highways and railroads. Farther west the vigorous pioneers and their brothers in spirit who have followed after have thrust

* See "Santa Fe Trail, Path to Empire," by Frederick Simpich, in the NATIONAL GEOGRAPHIC MAGAZINE, August, 1929.

© H. G. Eisenhand

AROUND THIS CIVIC CENTER CLUSTER STATE, COUNTY, AND CITY ACTIVITIES

In the foreground is the Capitol of Colorado, erected in the eighties. The white building at the top center is the recently completed $5,000,000 City-County Building. Below the right wing of the new building is the Public Library. Farther to the right is the Voorhies Memorial. Balancing this curved colonnade, across lawns and walks, is the Colonnade of Civic Benefactors and an open-air theater. Beyond the right wing of the City-County Building is the United States Mint, where much of Colorado's gold and silver has been fashioned into coins. More than 50 Federal agencies have regional or local headquarters in Denver, a greater concentration of Federal governmental activity than is to be found anywhere else outside Washington.

railways through gorges, even hanging them on artificial shelves from sheer precipices.

They have gouged their way through the Continental Divide and lesser ranges to construct long tunnels; and over the great sea of mountains, along the routes of Indian trails and the crude early roads of the miners, that clung precariously to steep slopes, they have flung an amazing network of modern highways.

Now, on any summer's day, on the heights which early pessimists called cheerless polar solitudes, one may see the gayly colored frocks of women and children fluttering from scurrying automobiles. They belong to visiting family parties, on picnicking bent, who are whisked over the mountain roads in a continuous stream. The once impassable mountains are a fair mark now for the wheeziest flivver.

### COLORADO DEVELOPED IN ONE LIFETIME

The story of Colorado's swift development in the short space of one lifetime is crammed with romance, tragedy, and high adventure, with strokes of good fortune and ill, as are few chapters in the national chronicle.

One day the region was raw, virtually untouched by civilization. The next, almost, men were starting to make a State out of thin mountain air and dusty sagebrush flats; were selling town lots at auction; issuing newspapers; building homes, churches, saloons, and theaters; organizing stagecoach companies; talking politics!

The stage probably had never been better set during American history than during 1859 for a rush to new lands. The country was in the middle of a great financial depression. Tens of thousands of men were out of jobs. Tens of thousands of others were barely making livings and were restless.

Then the news of gold discoveries in the Pikes Peak country sifted back East—not the true facts, but preposterously glowing accounts. Before the winter snows had melted, long lines of travelers were in motion, converging on the frontier towns nearest the Pikes Peak country—Leavenworth, Lawrence, Nebraska City.

What a mad scramble it became, that mass march to find the rainbow's end! Over the boundless prairie west of the settlements it spread, with scarcely a break from the Missouri to the Rockies. Sturdy covered wagons, some with three yokes of oxen; light wagons drawn by horses and mules; horseback riders; men and women on foot trundling loaded pushcarts; other pedestrians with knapsacks; some reckless souls with nothing but the clothes they wore—all poured on toward the Promised Land. "Pikes Peak or Bust" was blazoned on many a wagon in the motley train. Some of these were to meet disappointment at the meager gold showings in river sands, and to return in a few months with only a sense of humor left, the old sign marked out and below a laconic new one: "Busted, by Gosh!"

Before the discouraged return stampede to the East could run its course, there came news of really substantial gold discoveries in veins; then new hopes and a new and bigger gold rush. Where 10,000 had gone before, now probably 100,000 crossed the plains.

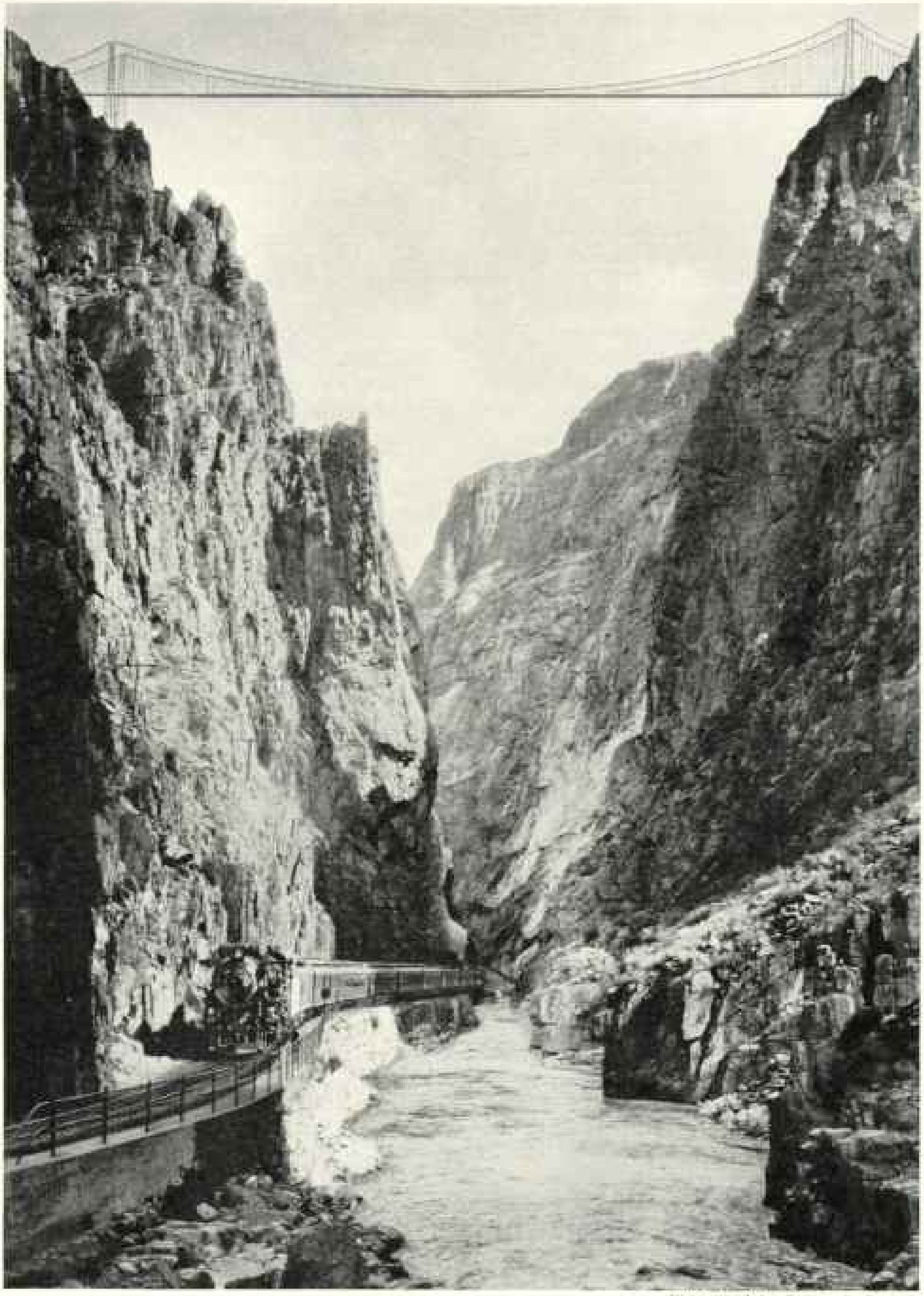
The Colorado mountains, it seemed, might be America's last frontier, and Americans turned toward them as children troop to a street parade. They overran the existing towns, built new ones, clambered into the mountains, staked claims or jumped them, dug, played riotously, fought, organized vigilante committees and courts, and began, ineptly at first, but determinedly, to iron the rough edges of the frontier into a civilized community.

So began the Pikes Peak Diggings, a group of communities that was to spread over a great area and to become seventeen years later the Centennial State.

### THE STATE HAS NO NATURAL BOUNDARIES

Mapwise, Colorado is something of an anomaly. Across it marches North America's mightiest mountain range and within it are concentrated Uncle Sam's greatest group of lofty peaks. Among these mountains rise some of the country's major rivers. Yet at no point does range or stream mark Colorado's boundaries. Its straight lines of meridians and parallels, hurdling all natural geographic features, actually bear a closer relationship to Greenwich, England, and the Equator than they do to the Rocky Mountains or the Colorado River.

The eastern two-fifths of the State is a plains country, a continuation of the gently



Photograph by George L. Beam

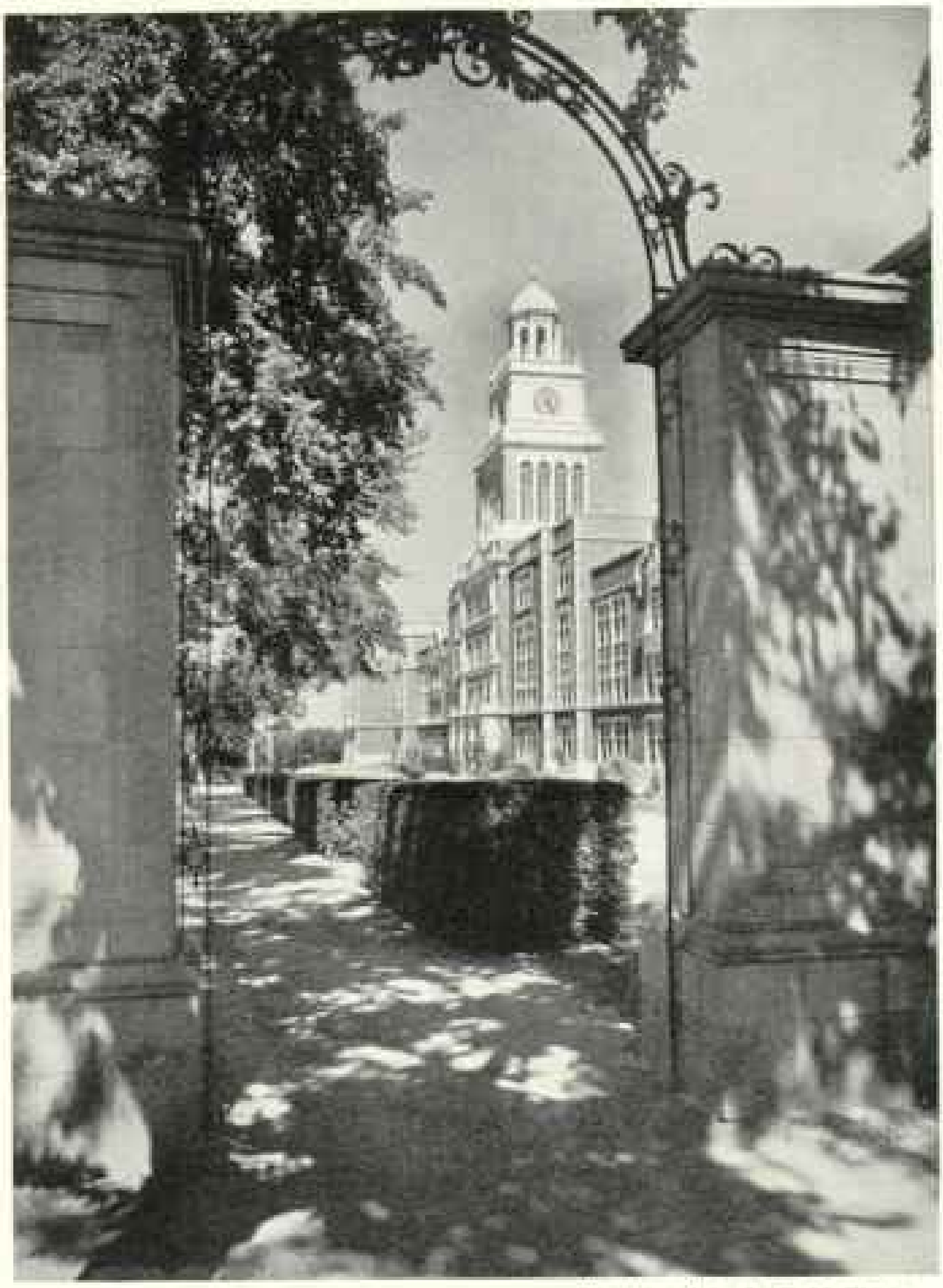
ROYAL GORGE, WHERE THE ARKANSAS RIVER BREAKS THROUGH TO THE PLAINS

Unique engineering records have been made in this deep chasm. In the background is the famous Hanging Bridge, where a railway is suspended from steel girders rooted in both walls of the narrow canyon. Overhead the highest suspension bridge in the world, 1,053 feet above the river, extends from cliff to cliff. This lacy span, 880 feet long, carries over the gorge a scenic highway from Canyon City, six miles away.

undulating and always rather dry prairies of western Kansas and Nebraska.

Approach from the west and you find that Utah carries over into the extreme western part of Colorado as Kansas and its neighbors do on the east. Dry plains alternate with table-lands, their rocky slopes clad with scraggy bushes.

It is in the middle panel of the State that you find the quintessence of Colorado—a land of foothills and sentinel peaks, tangled mountain ranges, and wide valleys.



Photograph by L. C. McClure

EASTERN HIGH SCHOOL IS AN EXAMPLE OF DENVER'S FINE EDUCATIONAL BUILDINGS

Wherever possible, Denver has set its schools in the edges of parks.

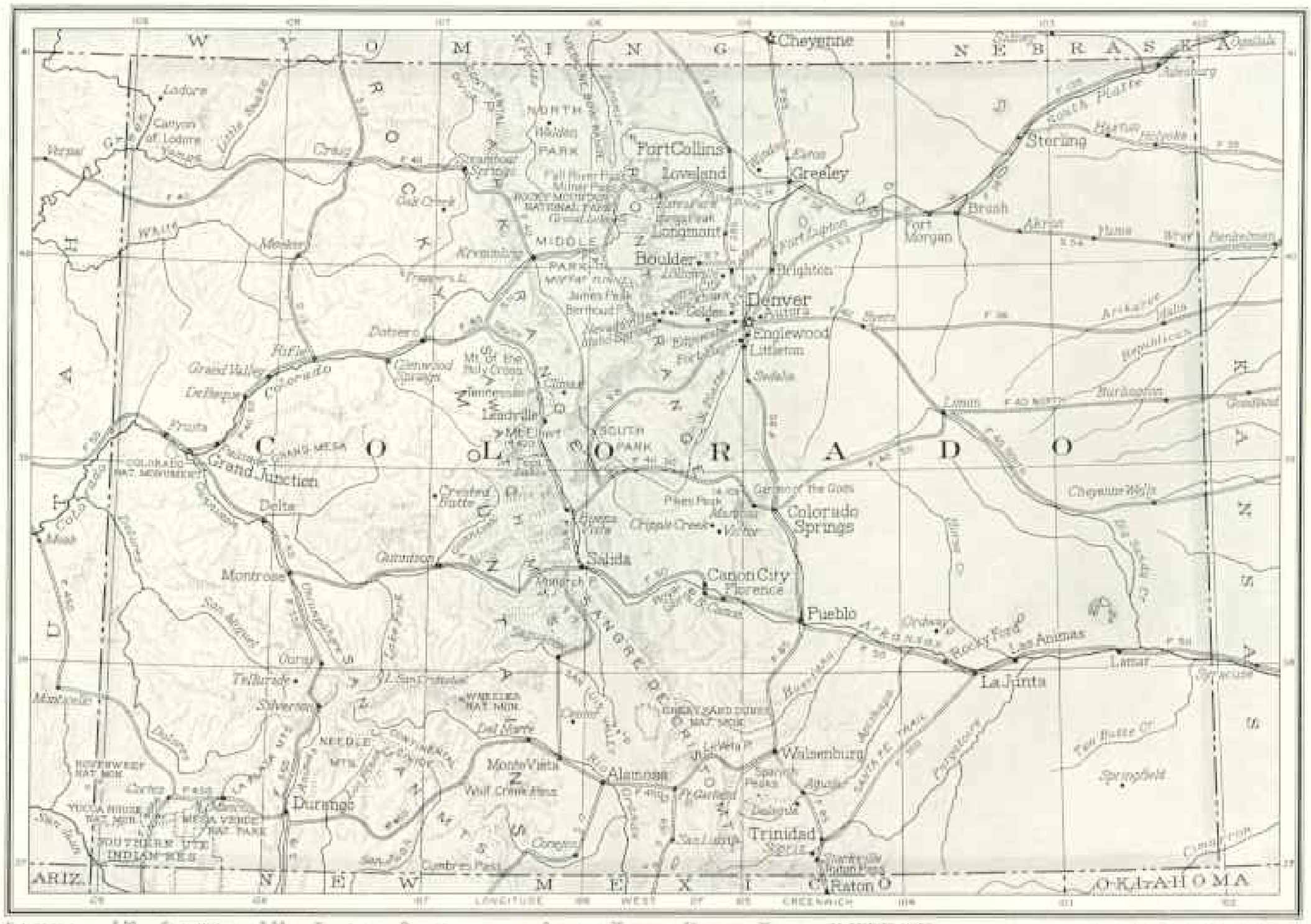
### THE REGION OF GLITTERING GOLD

This great central area, where the earth has been thrust skyward, is the region of glittering gold to which Colorado owes its birth as a State. If you would plunge into this old Colorado of pioneer gold-mining days, drive west from Denver on paved roads, over the foothills, and up Clear Creek for 25 miles. There, strung out in a canyon, you will find Idaho Springs, famous as "the town that is three miles long and three blocks wide."

Look up to sights that will become more and more familiar as you poke about the mountains: holes torn in the hillsides with steeply sloping dumps outside, as though huge animals had dug lairs, scratching the débris out behind them. A few are mere prospect holes, where some treasure-seeker guessed wrong. Others are portals of long tunnels. There are steep-roofed mills, some abandoned, some preserved for a better day.

But push deeper into the pioneer country. Turn up Virginia Canyon and over a tremendous ridge to Central City and Black Hawk, the cradle of the Colorado mining industry. Here, at the "Gregory Diggings," the first gold was dug from veins, the first crude ore-crusher was evolved, the first steam quartz mill was erected. It was the miner's laboratory. Steam, fire, chemicals were tried in the battle to pry precious gold from worthless rock; and finally, in 1867, the first experimental smelter was set up.

Central City was a lusty town in those days, vying with Denver itself until well after Colorado became a State. At one time both United States Senators and the State's single member of the House of Representatives hailed from this little



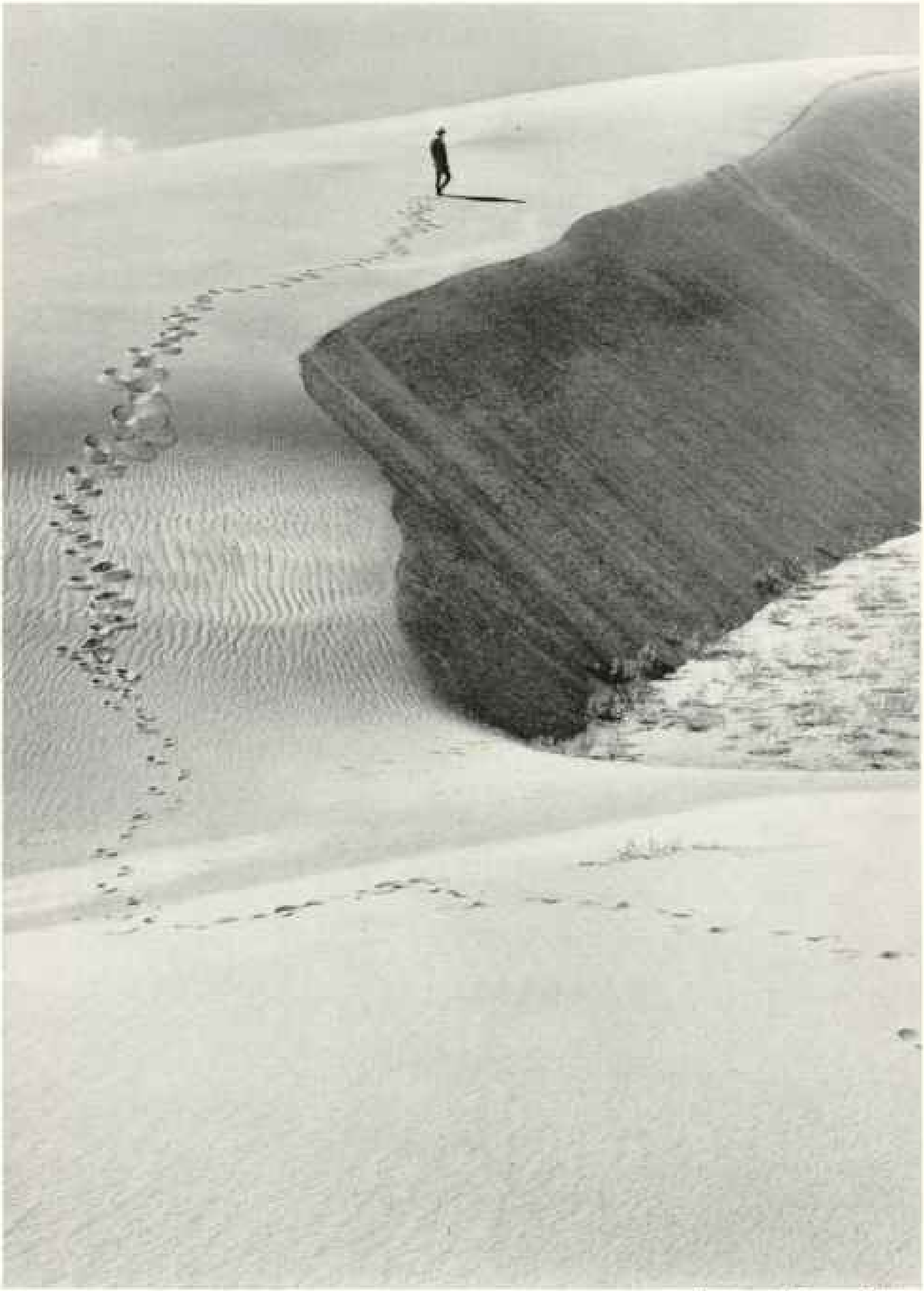

Drawn by James M. Durley

COLORADO, GATHERING PLACE OF MOUNTAIN PEAKS, BIRTHPLACE OF RIVERS

Photograph by Henry G. Eisenhand

PRAIRIES MAKE SUPERB LANDING FIELDS

Denver's new Municipal Airport, at the eastern edge of the city, is carved out of the mythical "Great American Desert," that was supposed to extend from the mountains to the Missouri River. The greater part of the site of modern Denver, with its tens of thousands of shade trees and its velvety lawns, was like this treeless plain seventy years ago. Regular airlines are operated north and south along the mountains and eastward, and many planes fly directly over the high Rockies.



Photograph by Laura Gilpin

FOOTPRINTS IN THE SANDS OF A MINIATURE DESERT

Near sunrise and sunset, when shadows bring out the sharp edges of the vast piles of sand, the Great Sand Dunes Monument is at its best. Pike was the first American to write of the San Luis dunes. He and his party saw them in 1807. The dunes shift continually, but are always confined to a relatively small area near the foot of the mountains (see, also, page 17).

mountain town. It has never become a ghost town, like many of the early mining camps, but at times in recent years it has seemed to have at least one foot in the grave. Just now it is showing increased vitality, but scores of dwelling houses are boarded up and some business buildings are unoccupied.

If you would see a real ghost town, motor only a mile away to Nevadaville, in effect a suburb of Central City in more prosperous days. Officially, Nevadaville lives. The 1930 census gave it a population of two souls! But when I visited the place one had moved away, and the other only commuted occasionally to the town of which he was mayor, city clerk, and population. A few disconsolate burros wandered along the single business street; doors were nailed, windows broken. The former saloon, where life once ran riotously, was the deadest place in town.

Into Central City once flowed a stream of gold. There is only a trickle now; but the city continues to live for gold and the silver and baser metals that are extracted with it. In the bank you are shown scales on which twenty-five million dollars' worth of local gold has been weighed, in dust and nuggets and amalgam "blooms."

### THE MAGIC METAL STILL LURES

Gold has been a fetish in Colorado, as it has in all other parts of the world where it might be had for the digging; but it has played a mighty part in the State's life.

Colorado has manifold interests and diverse activities now, but she hasn't deserted the old love. Talk for half an hour to any substantial Coloradan west of the 105th meridian and inevitably the magic word "gold" will creep into the conversation. Through a new quest, a newly discovered vein, a new process, perhaps only a new personality, whose genius for management is taking hold of a seemingly worthless property and making it pay, interest in gold is continually kept alive.

Optimists will tell you that another great gold strike in a wholly new field is just around the corner. And perhaps it is. Time after time, in the 73 years since Colorado's first golden vein of ore was opened, pessimists have asserted, as soon as the "easy gold" was dug, that the mountains were mined out; but each time they have been confuted by discoveries of richer fields that have poured forth still greater wealth.

Whatever the prospects of new bonanzas may be, gold mining continues to live in Colorado and its glamour hangs on. Why shouldn't it? With the possible exception of sifting diamonds from South African sands and diving for pearls in shark-infested tropic seas, gold mining offers the best industrial outlet for man's irrepressible gambling instinct.

Panning from the gravels and sands of streams was the earliest method of gold recovery practiced in Colorado, as it has been in most of the world's gold fields. Then, in the mountains, prospectors found the weathered veins of ore from which the golden grains had been washed, and Colorado's second chapter in gold recovery started.

### THE LONE MINER PASSES

The third phase came when the hard, unweathered veins were followed into the rocky hearts of the mountains. It was then that Colorado gold mining ceased to be a one-man possibility. Much capital was required. Companies took hold; complicated treating plants were erected, and finally the era of smelters was ushered in.

Colorado is entering the fourth stage of gold mining now, and it is a typically modern American stage. Because of more efficient organization, better machinery, and more careful management, mining companies to-day are able to make money from ore so low in grade that a generation ago it was of no more value for mining than the top soil of an Iowa corn farm.

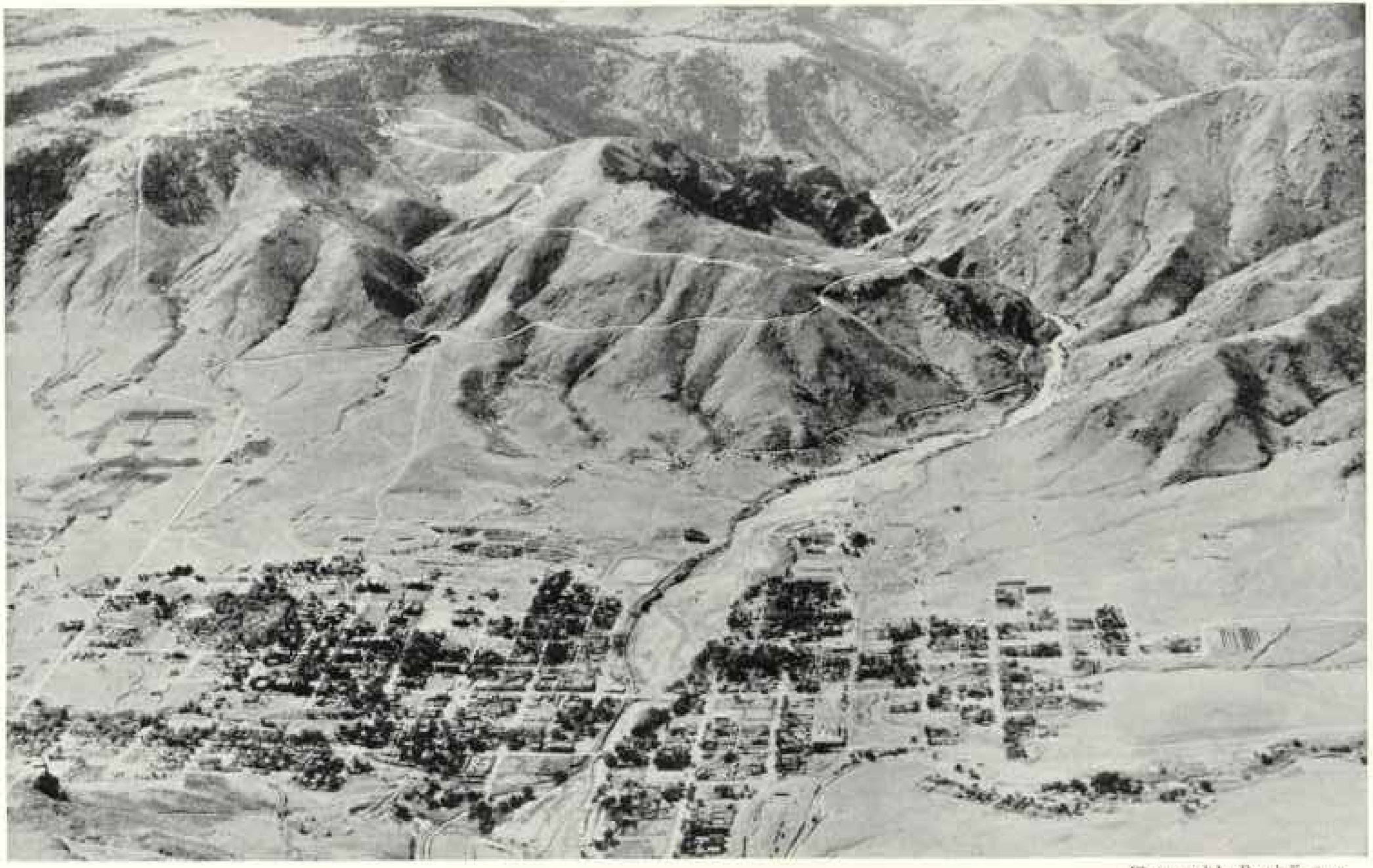
I visited one of these modern gold mines in the San Juan Mountain country and found it to be a self-contained little mining world, with its varied activities geared smoothly together, and with a steady outturn of product that reminded me of automobiles rolling from the assembly line of a Detroit factory. It is typical of a growing number of such mines scattered over the State. Operations in such establishments are kept going, by the use of several shifts, for 24 hours a day and 363 days a year; only on Christmas and the Fourth of July does work cease.

From the company's mill in a mountain valley I rode the breath-taking two miles to the mine portal in an ore bucket of a cableway, and experienced all the thrills of

Photograph by Ren Gill

ELK DRIVEN TO VALLEY FARMS BY WINTER SNOWS

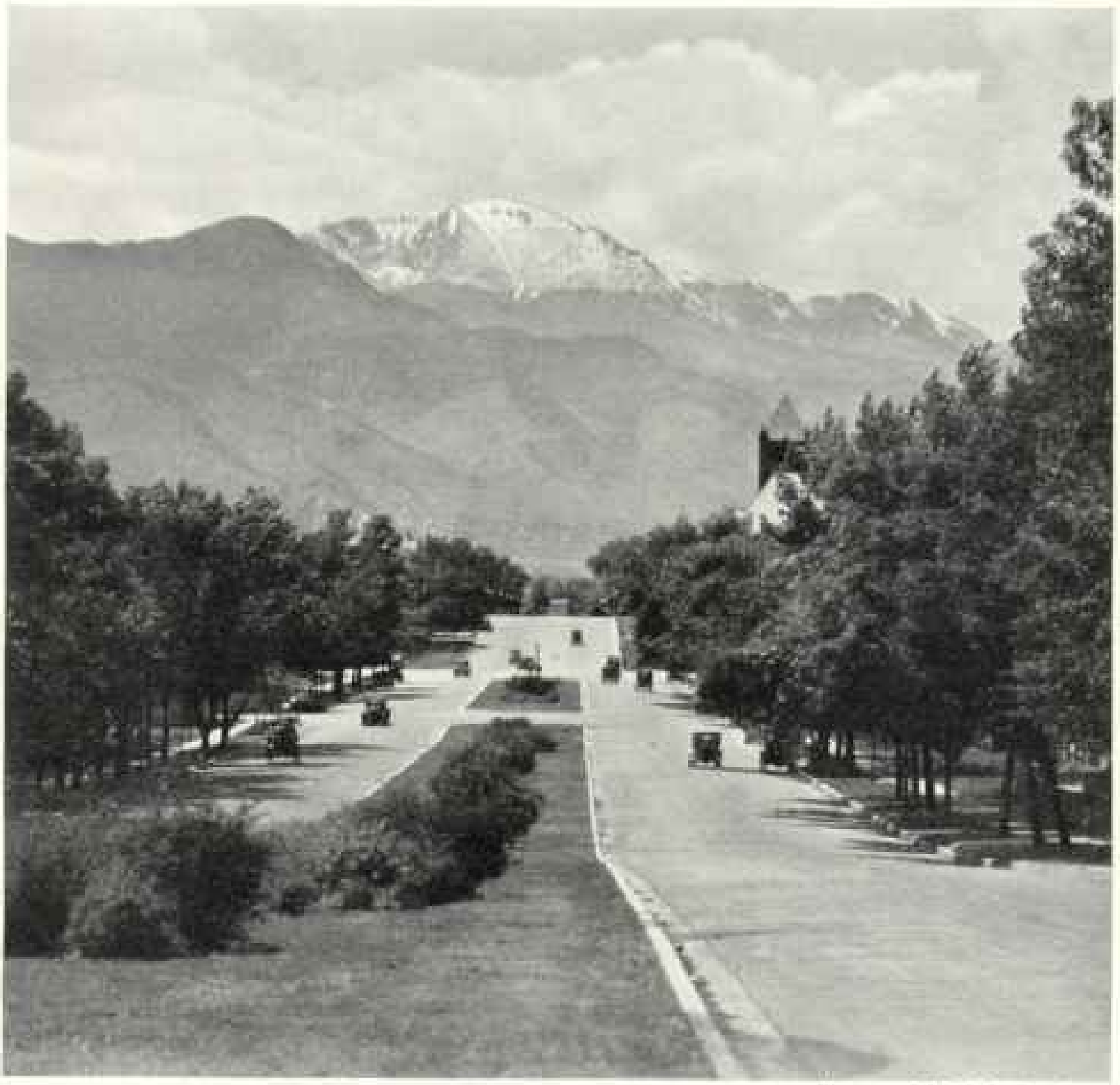
Near Steamboat Springs, where this herd was photographed, and in several other sections of the State, valley farmers must protect their haystacks from the depredations of hungry elk. Herds of these animals thronged Colorado's mountains and extended far out upon the plains along watercourses, when white men first came to the region. They were completely exterminated, but were reintroduced in 1915 and are now found in considerable numbers in the mountains. Colorado's mountains and valleys are rich in wild life.



Photograph by Frank Fortson

WHERE PLAINS GIVE WAY TO MOUNTAINS

Golden, a capital of Colorado before Denver, lies in the foreground in a pocket of the foothills. Immediately beyond begins the rise that leads within 25 miles to the crest of the Continental Divide. Up the ridges winds the Lariat Trail, one of the highways of the Denver Mountain Parks system. Where the highway loops farthest to the right is the crest of Lookout Mountain, burial place of Buffalo Bill. In Golden, 15 miles west of Denver, is the Colorado School of Mines, one of the leading mining colleges of the world (see text, page 63).



Photograph by H. L. Standley

RESIDENTS OF COLORADO SPRINGS LOOK UPON THIS MIGHTY MOUNTAIN FROM THEIR WINDOWS

Pikes Peak, snow-capped throughout much of the year, rears its summit only ten miles from the heart of the city. A cog railway, an automobile highway, and trails for riders and foot climbers lead through evergreen forests and over the bleak region above timber line to its crest.

a trip on a Coney Island roller-coaster. My sturdy flying carpet swung so far above the tops of great pines and spruces, growing among huge bowlders below, that they seemed like the toy trees of Noah's Ark days set down among pebbles.

At the end of my cable journey I found clinging to the mountain side not a bunkhouse, but a veritable hotel and office building with insulated walls and steam heat. In effect I had traveled far toward the North Pole. This mine, in the latitude of Richmond, Virginia, lies in a subarctic region with a climate which approximates that of Labrador.

In the company hotel, in addition to the offices of the resident manager and his assistants, are pleasant sleeping rooms, a store, lounging rooms with books and magazines; pool tables and other game facilities; an emergency hospital ward, a kitchen and large dining room.

### INSIDE A GOLD MINE

When you set out to explore the mine, you learn that there is much water in the heart of a mountain. It drips from the tunnel roof and oozes from the sides. Here and there it gushes forth in springs. As you walk along in heavy rubber boots, you

Photograph by H. L. Stanley

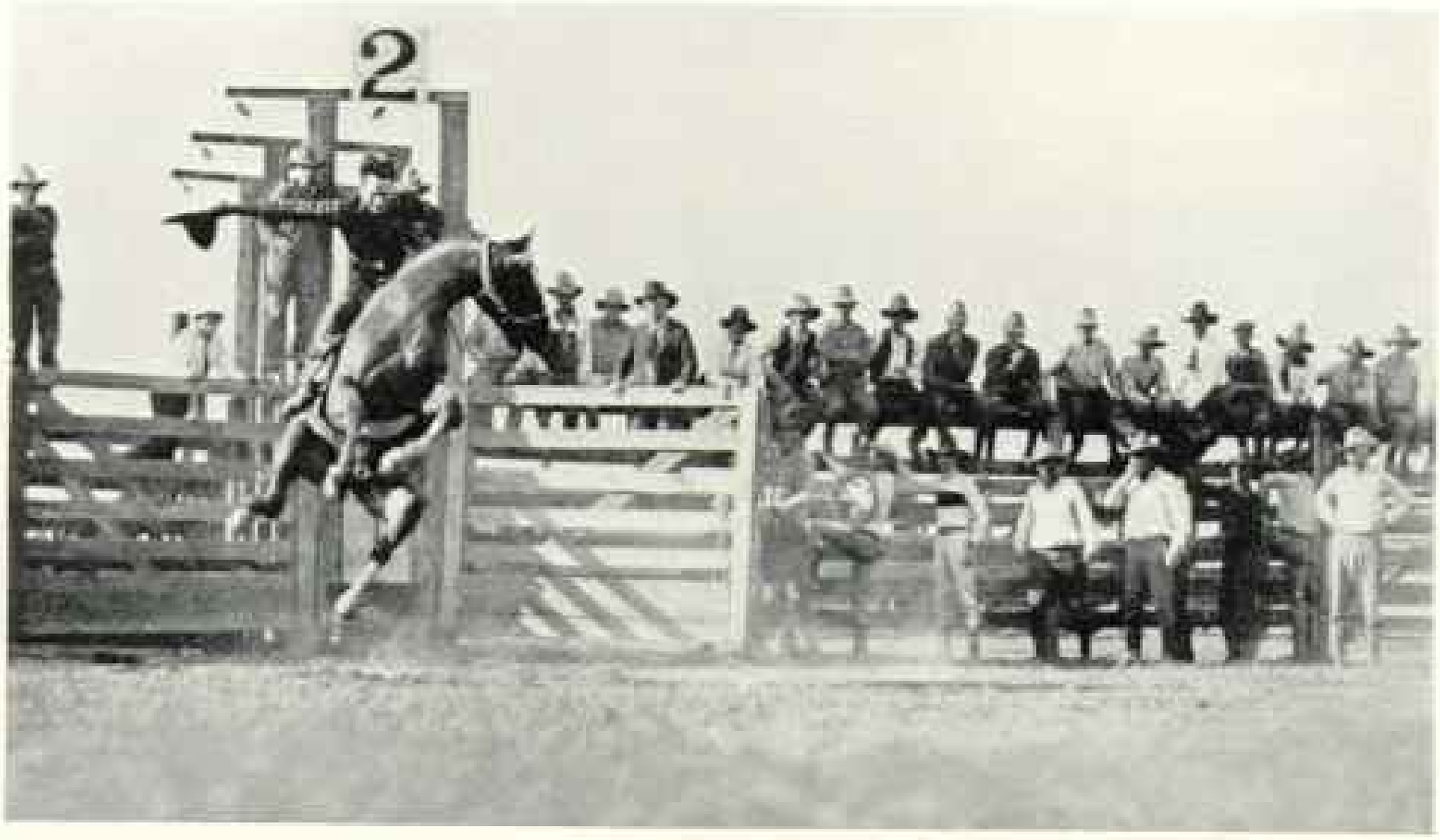
A COUNTRY PIKE SAW, BUT A TRAIL HE NEVER CLIMBED

In his effort to reach what is now Pikes Peak, Zebulon Pike climbed Cheyenne Mountain, a few miles south of Colorado Springs, from which this photograph was made. In recent years a looping automobile highway has been built to the summit of Cheyenne Mountain and on its 9,000-foot crest is an inn. The change in topography is sudden here. From the foot of the mountain the Great Plains stretch eastward for 800 miles, to the Mississippi Valley.

wade in a little flowing brook that has been churned with ore dust by hundreds of feet into a muddy slime, or step, if you prefer, from tie to tie of the 30-inch railway which rises an inch or two above the muck.

Overhead is a clutter of pipes and wires. Mining is not the simple procedure of digging a hole and dragging out ore, as many a layman imagines. Big pipes conduct air under light pressure for ventilation. Smaller pipes carry highly compressed air for operating drills. There are wires for power to turn hoisting drums; others supplying lighting current; still others for telephones. This quite literal overhead of a mine, together with supporting timbers, adds tremendously to the cost of mining.

You climb into the open metal car of an ore train and are hauled perhaps a quarter of a mile, to the end of the drift where the tunnel is being pushed ahead into the vein. A miner, operating compressed-air-driven drilling machinery, is puncturing the end wall with closely spaced holes that reach eight feet into the rock. This is a day's stint. Into the holes are rammed sticks of dynamite and once each day the blasts



AN "UNTHROWABLE COWBOY" ON AN "UNRIDABLE HORSE"

Each summer, at Monte Vista, in the San Luis Valley, riders and horses from the mountain cattle country and the ranches of the Southwest gather for the "Ski-Hi Stampede." There are no paid participants. Every rider must be an honest-to-leather cowman, ready to give the best he has in competition with his fellow buckaroos.

Photographs by J. E. Magruder

THE TAKE-OFF FOR AN UNPLANNED THREE-POINT LANDING

Even the best riders hit the dust now and then, when a stubborn broncho, with twitching muscles like steel springs, objects to being ridden.

Photograph by Ernest Corta

NOT THEIR ANCESTRAL RANGE, BUT THEY SEEM CONTENTED

Bison were primarily prairie animals, although some of them wandered into the mountains and even crossed the Divide to the plains of Utah and Idaho. This herd, placed recently in a canyon of western Colorado, is thriving on the grasses of the semiarid region.

are set off. This one mine uses ten tons of dynamite a month.

### EXTRACTING NEEDLES FROM HAYSTACKS

Back at the mill you learn that the work of gold production has only been well started when the ore comes out of the mine. From then on the problem is one of concentration—of separating the few gold particles from their billions of worthless companions. This work, done in mill and smelter, is a strange mixture of primitive processes and highly technical operations.

Follow the lumps of ore into a mill and you soon see them lose their rocklike form. They are ground as nearly as possible to a powder and then mixed with a large volume of water to form a muddy "ore soup." It is in this liquid form that the ore is made to run the gamut of clever traps, each designed to catch some part of the hidden gold.

Burlap fibers reach for the glittering particles as the murky liquid flows over them, jiggling metal tables shake thin streams to separate the grains by gravity, and chemical solutions lie in wait to capture their share, or to deplete the ranks of the worthless rock grains.

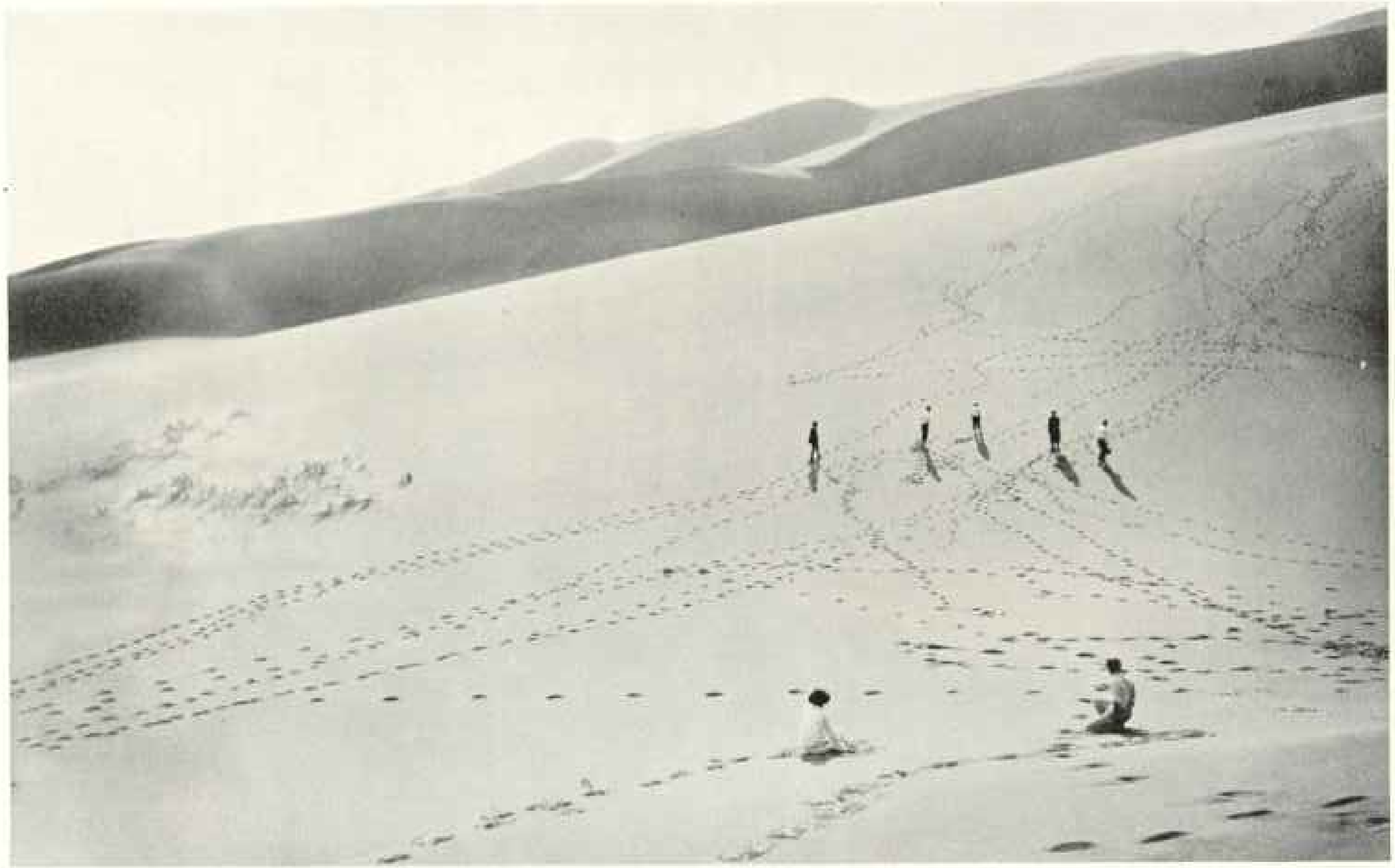
The most fascinating step is taken in the mill's flotation tanks, where a seeming magic is worked. A few drops of oil are added to the ore soup, bubbles of air are stirred in, and the resulting froth floats the gold and some of the other metals, letting the remainder sink. The "pay" is skimmed off like cream and sent to the smelter.

The way to this ingenious process was pointed by a washerwoman in a Colorado mining camp. When she washed the

Photograph by Rev. William L. Earl

THE INDIANS' LAST FOOTHOLD IN COLORADO

A portion of the southern Ute Indian Reservation, near the southwestern corner of the State (see map, page 6). Red men once wandered over most of Colorado, but after the gold rush and the coming of the railroads they were pushed steadily westward. Following an uprising of the Utes at Meeker in 1879, most of the remaining Indians were transported to Utah. Only a handful of red men now live in Colorado on this reservation, near the Mesa Verde National Park. Chimney Rock, conspicuous landmark of the region, rises at the left. A few miles west of this spot is the only point in the United States where four States meet.



Photograph by Charles M. Smyth

THE GREAT SAND DUNES NATIONAL MONUMENT IS UNCLE SAM'S NEWEST PLAYGROUND

In the eastern edge of the San Luis Valley, in an area less than ten miles square, is this Sahara in miniature. The snow-capped Sangre de Cristo Mountains rim the tiny desert on one side and lush irrigated fields on the other. Some of the dunes rise to a height of 800 feet. So fine is the sand that skiing enthusiasts sometimes race over the slopes in summer. President Hoover created the monument by executive order March 17, 1932.

INDEPENDENCE ROCK, NEAR MONUMENT CANYON'S MOUTH

The monolith of red sandstone is within sight of the irrigated orchards and farms of the Grand Valley (see illustrations, pages 33 and 48). This and the scores of other striking rock formations that abound in the region west of Grand Junction have been carved by water and wind from a plateau of sedimentary rocks that rises at the valley's edge.

clothes of miners she noticed gold particles floating in the suds. She jumped to the conclusion, unfortunately, that oil buoyed up the particles. As a matter of fact, an oil film merely makes it possible for air bubbles to take hold. Her patent was declared invalid.

Scientists in laboratories worked the process out, and it has been worth scores of millions of dollars to the gold-mining industry. Carrie Everson, the washerwoman discoverer, missed a great fortune by probably the narrowest margin on record. Only a filmy air bubble stood between her and millions.

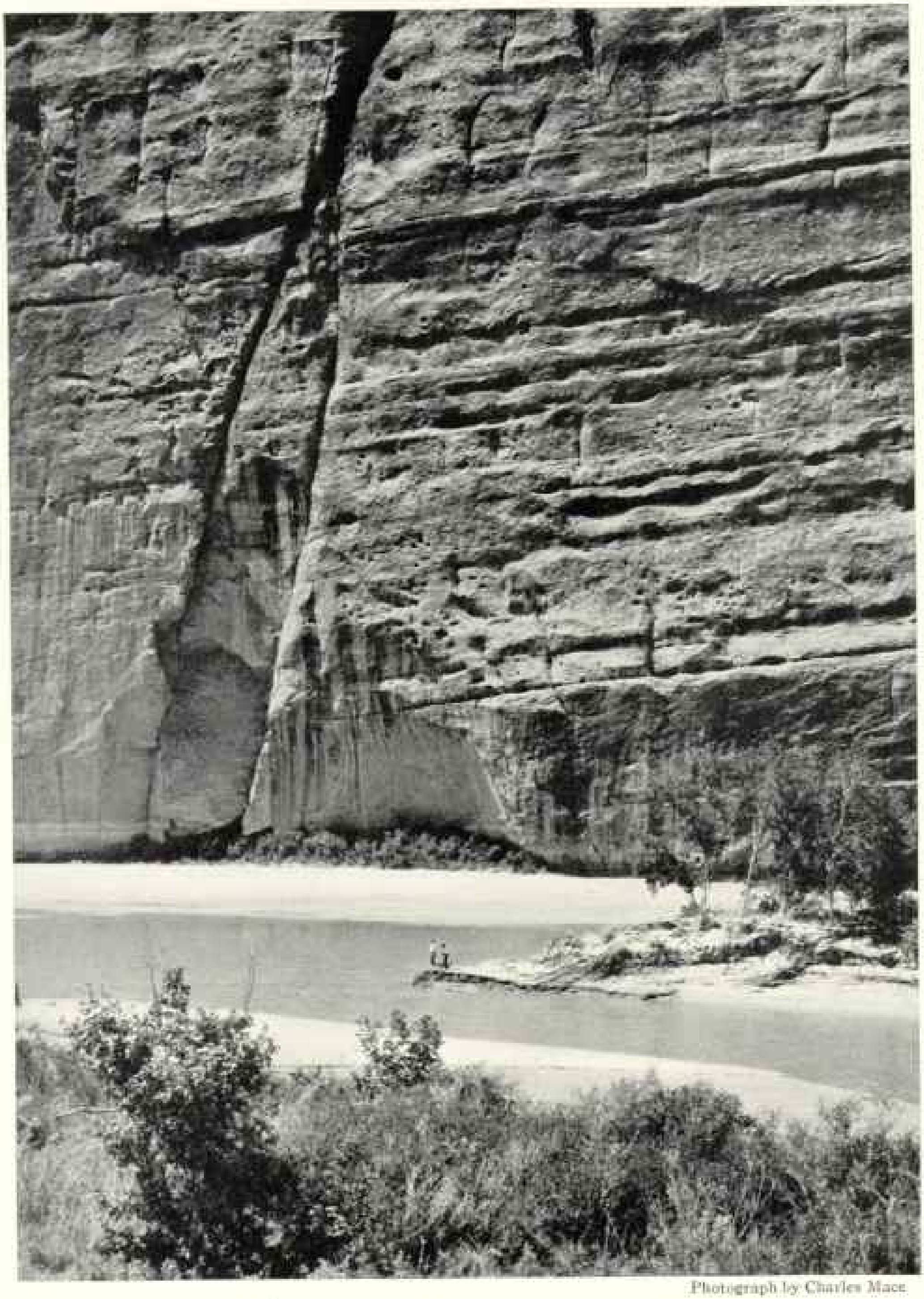
### HIGHWAYS HAVE OPENED THE BACK COUNTRY

As you explore Colorado's mountain region, rich alike in gold and superb scenery, you find excellent motor roads penetrating the roughest terrain. The State's mountain highway system has opened up this region of tumbled peaks only in recent years. Twenty years ago the State's "summer land" consisted almost exclusively of the foothill country and the eastern slopes of the front range.

Now, with four excellent main highways crossing the Continental Divide and with a network of minor roads and trails available, increasing numbers of the holiday crowds are pushing into the back country, where the scenic beauties are more marked, where the fishing is better, where the highways are less crowded, and where, if one wishes to penetrate still farther, he can leave civilization itself behind and live for a time in an unspoiled wilderness.

Mountain highway building may appear simple enough to the vacationist, as he bowls along "in high" over loop after loop of gently rising road that lifts him eventually to a lofty ridge of the Rockies and eases him down on the other side.

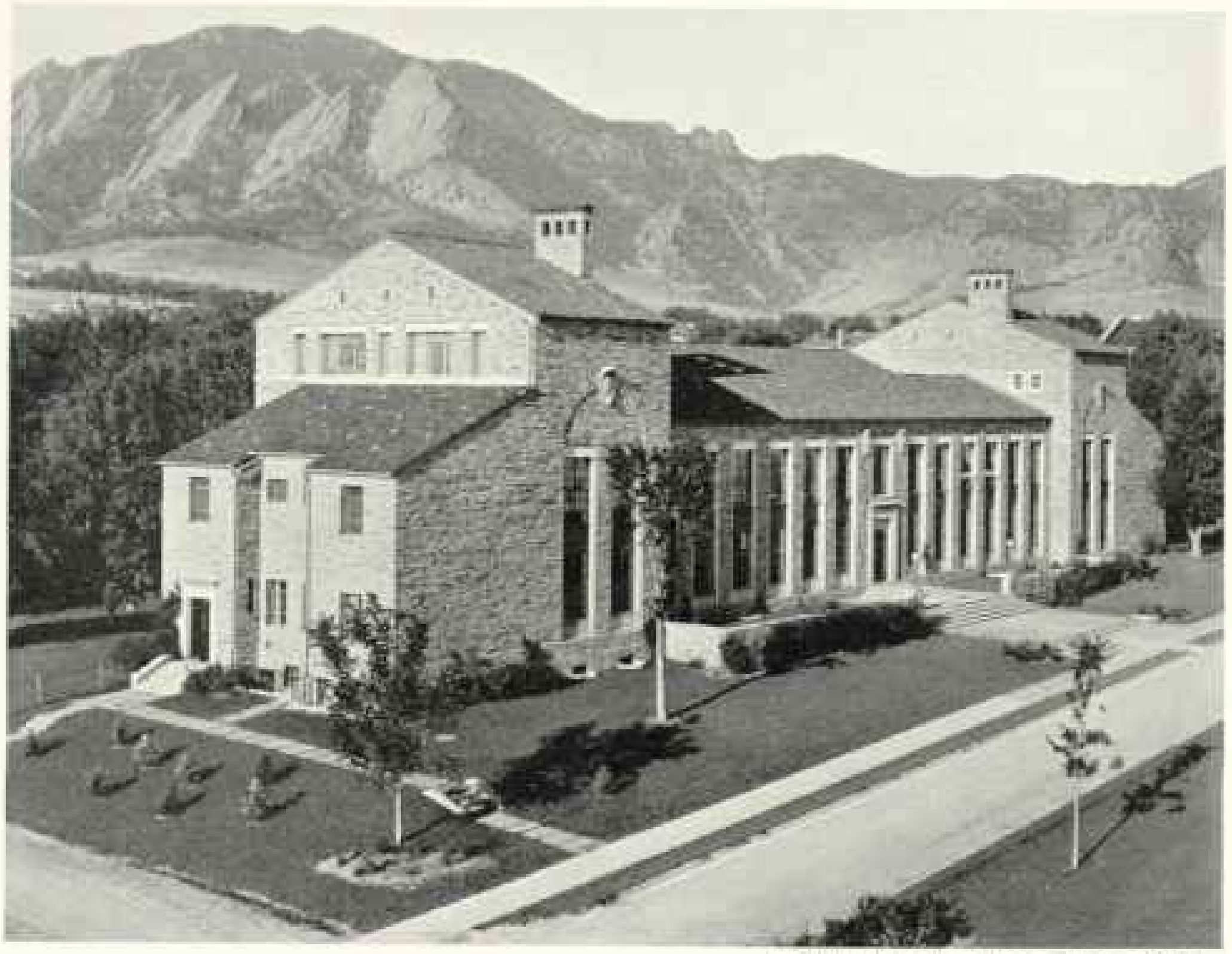
But these modern highways didn't come into existence over night. Look sharply and you will see their history written in the rocks by the wayside. There is an abandoned stretch of the road of fifteen years ago, good in its day, but climbing with a grade up which automobiles could barely creep. Farther, half hidden by new growth, is an eroded section that strikes boldly and unscientifically up the mountain side. It is a part of one of the first



Photograph by Charles Mace

THE GREEN RIVER'S TOWERING CLIFFS DWARF THE OCCASIONAL VISITOR

Only a few wandering cowboys and now and then a searcher for the ultimate wilderness see this deep canyon, near Colorado's northwestern corner, where the Yampa or Bear River meets the Green.



Photograph from the Colorado Association

SCENERY AND SCHOLARSHIP, MOUNTAINEERING AND MATHEMATICS, ARE ALL FACTORS IN THE COLLEGE LIFE OF THIS CAMPUS

The Rockies start almost at the edge of the grounds of the University of Colorado, at Boulder. Within a stone's throw are stiff climbs and woodland trails. Only a few miles distant are glaciers, trout streams, and the crests of 14,000-foot peaks. For the comprehensive building development that has been begun, the authorities of the university have chosen an architectural form created to harmonize with its mountain background. It was adapted from the style that has grown up in the high valleys and among the lofty peaks of northeastern Italy. The Fine Arts Building.

roads to dare Colorado's "impenetrable" mountains, a relic of railroadless mining days. Over it great creaking wagons were drawn sometimes by 20-mule teams or long strings of laboring oxen, to the curses of weather-beaten mule-skinners and hard-visaged bull-whackers.

### EARLY DIFFICULTIES FORGOTTEN

Decade after decade grades have been pared down, curves made less sharp, roadways widened. And still it goes on, this breaching of Colorado's barrier. But the history of the travail of early road-building and the major operations that followed has in large part been forgotten with the passing of the men who pioneered.

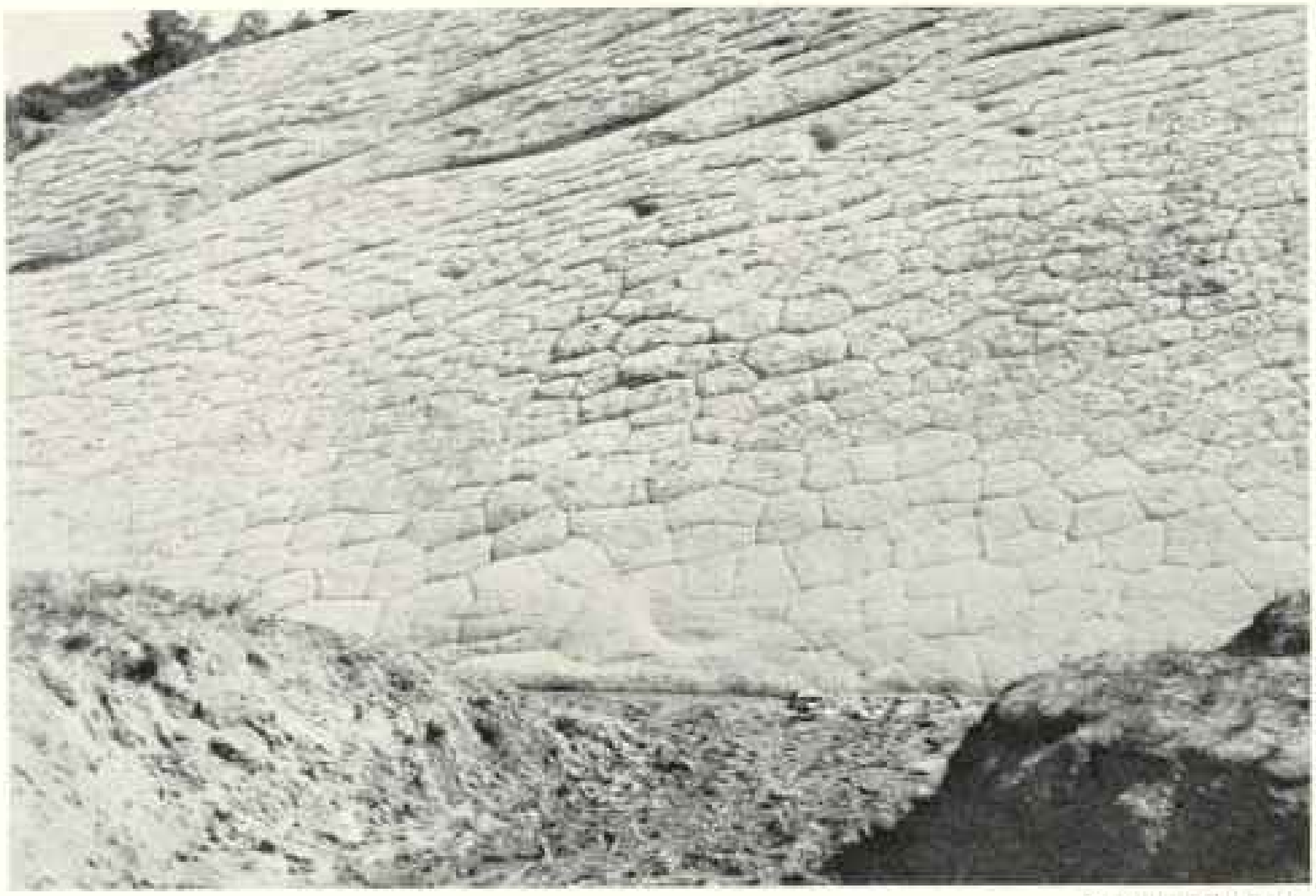
Colorado has had real problems in financing its costly road-building—problems not encountered by highway engineers in most of the plains States. Highways must cross great stretches in the mountainous region where the population density is only one or two per square mile. Distances are long between towns of importance. The burden is somewhat lightened by the United States Forest Service, which constructs and maintains the sections of road that pass through its areas, and by the National Park Service, which builds roads in the parks and other reservations under its control in Colorado.

Motoring over the crushed-stone roads of the State, you realize that the Spaniards who named the region "Colorado" (colored) named it well. In a 1,500-mile drive through the State, I traversed pink roads and brilliant red ones, roads that were

Photograph by George L. Beam

NATURE FILLS THIS GIGANTIC BATHTUB WITH HOT WATER

Even in subzero weather one may swim in comfort in this pool at Glenwood Springs. It is one of the largest open-air, hot mineral pools in the world. Glenwood, with excellent hotel facilities and mineral baths, has been a Colorado Spa since the railways pushed into the Western Slope country. More than 250 mineral springs are scattered over the State, many of them hot.



Photograph by Gale

A JIG-SAW PUZZLE IN GEOLOGY

Unusual polygonal jointing in white sandstone near Meeker, in northwestern Colorado. Through Meeker runs the northern highway route to Salt Lake City and on to the Pacific coast.

gray, green, white, black, and yellow, and even one with a purple hue.

But Colorado's unique road, though it appears to be of ordinary concrete, is a road of gold. Because certain ore from a Cripple Creek mine is so hard that it costs almost the value of its gold to recover it, the mine-owners sold large quantities of it to the State as concrete aggregate. The road, laid for 40 miles in the foothills between Colorado Springs and Sedalia, contains twelve thousand dollars' worth of gold per mile.

### MOUNTAIN PASSES ARE VITAL IN COLORADO'S LIFE

Nothing has been a more vital factor in Colorado's transportation problems than passes, the notches in mountain ranges that, when found, may eliminate several thousand feet of hard climb. The earliest roads made use of the first passes discovered, but these were not always the lowest and best. Gradually, as the more easily negotiated notches came to light, travel shifted to them, and over them now operate the railways and leading highways.

But, even with the best passes in use, the Rockies are formidable. It is impossible to cross the State by highway without rising at least once to more than 10,000 feet above sea level. On some routes this elevation must be reached twice and even three times. The most traveled of the passes over the Divide are Berthoud, west of Denver, on the direct route to Salt Lake City, more than 11,300 feet high; Tennessee Pass, near Leadville, traversed by both railway and highway, 10,240 feet; Monarch Pass, a hundred miles west of Pueblo, 11,650 feet; and Wolf Creek Pass, in southwestern Colorado, 10,850 feet.

To the commercial trucker the numerous gigantic ridges that must be crossed in Colorado are doubtless sore trials, but to the holiday explorer by motor, who has come to drink in Colorado's rugged beauty, they are a continual delight. Repeatedly he is glad to make in a few hours the astounding journey that transports him, climatically, from Kentucky to Labrador, and whisks him back from Canada to the Mexican border.

Only a few years ago it was taken as a matter of course that all these high passes must be snowed-in each winter and closed to traffic for months. Roads remained open in western Colorado and in the east, but if an automobile owner in either section wished to use his car on the opposite side of the Divide, he must load it on a freight train and ship it over Tennessee Pass.

But the Highway Advisory Board found that it was costly to open up the roads in the spring; that it was cheaper never to let the snow and ice accumulate.

Now, when a blizzard sets in on Colorado's most important passes, a patrol starts to work with snow plows. When the blizzard is over, the pass is soon open and traffic resumes its flow (see illustration, page 54).

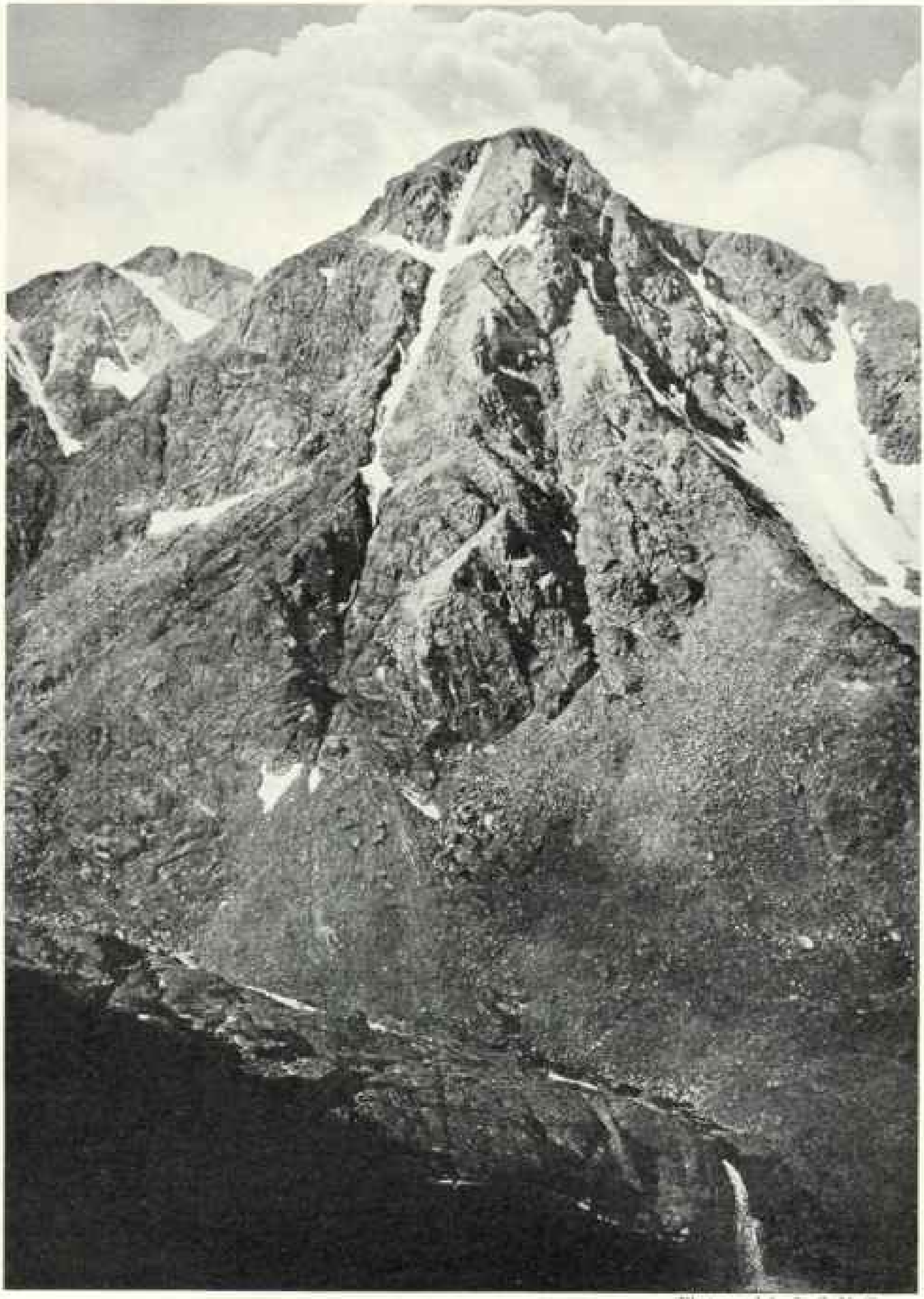
Gold was only the curtain-raiser for the amazing drama of minerals that has unfolded in Colorado. Silver was discovered in paying quantities six years after the gold rush. Four years later, in 1868, more ounces of silver were produced than gold, and this has been the case in every year since.

When Leadville's bonanza silver mines came into heavy production, in 1879, the dollar value of the silver mined each year actually passed that of gold. Colorado had become primarily a silver State.

### AMAZING WEALTH OF MINERALS

One reason for the tremendous production of silver in Colorado—an average of more than 300 tons of it a year—is the complex nature of the State's ores. Many contain mixtures of gold, silver, copper, lead, and zinc. Thus silver has been a by-product in numerous properties and has often paid the freight for gold.

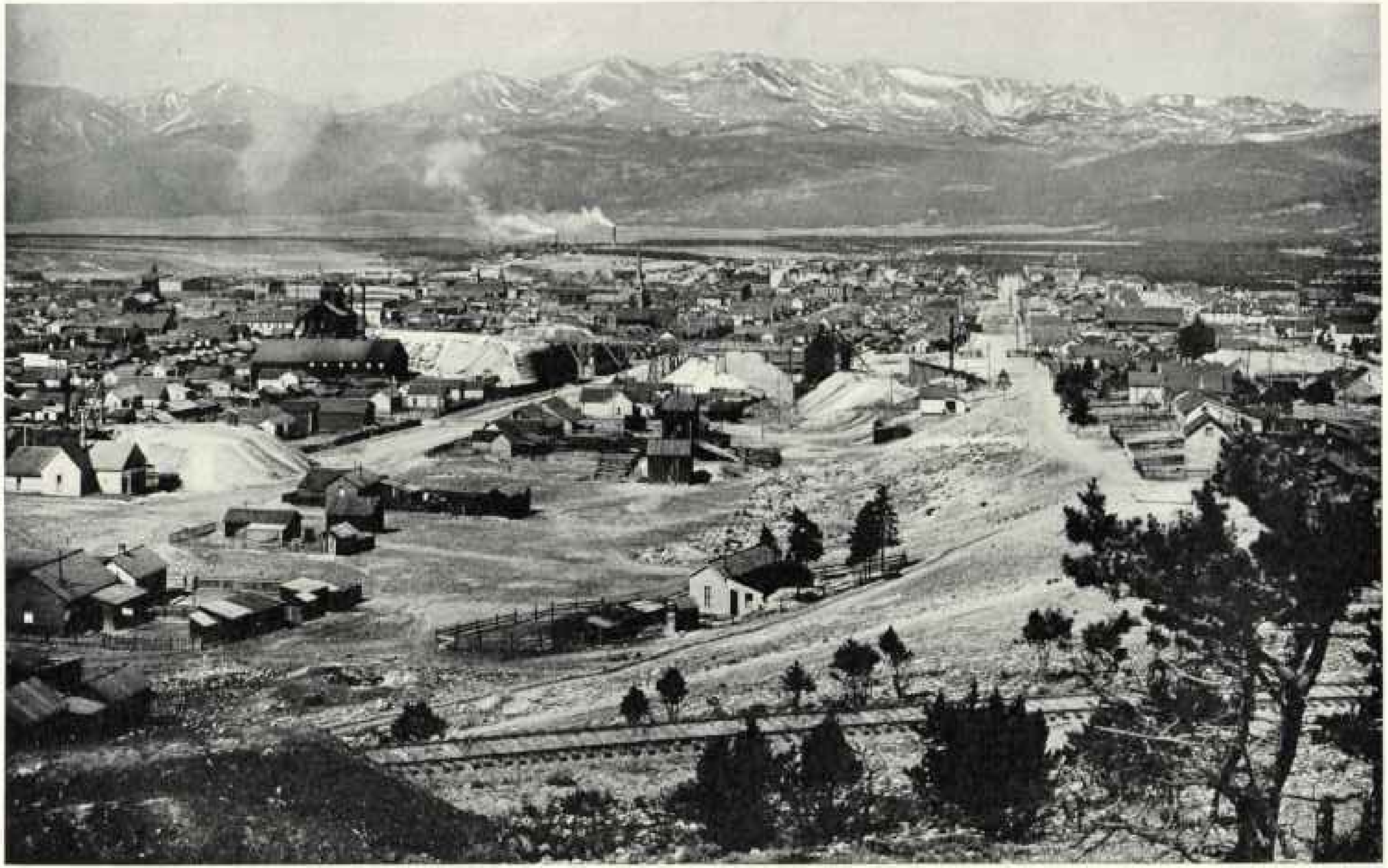
Tin and titanium, cadmium and cobalt, manganese, mercury, and molybdenum, antimony and arsenic, zinc and zircon—dip almost where you will into the alphabet of minerals and you will find substances mined or minable in Colorado. Some deposits are awaiting a turn in economic conditions before they can be touched. Others have had their day and may have a rejuvenation. A case in point is radium. Carnotite beds from near the State's southwestern corner furnished the world some of the earliest radium produced. But this mine had to close when ores that could be more cheaply worked were discovered in Africa.



Photograph by L. C. McClure

CHRISTIANITY'S HOLY SYMBOL IS BLAZONED IN SNOW ON A MAJESTIC MOUNTAIN

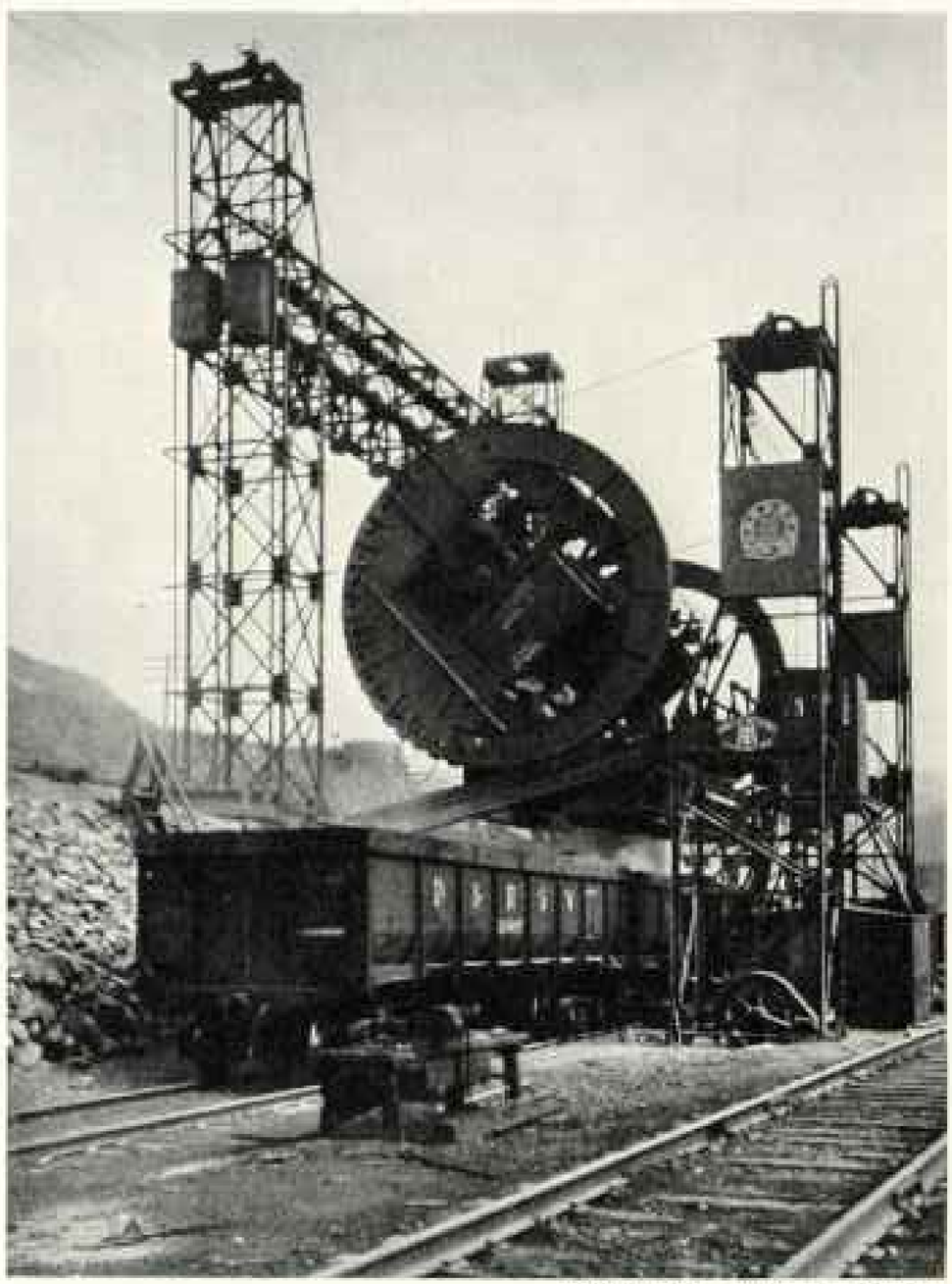
The Mount of the Holy Cross has been an inspiration to thousands, although it is known chiefly through its photographs. Because of its hitherto inaccessible location, probably not one in a thousand of the throngs of visitors to Colorado has seen this noble peak. In 1929 President Hoover created the Holy Cross National Monument, embracing the face of the mountain on which the cross appears. A road now being built will make it possible to reach by automobile a vantage point from which the great snow cross can be viewed. The mountain is supposed to have been given its name by early French fur traders. The cross is formed by deep ravines filled with snow. The upright is approximately 2,000 feet in length.



Photograph courtesy of the Colorado Association

LEADVILLE WAS COLORADO'S MOST SPECTACULAR TREASURE CHEST

For eighteen years after the gold rush of '59 there was only slight mining activity at the site of Leadville. Then it was found that virtually the whole area was extremely rich in carbonate of lead carrying a heavy content of silver. Later gold, too, was discovered. The town boomed and by 1880 was the second city of Colorado. To-day shafts and tunnels extend under the city streets and mine dumps rise in back yards. Since the beginning of its mining activities, Leadville has produced gold, silver, lead, and a half dozen other minerals of a total value between three-fourths of a billion and a billion dollars. During its hectic boom days it was one of the most famous mining camps in the world.



Photograph by Charles M. Smyth

TRANSFERRING FREIGHT WITH TOPSY-TURVY MACHINERY

At Salida, where the broad-gauge system of the Denver and Rio Grande Western Railway meets its narrow-gauge lines, this device has been erected to transfer ore from little cars to big ones. The small car is run into the open-work drum, where it is made fast and then rotated. The ore is thus dumped into the waiting standard-size car below. A greater mileage of narrow-gauge railways exists in Colorado than in any other State in the Union (see text, page 47).

Photograph by R. P. Lucas

TUNNELING FOR GOLD IN THE HEART OF A MOUNTAIN

Hundreds of miles of such tunnels have been gouged from the solid rock of Colorado's mighty ridges since John Gregory discovered the first vein of gold on Clear Creek, in 1859. In the early days a mine was considered a big business enterprise if it handled a hundred tons of ore a day. Now some Colorado mines run 500 to 1,000 tons through their mills, but the ore is of low value and the precious metal extracted is frequently only a few dollars a ton (see, also, text, page 22).

Photograph by Ernest Carta

THE CRUDE FORERUNNER OF THE COMPLICATED MODERN ORE MILL

The early Spaniards of the Southwest invented this *arrastra*, a primitive device for grinding ore, so that the few golden grains could be released from the many worthless particles of rock. The small bowlder, attached to the short end of the beam by a chain, was dragged around the stone basin by a horse hitched to the beam's long end. To-day the first step in ore treatment is still to grind the rock, but instead of using the primitive arrastra, the modern mining engineer crunches his ore to bits with power-driven plates and cones of tool steel.

Just now Colorado is sitting on top of the molybdenum world. A mine at Climax, near Leadville, is turning out ore that produces each year several million pounds of this rare metal that makes the steel of our steel age tougher, stronger, and harder. From this one mine comes more than four-fifths of the entire world output of molybdenum.

Vanadium, another rare and valuable metal used in steel manufacture, is flowing from a mine at Rifle, in western Colorado. This is one of the largest vanadium mines in existence and yields one-fifth of the world supply.

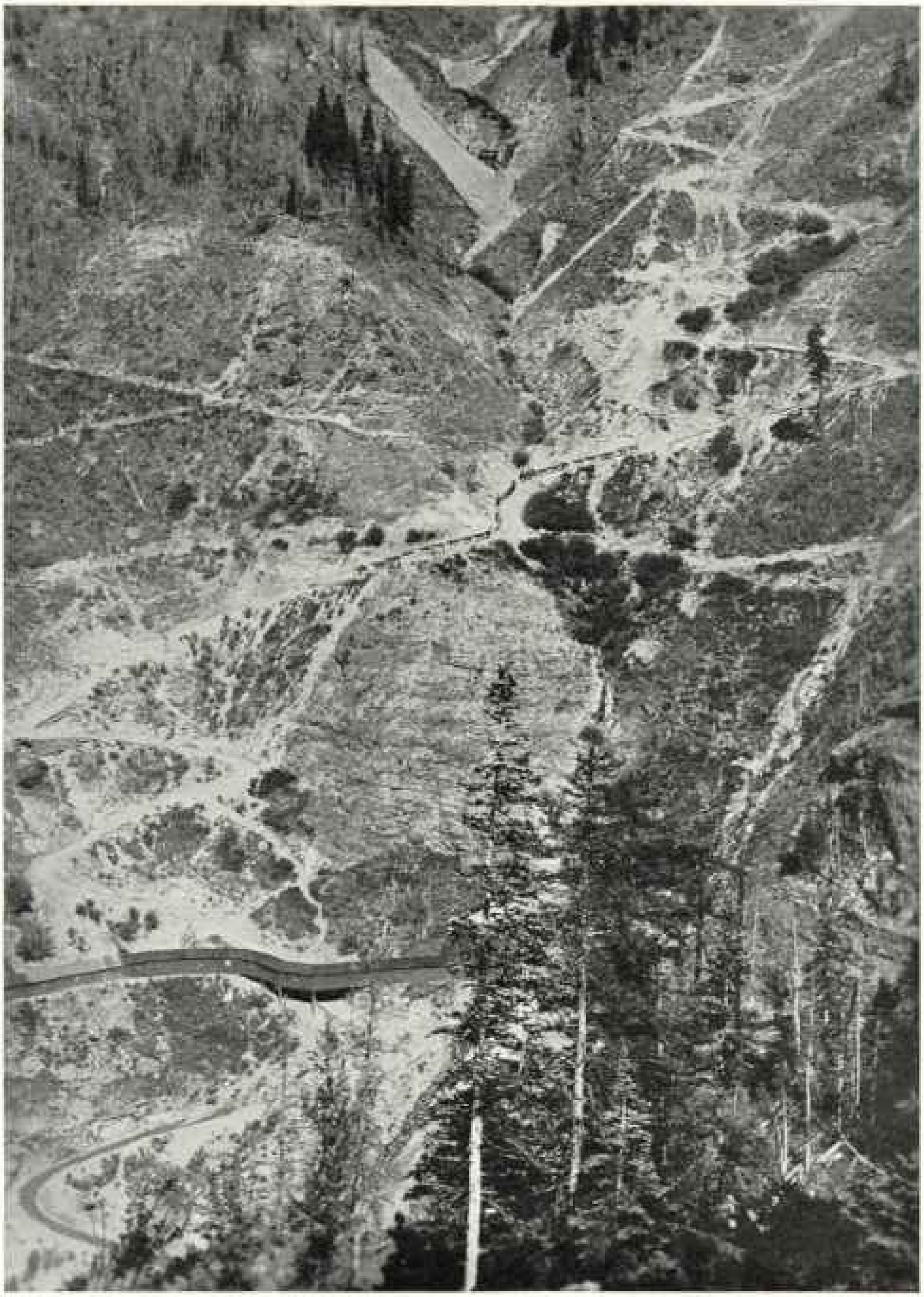
### COAL, NOT GOLD, IS KING

Beside precious and rare metals, coal may seem a grimy interloper, but it is mineral king of Colorado. It passed gold a few years ago. Close to three-quarters of a billion dollars' worth has been dug during the State's life.

All along the foot of the front range are coal mines—some large, some mere private fuel-holes. Near Colorado Springs two guides who take visitors up Pikes Peak on burro-back in summer open up their little mine in winter, dig the coal themselves, and sell it at a few dollars a load, "cash and carry."

Petroleum production to-day means derricks and clanking drilling machinery, gushing streams of greasy, black liquid. But some day petroleum will be *mined* and *manufactured* in Colorado. The State's vast beds of oil shale are one of America's mineral wonders. Nearly a million acres in the State have been classified by the United States Geological Survey as oil-shale lands and have been removed from entry against the day when the country's liquid petroleum supply will be exhausted.

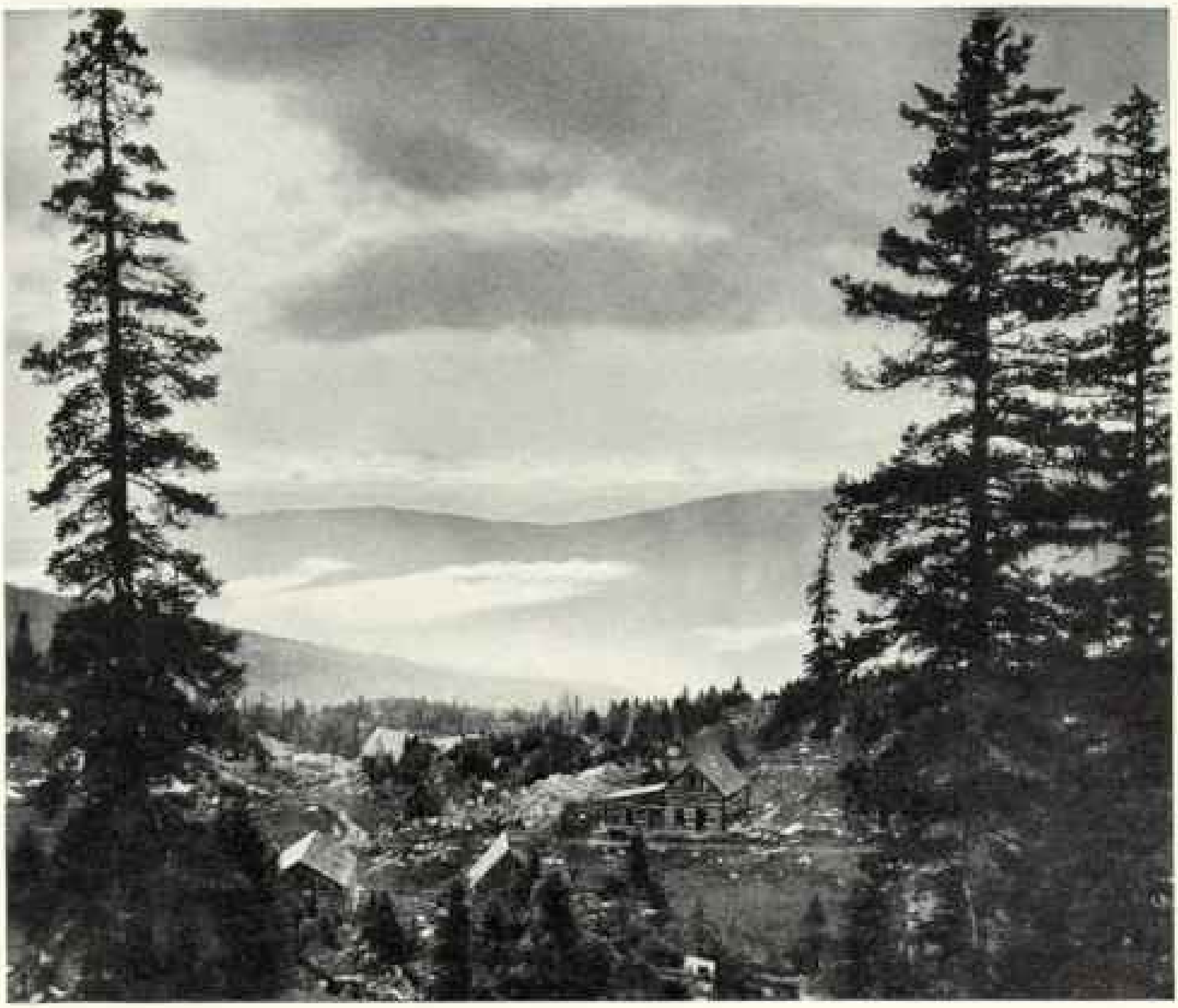
Driving in western Colorado along the highway between Glenwood Springs and Grand Junction, you pass beside cliffs of



Photograph by D. B. Walker

DOWN SUCH TRAILS GOLD WORTH MILLIONS HAS COME BY MULEBACK

The pack train was the only practicable means for transporting ore from inaccessible mines to mills and smelters in the early days of Colorado mining. Only extremely rich ore could yield a profit after such costly handling. Shafts to lower levels, wagon roads, and great cableways, which swing heavy ore buckets high above tree tops, have in large measure superseded pack-animal transportation; but a few mines, notably the Camp Bird, near Ouray, still depend on the mule and his pack saddle. The pack train in the middle distance is descending Cornet Gulch, near Telluride, from the Liberty Bell Mine.



HOLY CROSS CITY IS ONE OF COLORADO'S GHOST TOWNS

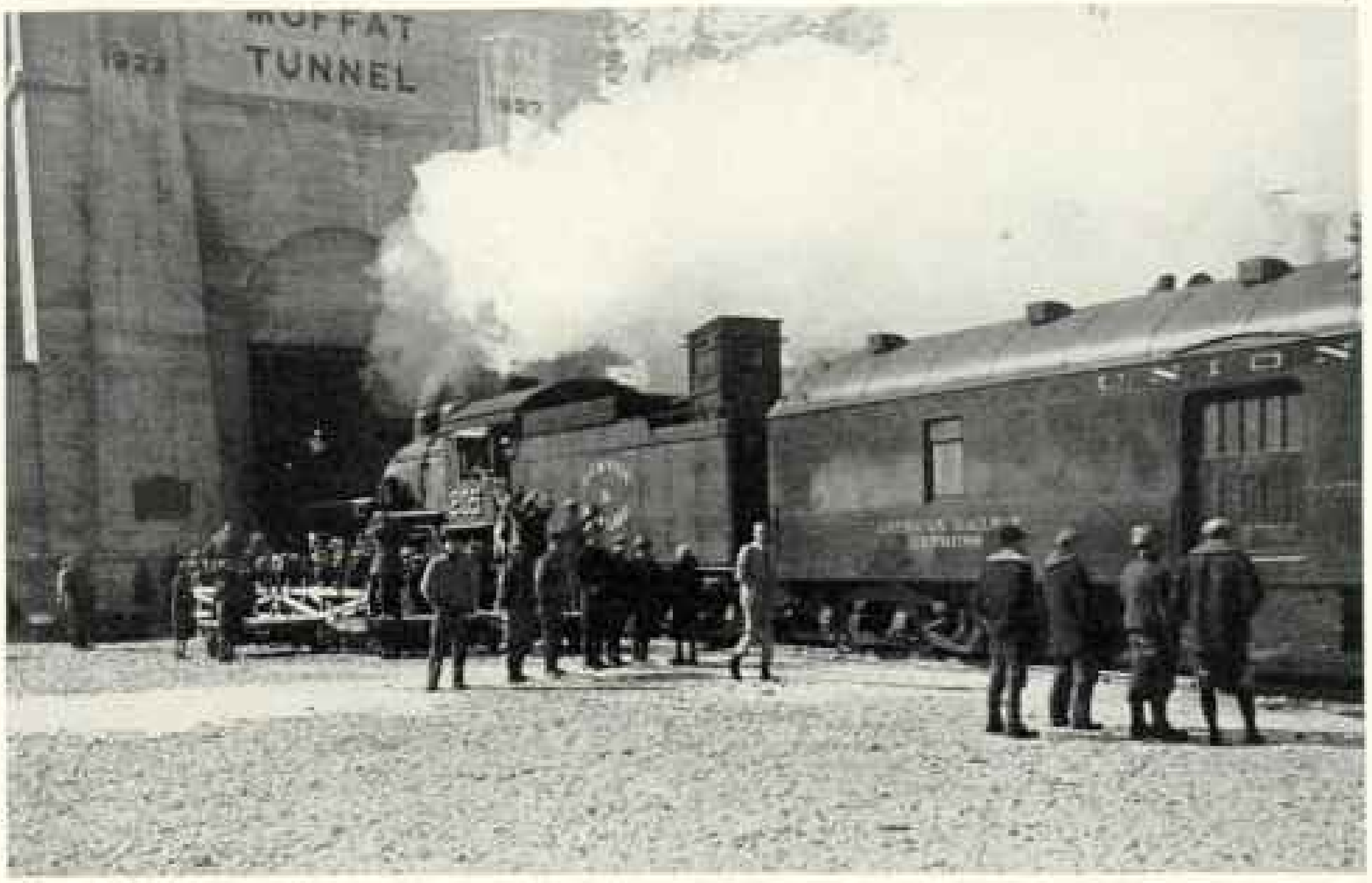
The deserted village was once a busy mining community. Started in 1881, the town grew rapidly. Hundreds of dwellings and store buildings have disappeared entirely, and grass covers former streets that saw business by day and rollicking celebrations by night. The site of the town is near the Mount of the Holy Cross, at an elevation of 11,500 feet (see illustration, page 23).

oil shale near De Beque. The shale is bone dry; no greasiness, no seepage of oil; yet in each ton of it, securely locked up in some unexplained way, are from 15 to 50 gallons of crude oil. In the known deposits, it has been estimated by petroleum specialists, are nearly 50 billion barrels of recoverable oil. This is enough, at the 1932 rate, to supply the annual production of crude oil in the United States for more than half a century.

### THE SECOND STATE TO STRIKE OIL

But Colorado's interest in oil is not confined to shale. It is a surprise to many, who know pretty well the magic story of petroleum development, to learn that Colorado was the next State after Pennsylvania to strike oil. The Florence oil field, a few miles west of Pueblo, was discovered in 1862, and, although it was not spectacular, its wells have produced petroleum in paying quantities since their development, in 1887. In recent years other fields have been discovered, some of the most promising in 1931.

By far the most spectacular gas well in the State lies in North Park. It is a natural soda fountain, a well from which gushes daily forty million cubic feet of carbon-dioxide gas. This freakish hole has been dubbed "the ice-cream well," for when the tremendous pressure of the gas is released as it reaches the outer air, the accompanying oil is frozen to a white, snow-like substance. The temperature of the gas is more than 100 degrees below zero. In a little factory near by the gas is made into carbon-dioxide ice and shipped for refrigerating purposes.




THE ROCKIES' PREMIER TUNNEL SAVES A 2,400-FOOT CLIMB

The Moffat Tunnel, under James Peak, gave Denver its only standard-gauge railway directly into the rich Western Slope country. A proposed 35-mile cut-off in western Colorado will make the tunnel, which cost $18,000,000, a link in a through transcontinental line (see page 61).

Photograph by Eugene Hutchinson

HERE FAT STEEL BILLETS ARE TRANSFORMED INTO MILES OF SHINING WIRE

The steel plant in Pueblo is the largest west of Chicago. Of barbed wire alone 225,000 miles are turned out annually—enough to build a nine-wire fence around the world at the Equator.

Photograph by L. C. McClure

WINTER MEANS A SEASON OF INCESSANT BATTLE FOR MOUNTAIN RAILWAYS

In Colorado is the greatest concentration of high mountains in the United States. Forty-eight named peaks exceed 14,000 feet in altitude and hundreds reach above the 10,000-foot mark. Four through railways cross or penetrate the Continental Divide within the State and, except under the most unusual weather conditions, are kept operating during the winter. These drifts are on Rollins Pass. The Moffat Tunnel (see pages 29 and 61) now permits trains to dodge far under them.

Take in fancy a rapid swing around Colorado to learn the bewildering variety of the State's physical features and its diversified economic life.

Within this typical mountain State is an area as great as all Indiana almost devoid of hills. As you whiz by on the airline roads of eastern Colorado, you see only small herds of cattle in pastures. But 60 years ago these vast plains, unfenced, were the seat of a bonanza cattle industry that rivaled gold mining and created cattle barons as wealthy and famous as those of Texas.

The industry killed itself by the late eighties by overgrazing, and moved west.

Turn north to the valley of the South Platte River. There you enter Colorado's outstanding irrigated domain. Lush green fields of alfalfa here, dairy herds, and mile upon mile of straight rows of sugar beets. You drive West in spring and summer through a sea of moisture-created green, beside wide irrigation canals, across many a water-filled ditch.

## IRRIGATION MAKES FACTORY CHIMNEYS GROW

Irrigation was the savior of Colorado. Most of the treasure-seekers who went out in '59 and '60 had only the desire to collect gold quickly and return to the East. It was believed that the country could not support a permanent population. But a few men planted gardens in the river bottoms, led water to them in crude ditches, and obtained astonishing yields.

Coöperative groups built larger ditches at higher levels and threw up diversion dams. Development has gone on until now every one of the many streams that flow from the mountains is taken almost bodily over by irrigators as soon as it reaches the foothills.

BIGHORNS, OR ROCKY MOUNTAIN SHEEP, FEEDING AT OURAY STATION

Deep snows and hunger drive dozens of mountain sheep from the heights above Ouray down into that mountain-rimmed town. For years the citizens have provided hay for these winter visitors. Naturally the shyest of wild creatures, these sheep do not object, while they eat, even to the noises of civilization. Immediately behind the sheep is a narrow-gauge train, of the type that has provided all southwestern Colorado with rail transportation since 1881.

As I drove through the highly developed irrigated region north and west of Denver, I came, every few miles, to great factories of steel and glass, each dominated by a tall smokestack. These, I learned, are one of the fruits of irrigation. In them millions of tons of beets that grow in the surrounding fields are turned each year into hundreds of millions of pounds of sugar. In 1930 Colorado factories produced nearly a third of all the sugar produced in the United States.

This white, crystalline gold from Colorado's plains has been worth in excess of $50,000,000 in a single year, more than ten times the value of the yellow gold that was dug in 1931 from the mountains.

All through this irrigated country of northern Colorado I came upon thriving towns—Sterling, Fort Morgan, Greeley, Fort Collins, Longmont, Loveland, and dozens of smaller ones—each surrounded by fields of verdant green.

Greeley is probably the best known of these towns. It was founded in 1870 by the pioneer agricultural colony of Colorado, led by Nathan C. Meeker, agricultural editor of the *New York Tribune*. Horace Greeley, editor of the *Tribune*, helped organize the colony, and his name was given to the new town. This community had not been planned when the great editor, through his paper, counseled the youth of the land to "go west and grow up with the country," but the widely published advice undoubtedly sent many an emigrant to the Pikes Peak country.

SENTINEL CRAGS GUARD THE ROCKIES

I drove westward from Greeley one summer afternoon, intent on making the sudden passage from plains to mountains. This ability to leave a world of flatness behind and to plunge, on a moment's notice, into a contrasting realm of rocks and forest-clad hills, valleys, and towering peaks, is a never-ending fascination. As I passed through Loveland and on westward, the high Rockies loomed up more and more plainly, dominated by the small, flat top of Longs Peak, king of the northern mountains.

Courtesy U. S. Forest Service

BRIDAL VEIL FALLS AND SPOUTING ROCK, NORTHWESTERN COLORADO

The least-known region of Colorado is the portion that lies west of the Continental Divide and north of the Colorado River. Major roads cross it and one railway penetrates it, but large areas are without permanent inhabitants.

Soon my car was rolling through a rough country of tumbled rock layers, dragged into confusion millions of years ago, when the Rocky Mountains were thrust up a few miles to the west. They stand all along the Front Range, these fantastic crags, like sentinels set to guard the majestic heights beyond.

Past the jumble of rocks, my highway dived into the canyon through which the Thompson River issues from the foothills, and followed that narrow and picturesque defile for ten miles beside waters that rushed and plunged among huge bowlders.

Suddenly the canyon ended. The hills seemed to have been pushed aside, and I found myself in one of the typical, charming mountain-rimmed "parks" for which the Rockies have become famous. This was Estes Park, long a haven for summer visitors and now the portal to Rocky Mountain National Park, the 405 square miles of valleys and mountains, glaciers, lakes, and streams that make up one of the most popular of the Federal playgrounds. To travelers approaching from the East, it is the most accessible of the larger national parks. As a result, at the height of the summer season, approximately 20,000 visitors enter each week.

### A ROAD AMONG MOUNTAIN TOPS

One could tarry long in Estes Park, treading new trails and finding new beauties daily; but I was eager to breast the Continental Divide that hangs over this sheltered nook in the mountains; so, after a night in one of the many hotels that perch on hilltops and mountain slopes near the village, I pushed on with a companion. We drove, with many a turn and loop, over a good highway that lifted us to Fall River Pass, approximately 11,800 feet high; on over near-by Milner Pass, in the Divide, and down to mountain-rimmed Grand Lake, Colorado's largest body of water.

The road that led us out of Estes Park discloses marvelous mountain scenery, but it is not to be compared with another National Park highway nearing completion close by. This, the Trail Ridge Road, built by Federal engineers, is the most ambitious mountain highway yet constructed in America.

We nosed our car around clumsy, clanking steam shovels, that seemed strangely

out of place in this lofty region, the undisputed realm only a few years ago of the eagle and the mountain sheep. Rounding a shoulder, we entered a stretch of road that runs for four and a half miles along a huge ridge, almost level, at an elevation above 12,000 feet. This level road is actually higher than many a world-famous mountain summit. Across a vast abyss but only a few miles away from us rose the Continental Divide, peak after towering peak set in a row. I could almost look down upon the tops of those mountain giants.

Where other roads seek the easiest and cheapest route over mountains, this unique highway was deliberately pushed through difficult terrain to reach scenic vantage points. As a result, it puts in reach of the automobile driver magnificent views from mountain heights accessible before only to horseback rider and skilled foot-climber.

Over the mountains, a few miles to the northwest of Estes Park, lies much larger North Park, one of the major level plots of the mountain region, where the cattle industry still lingers and where streams teem with fish.

### STATE ENVOYS CONSIDER IRRIGATION PROBLEMS

One of Colorado's fundamental irrigation problems has arisen there. A fork of the North Platte River rises in the park and flows north into Wyoming. Plans were made by Wyoming to use the water from this stream to fill a great irrigation reservoir; but Colorado was at the same time planning to divert a large part of it through a tunnel in her mountains, and to carry it to her own eastern plains to further develop irrigation there.

The resulting dispute has entered the field of "State diplomacy." For a year or more now accredited envoys from the two States, like ministers of independent nations, have met from time to time, seeking to negotiate a treaty that will apportion the waters equitably.

This is not the only problem of the sort confronting Colorado. The high Rockies are the birthplace of numerous streams that flow across State lines. Negotiations are under way or will arise with Nebraska over the waters of the South Platte, with Kansas concerning the Arkansas, with New Mexico in regard to the Animas River south of Durango, and with New Mexico,

Photograph by Dean

VISITORS FIND "COLD SHIVERS POINT" WELL NAMED

The canyon floor is 800 feet below. A scenic highway from Grand Junction leads to within a few feet of the point.

Photograph by Charles M. Smyth

A 1,200-GALLONS-A-MINUTE IRRIGATION WELL IN THE ARKANSAS RIVER VALLEY

Colorado has nearly three and a half million acres under irrigation, a far greater area than that of any other State save one. This use of water adds between forty and fifty million dollars annually to the value of Colorado's agricultural crops. Most of the water used in irrigation comes from streams.

Texas, and the Federal Government in regard to the waters of the Rio Grande. The most important State treaty to which Colorado has been a party so far is the Seven States Pact concerning the waters of the Colorado River, as a result of which the great Hoover Dam is now being built.

### HIGHWAY PARALLELS COLORADO RIVER

Over Tennessee Pass into Colorado's Western Slope country and along one of the headwater streams of the Colorado River runs one of the main highways to the Pacific coast. The road comes to the Colorado itself at Dotsero. By the time Glenwood Springs is reached the Colorado has gathered in numerous mountain-fed forks and is a sizable stream. Hot springs gush out at Glenwood, and it has been for two generations a Colorado Spa, like Virginia's White Sulphur and New York's Saratoga.

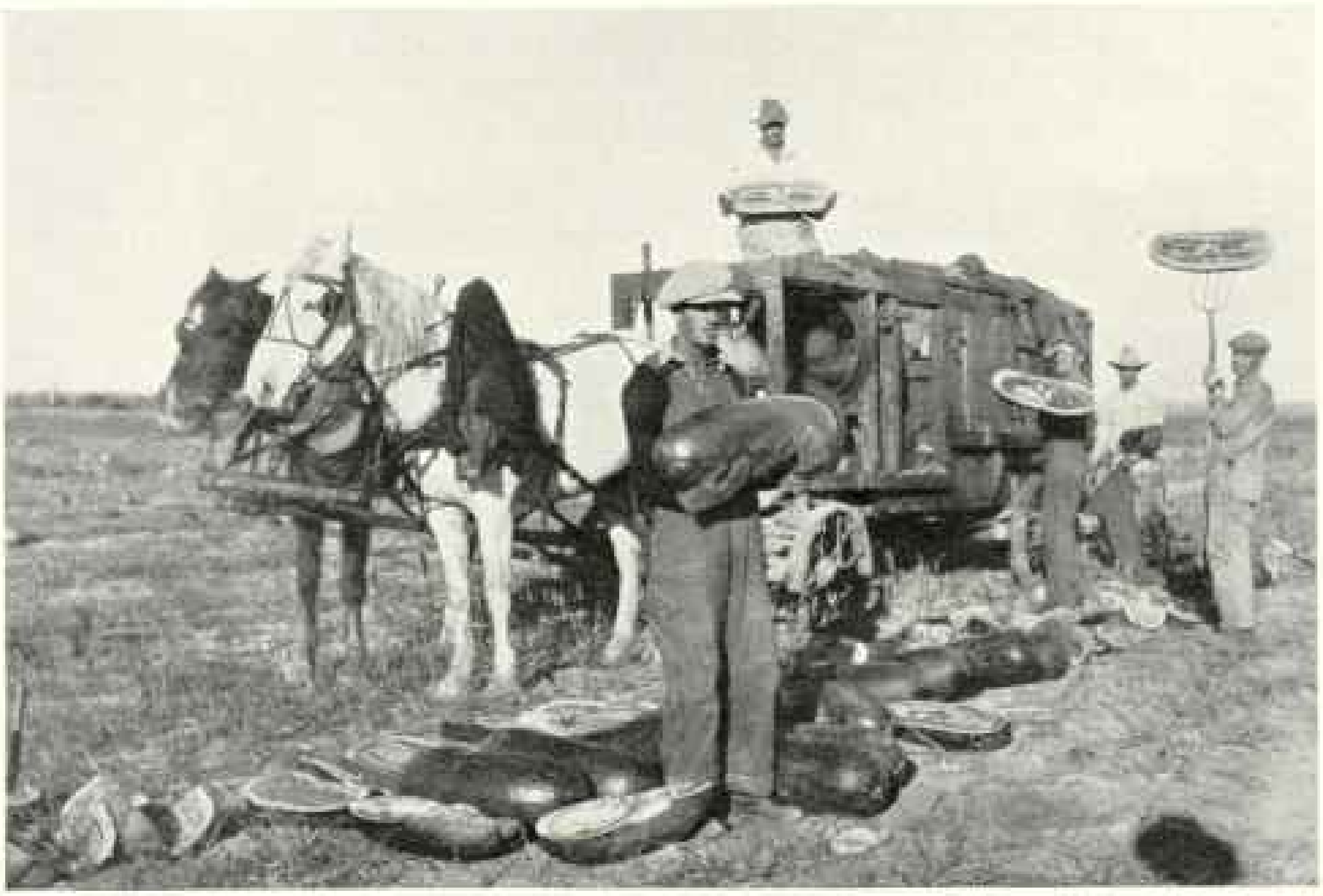
I drove west from Glenwood through alternating stretches of dry valley and irrigated farms. Passing mile-long cliffs of oil shale, I came to the village of De Beque, where the river plunges into a narrow canyon along which the railway long ago appropriated the only passable route. Until a year ago the highway turned aside for many miles over a high plateau; but dynamite and the jaws of steam shovels have gouged a shelf from the towering cliffs, and now a new highway section runs close above the tumbling waters.

A few miles downstream are the productive orchards that this water has created, square mile after square mile of them laid out in ordered rows that stretch far into the distance. Each year during late August and early September approximately 1,700 carloads of peaches roll east from the orchards around Palisade, a thriving little town that lives by and for peaches.

Photograph by Charles M. Smyth

SEEDS ON THEIR WAY TO THE PACKETS OF THE HOME GARDENER

Colorado's soil and climate make it an ideal seed-growing region and its bright sunshine facilitates the drying and curing of the seeds. Drying trays near Manzanola.



Photograph from D. V. Burrell

WATERMELONS ARE FED INTO THE MACHINE AND THE SEEDS ARE THRESHED OUT FOR MARKETING

Ninety-five per cent of all the cantaloupe seed grown in America and a large share of the watermelon and cucumber seed are grown on irrigated farms in the Arkansas Valley. Hundreds of acres of zinnias, petunias, and vegetables are cultivated yearly for their seeds.

Photograph by Del Norte Studio

"SKY-FARMING" IN A TRIBUTARY CANYON OF THE SAN LUIS VALLEY

In this single field, near Wolf Creek Pass, over 8,000 feet above sea level, are more than 50 acres of lettuce. In the high, cool regions succulent plants grow vigorously during the summer months, while the great heat and dryness at lower levels discourage growth. Colorado farmers can thus for a time have certain markets largely to themselves.

I rolled along through a broad valley covered with almost unbroken orchards—peach, apple, pear, and apricot—to Grand Junction, set down where the Gunnison River joins the Colorado. A few miles to the west lies a region of fantastically carved and eroded rock formations and deep canyons, into which scenic motor roads and horseback trails have been built. One of the most bizarre sections of this natural wonderland has been set aside by the Federal Government as the Colorado National Monument.

### AN UNCOMPLETED MOUNTAIN

A few miles to the southeast a great elevated region hangs over the valley, a block of "mountain stuff," it might be called, which has stubbornly resisted all Nature's efforts to wear it down into peaks and valleys. It is Grand Mesa, dubbed locally "the largest flat-topped mountain in the world." It is mountain high, assuredly, rising more than a mile above the valley. Its lofty flat top embraces 50 square miles of grassland and forest. More than a hundred lakes dot the top of the mesa and the slopes just below its rim.

The United States Forest Service administers this sky-high table-land and puts it to numerous uses, from grazing cattle and sheep to furnishing summer hotel sites and fishing facilities. Good motor roads make it possible to drive to the top with ease.

Whirling along the close-packed gravel road, bound south, you pass alternately through dry, semidesert bench lands and irrigated fields and orchards. Up the Uncompahgre River the road turns and is soon traversing a valley that in places widens to 20 miles.

Fertile farms now cover this valley floor and even neighboring bench lands. Capt.

THESE SEED PODS WILL ADD HUNDREDS OF TONS TO AMERICA'S ONION SUPPLY

Photographs from D. V. Burrell

ROCKY FORD, COLORADO, HAS LONG BEEN SYNONYMOUS WITH CANTALOUPES

Each year the State ships between 2,000 and 3,000 carloads of melons, the greater part of which come from the vicinity of Rocky Ford, where the market production of the luscious honey-dew melon also originated. This field of cantaloupes was grown for seed.

J. W. Gunnison, who passed through the region in 1853 in search of a route for a transcontinental railway, reported to the Secretary of War that the valley and its adjoining mesas, covered with sagebrush and cedars, was "a desert unfit for cultivation and habitable only by savages."

### ENGINEERS KIDNAPPED A RIVER

The transformation has come largely from the work of the United States Reclamation Bureau. There was insufficient water in the Uncompahgre River to irrigate the valley's many fertile acres; so the Bureau's engineers kidnapped the Gunnison River in a deep canyon, dug the world's longest irrigation tunnel through six miles of mountain, and turned the captive waters into the Uncompahgre.

President Taft went to the valley in September, 1909, to celebrate the completion of the notable engineering feat and made the electrical contact that set the man-made river flowing, by touching together bits of gold and silver, two of the State's chief products. Residents of Montrose, the modern little city that has sprung up in the Uncompahgre, are still chuckling over the President's *bon mot*, which toyed with syllables of the long Indian name, yet hurdled its difficulties. He spoke of Uncompahgre as "this incomparable valley with the unpronounceable name."

In the forty-mile drive to Ouray you encounter another of the many varied facets that Colorado is forever turning toward you. The main range of the Rockies, which runs generally north and south through Colorado, swings sharply to the west in the latitude of Pueblo and thrusts into southwestern Colorado some of the finest mountains in the State. The highway from Montrose climbs almost imperceptibly and reaches these mountains just short of Ouray.

### A TOY TOWN IN A MOUNTAIN POCKET

There is no town quite like Ouray. A toy town it is, set in a mountain pocket. "Every resident of Ouray," some visiting Bill Nye wrote, "has a mountain in his front yard and another in his back yard." In sober truth, you can walk no more than four or five blocks in any direction; then you bump into a sheer cliff or a steep mountain slope. Fortunate it is that Ouray has never had a superboom; else it would have suffered the fate of Æsop's frog, or would have been driven to build skyscrapers rivaling Manhattan's. You stand on the short main street with a palisade of high peaks hemming you in and marvel that an automobile can get into or out of the place; yet through the town runs one of the State's finest roads, the Chief Ouray Highway.

South from Ouray this road leads between the towering ranges of the La Plata and Needle Mountains to Durango, a thriving town set in the irrigated valley of the Animas River. There are reminders of Spain and Mexico in Durango other than those supplied by its name and that of its river. The sun shines from a brilliant sky on the dry hills that rim the valley, and there are stucco houses in the architectural spirit that the Southwest has borrowed from the Republic to the south.

### GATEWAY TO DISTANT CENTURIES

Through Durango passes a rapidly growing stream of tourists, for the town is the eastern gateway to the cliff dwellings of the Mesa Verde National Park.

Mesa Verde (Green Table) looms up 30 miles west of Durango, a huge block of rock and earth rising 2,000 feet above a level plain. You must climb to the top of this table-land to reach the canyons in which are hidden some of America's most fascinating and mysterious ruins; but the climb is no longer difficult. The National Park Service has built a broad motor road that winds up the steep slope of the mesa, traverses for nearly 15 miles the juniper and piñon forests of its top, and leads to the cliff dwellings near the southern rim.

Into the south end of the great mesa a maze of deep canyons has been eaten by erosion, leaving narrow tongues of land between them. Under great overhanging masses of sandstone near the tops of these canyons the cliff dwellers built their homes.

You pick your way on foot along a narrow trail that leads below a canyon rim and drop straightway into distant centuries. You pass beside steep, sloping cliffs of sandstone into which brown workers pecked hand and toe holds long before Columbus was born, round a huge bowlder, and come upon a great structure of masonry, story piled upon story, stretching along the canyon wall.

The dry air and the protection afforded by the overhanging rock have preserved

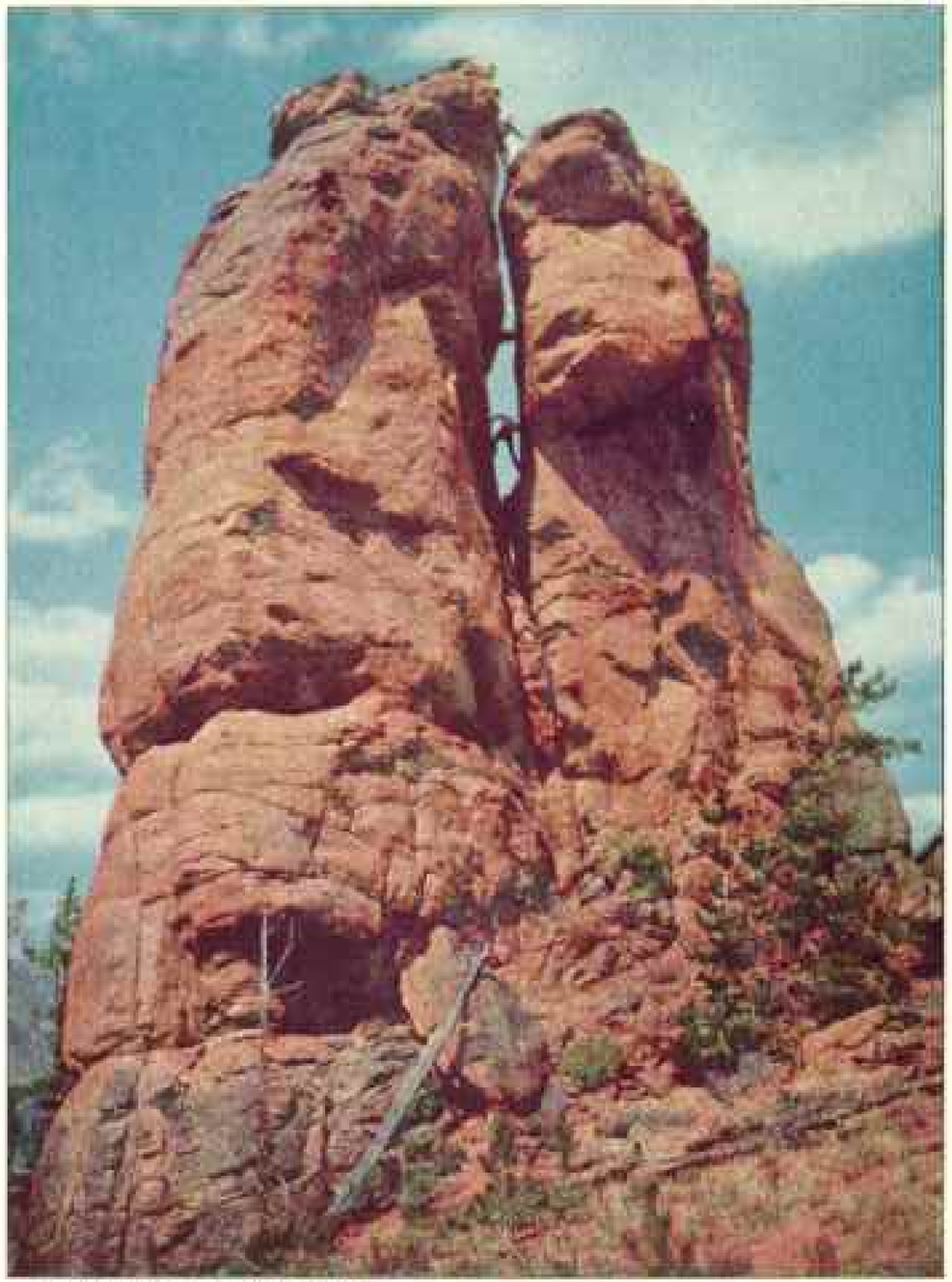
COLORADO'S CAPITOL RISES ABOVE DENVER'S CIVIC CENTER

Golden dome and virile cowboy symbolize two of the industries that have had important parts in building the State.

 Natural Color Photographs by Fred Payne Clatworthy

RARE EGYPTIAN LOTUS BLOSSOMS ADORN A DENVER ESTATE

The flowers of both land and water grow luxuriantly in mile-high Denver's sunny climate. The city has become in recent years one of the chief floral centers of the United States. Cut flowers from open gardens and greenhouses are shipped to all parts of the country, and even to Cuba and England.





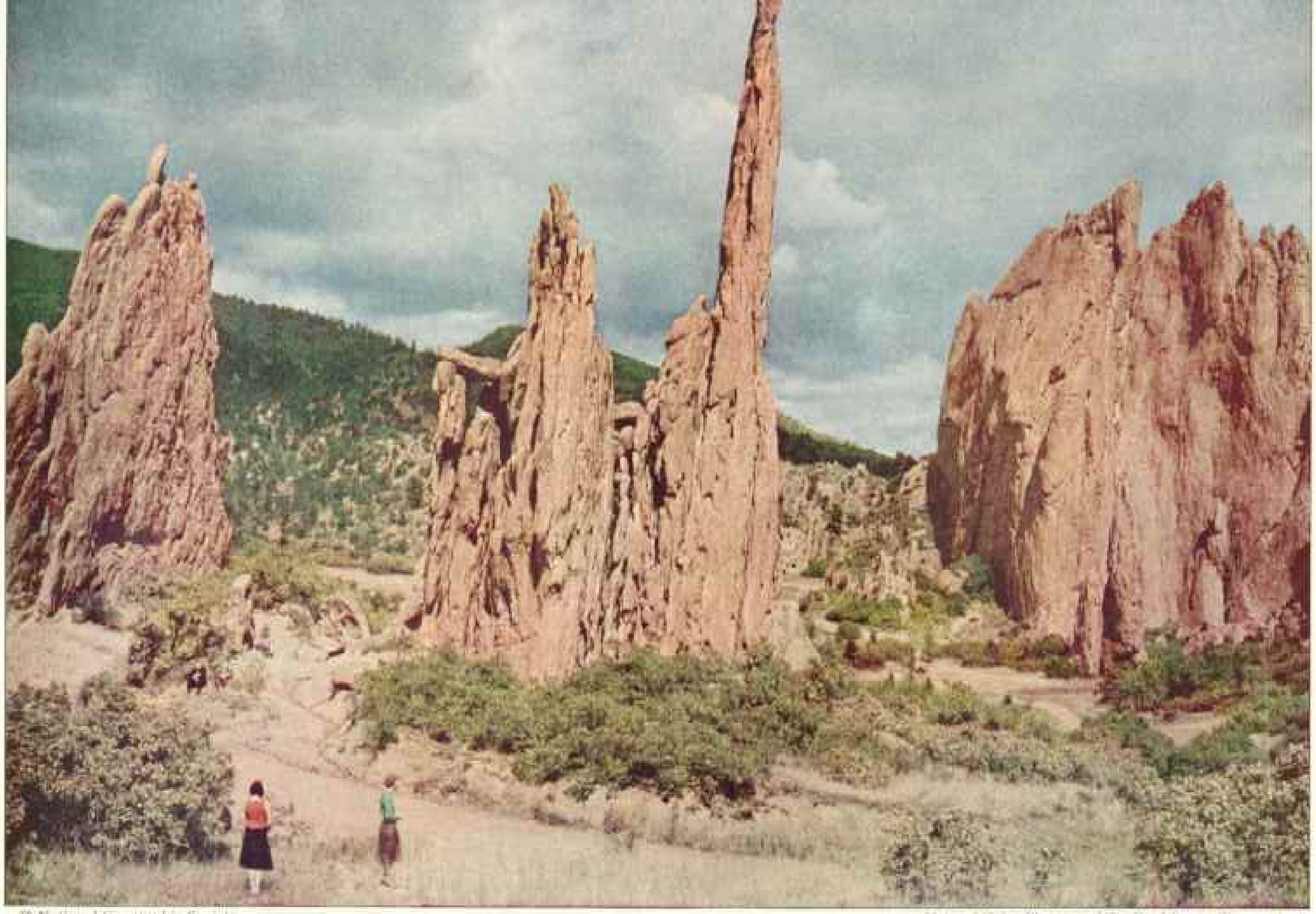
DIFFICULT ROCK CLIMBING IN ESTES PARK

In color these pinnacles are similar to those of Denver's Park of the Red Rocks, at the edge of the foothills, where towering crags are tilted at fantastic angles. It is to such bright-hued outcroppings as these that Colorado owes its name, meaning in Spanish "reddish colored."

Natural Color Photographs by Fred Payne Clatworthy

THE ROCKIES CLING LONG TO WINTER'S MANTLE

A road near the crest of the Continental Divide in the Rocky Mountain National Park, in early June. The scenic roads in this Federal playground are opened with snow plows before June 15, and the rays of the summer sun soon eat away their white walls.





Natural Color Photograph by Fred Payne Clatworthy

TESTIMONY IN STONE TO NATURE'S MEASURELESS FORCES

The soaring pinnacles of sandstone in the Garden of the Gods near Colorado Springs once lay horizontally. But when mighty geologic forces pushed up the molten granite core of the Rockies millions of years ago, the sandstones were dragged from their beds and stood on end. Through unnumbered centuries, other natural forces, rain, frost and wind, have carved them into the grotesque forms of to-day. The Garden of the Gods area is a park, owned by the cities of Colorado Springs and Manitou.

A MOUNTAIN OF STONE AND ITS AQUEOUS SCULPTOR

The Colorado, near Grand Junction, is still only a stripling river; but even there it has carved lofty cliffs, as if in practice for its mightier work in the Grand Canyon. The great hills of west central Colorado, cut from horizontal rock beds, contrast sharply with the folded granite Rockies to the east.

 Natural Color Photographs by Fred Payne Clatworthy

JULY SEES WINTER SPORT IN THE HIGH ROCKIES

From Denver, Colorado Springs, Pueblo and many other cities of the plains, modern mountaineers in automobiles can drive in a few hours over excellent highways to the region of summer snow fields. Each weekend the mountains draw throngs of summer students from the University of Colorado, whose campus at Boulder is in the shadow of the Rockies.

BEAVERS BUILD IN COLORADO TO-DAY AS IN KIT CARSON'S TIME

Half a century before gold drew its thousands to the Pikes Peak Diggings, beaver pelts lured a handful of adventurous "Mountain Men" to the Rockies. But the world did not learn of the hidden beauties of the mountains from these close-mouthed adventurers, who guarded jealously the sources of their furs. In the background is the Mummy Range.

 Natural Color Photographs by Fred Payne Clatworthy

MULTIHUED TROUT TEEM IN THE MOUNTAIN STREAMS

Colorado has one of the largest and best organized fish propagating services among the States. Fifteen hatcheries, fed by pure spring water, have an ultimate capacity of 75 million eggs. Between 25 and 30 million young fish have been planted yearly during the past five years in 6,000 miles of trout streams and lakes.



Natural Color Photograph by Fred Payne Clatworthy

PIKES PEAK, AMERICA'S MOST FAMILIAR MOUNTAIN

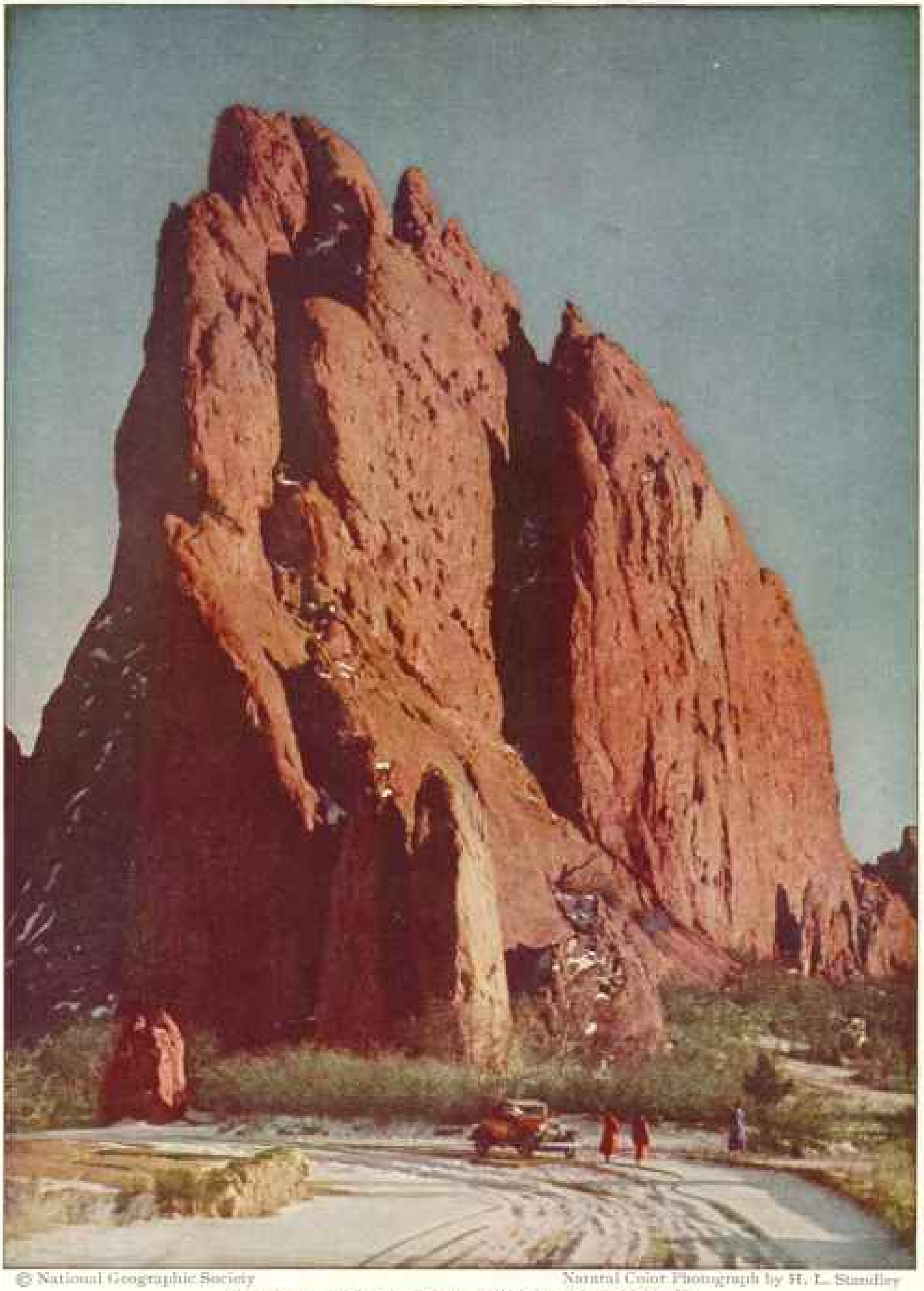
Up Fountain Creek, shown in the foreground, Captain Zebulon Pike and a squad of enlisted men marched in 1806, in the first recorded effort to climb "the Grand Peak." Turning back from a minor ridge, Pike reported in effect: "It can't be done." To-day the mountain bears the name of the man who thought it unscalable, and cog railroad and automobile highway carry thousands of visitors to its top each summer. On the last day of each year members of the unique Add-A-Man Club climb on foot through snowdrifts to the peak's summit to greet the New Year with a fireworks display visible for hundreds of miles.



Natural Color Photograph by Fred Payne Clatworthy

GOLDEN PUMPKINS TYPIFY COLORADO'S AGRICULTURAL WEALTH

The State won its first fame through the gold and silver torn from its mountains. Its prairies were considered arid wastes. But irrigation changed this. The soil, rich in plant food, produced astoundingly when water was brought to it. In addition, plants and methods were found that made dry-land farming practicable. To-day Colorado's farmers produce each year crops worth more than $100,000,000, a value nearly double that of the State's annual production of minerals and metals. This pumpkin field is near Longmont, just outside the foothills east of Longs Peak. A few miles away, at Greeley, large scale irrigation had its birth in Colorado.



 Natural Color Photograph by H. L. Standley

MAJESTIC PORTAL TO A BIZARRE PLAYGROUND

The shadows of the rising and setting sun accentuate the grotesque figures that Nature has carved in the Garden of the Gods. Visitors, calling imagination to their aid, see in the jagged rocks devils and angels, animals and birds, and palaces so elaborate that they might be Abt Vogler's fantasy of sound frozen into stone.

these buildings so well that it is hard to believe that they were built seven or eight hundred years ago and have probably stood abandoned for half a millennium. The age of these cliff dwellings was a mystery to archeologists until the secret was solved by the ingenious tree-ring calendar developed by Dr. Andrew E. Douglass while investigating the age of Pueblo Bonito * for the National Geographic Society.

Cliff Palace was under construction seven years after William the Conqueror invaded England, and Spruce Tree House was rising under its cliff while half around the world Genghis Khan and his hordes were conquering all Asia. The youngest beam found in any of the buildings was put in place in 1262, nearly two and a half centuries before white men brought their civilization to the New World.

As you examine the ruins of these ancient apartment houses you picture the life that throbbed there long ago. Near those deeply worn grooves in the sandstone, men sat sharpening their stone axes. There, on other stones, young women ground corn. Behind that narrow window over a path stood an archer-sentinel. In the round, sunken chambers outside the main walls men gathered to talk and to instruct the youths in religious rites.

### "LITTLE BOY BROWN" LEAVES HIS FINGERPRINTS

Examine closely the adobe mud that serves for mortar between the stones and you will enter still more intimately into the spirit of those distant days. The adobe, soft then, was pressed into place with fingers and thumbs. Many bits of the mud show perfectly the fingerprints of the builders, every line of complicated whorls distinct. If one of the Indian builders could come back into the flesh to-day, any good fingerprint expert could identify him from a thousand Indians, and could lead him to the scene of the job he performed 700 years ago.

This close touch with the workers of long ago is wonderful enough, but there seems a still closer link with the past when you discover, far down on one of the walls, the prints of tiny fingers. It is a chance record left by some toddling youngster who played at the great game of building while mother or father worked above.

On top of Mesa Verde, park administration buildings and a hotel have been built of the same kind of stone as the cliff dwellings and with similar masonry. They fit perfectly into the setting in which the Indians gathered piñon nuts and cultivated their little plots of corn and squash.

Every Park Service ranger is an alert student of the priceless archeological material that is scattered so profusely about, and is eager to keep abreast of the fund of knowledge being built up about prehistoric America and its people.

Each summer evening a great camp fire is lighted, and in its glow one of the rangers tells the group of visitors, in language shorn of technicalities, what science knows of the America of 500, 5,000, and 25,000 years ago. Hundreds of casual visitors who have never had time or inclination to read archeology leave Mesa Verde with a new interest in man's fascinating climb from the savage hunter of cave days to the lawyer and merchant and banker of to-day.

### TRAINS OF LILLIPUT

From Durango one may make a unique journey on the little trains of the narrow-gauge railway that dips down into New Mexico and dodges back into Colorado over the Continental Divide at Cumbres Pass. They seem like the trains of Lilliput, these strings of toylike coaches drawn by bantam locomotives; but they have proved their worth to southwestern Colorado, which has been dependent on them since the first track of steel was pushed over the Divide, in 1881. They had, in fact, all Colorado for their domain in those days.

Construction in the mountains was so costly and grades were so steep that building standard railways with heavy rolling stock was out of the question. The narrow gauge saved the day. It nosed its way into almost every canyon where gold and silver were discovered, following hard on the heels of the pioneers. Hundreds of mines, at first dependent on wagon transportation, were saved by these quickly built railways.

Nor was there anything primitive about the little trains. Shining with paint and sparkling with nickel trimmings, they gave

* See "The Secret of the Southwest Solved by Talkative Tree Rings," by Andrew Ellicott Douglass, in the NATIONAL GEOGRAPHIC MAGAZINE, December, 1929; "Everyday Life in Pueblo Bonito," by Neil M. Judd, September, 1925.

Photograph by Dean

MILES OF PEACH ORCHARDS COVER THE GRAND VALLEY

The valley of the Colorado, which in early days was known as the Grand River, has become one of the most highly developed and compact peach-producing regions in the United States. From Palisade an average of 1,700 cars of peaches are shipped each season. The United States Reclamation Service dam above Palisade diverts water for the Grand River Project.

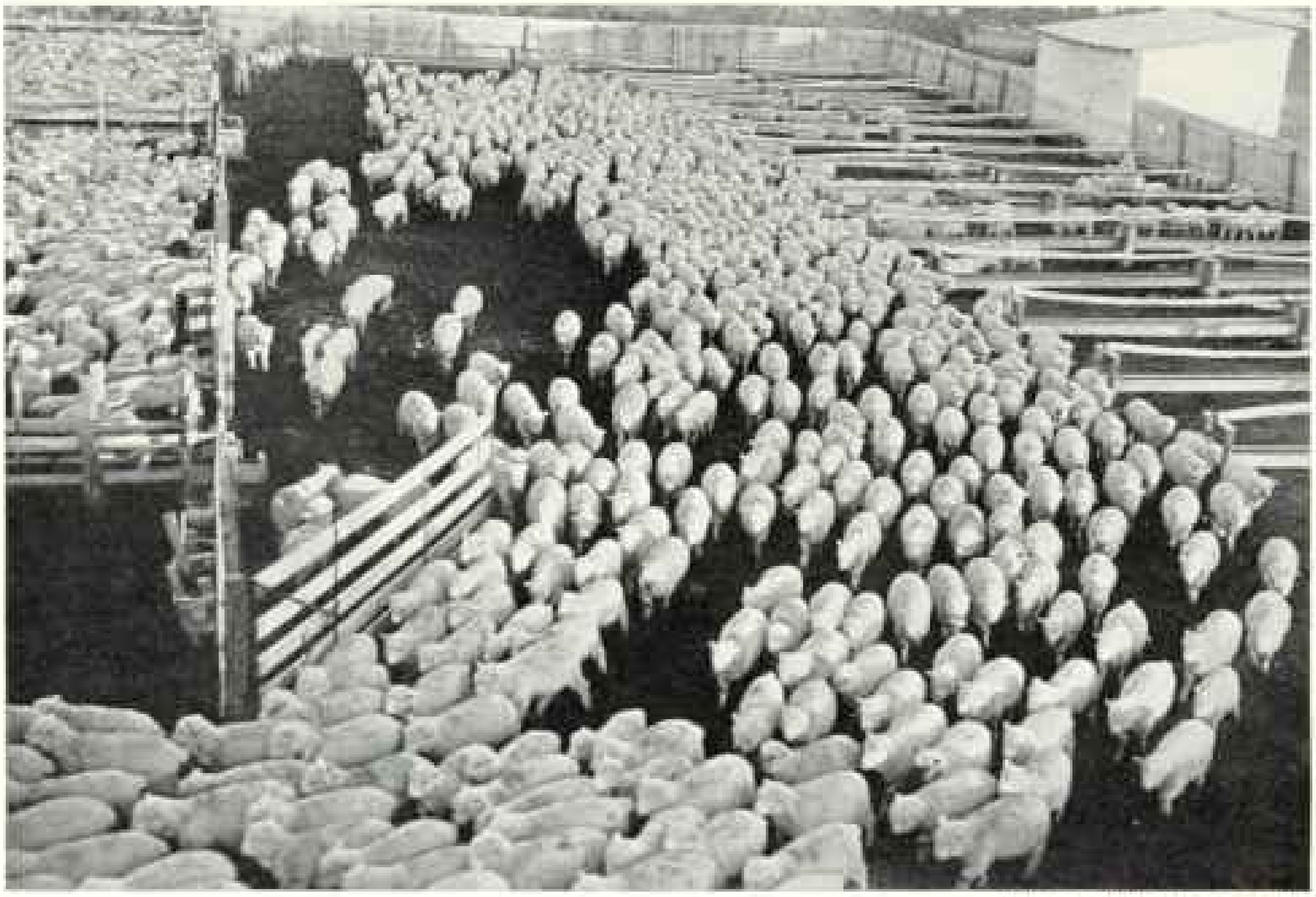
the easy-spending miners luxuries that could not be bought on many standard lines back East: diminutive parlor cars, luxurious "sleepers" that didn't skimp on berth lengths, finely appointed dining cars, and even rolling bars and gaming rooms. Automobile competition has put an end to these luxurious fittings, but comfortable passenger coaches are still operated, and hundreds of thousands of tons of freight still flow out of and into the mountain fastnesses behind the tricky little narrow-gauge locomotives.

The highway from Durango east climbs over the Divide at lofty Wolf Creek Pass and works its way down into the spacious San Luis Valley along one of the headwater streams of the Rio Grande. In the alluvial bottom lands, just before this stream leaves the hills to enter the San Luis Valley, you come upon one of Colorado's lustiest young agricultural industries, the growing of "mountain vegetables." Here it is head lettuce, hundreds of acres of it, just ready in mid-August for the harvest. In other high valleys it is green peas, spinach, or cauliflower.

Geographic names do not always tell a true story. When you first hear of the San Luis "Valley," you visualize another

A MOUNTAIN OF BEETS RISES ON COLORADO'S PLAINS

After the sugar is dissolved from the beets, the pulp, tops, and molasses are used in feeding hundreds of thousands of sheep and of beef and dairy cattle. Everything goes back to the soil except the sugar, and that came from air and sunshine. For beets alone, Colorado farmers receive from $15,000,000 to $24,000,000 annually.



Photograph by Grant Eddy

A MILLION SHEEP AND LAMBS FATTEN YEARLY IN THE SUGAR COUNTRY

Every fall, after the great piled-up trucks of beets have rolled to the factories, sheep and cattle are brought by trainloads into the region north of Denver. Feeding pens near Fort Collins.

TEN MILLION POUNDS OF SUGAR IN THE ROUGH

Colorado's sugar factories turn out close to one-third of all sugar produced in the United States. A 55,000-ton storage pile of sugar beets at Fort Morgan.

Photograph by O. E. Aultman

A ROUND-UP OF BEEF CATTLE ON A SOUTHERN COLORADO RANGE

Cattle-raising is no longer the spectacular bonanza industry that it was in the '70's and '80's, when eastern Colorado was one vast range and tens of thousands of steers were driven to the newly arrived steel highways; but there is still much cow country in Colorado's plains and mountains.

Photograph from Wide World

COLORADO'S UNEMPLOYED BECOME TREASURE SEEKERS

From the sands of the South Platte River, near Denver, where seventy years ago pioneers panned some of the first gold found in the "Pikes Peak Diggins," men and women who cannot find other work are to-day washing out shining golden grains. The sands have been washed for years and are not rich in the precious metal; but some of the workers pan one or two dollars' worth of gold a day. The groups shown in the photograph are receiving instruction in placer mining. More than a thousand persons in Colorado are enrolled in such classes.

Photograph by Dean

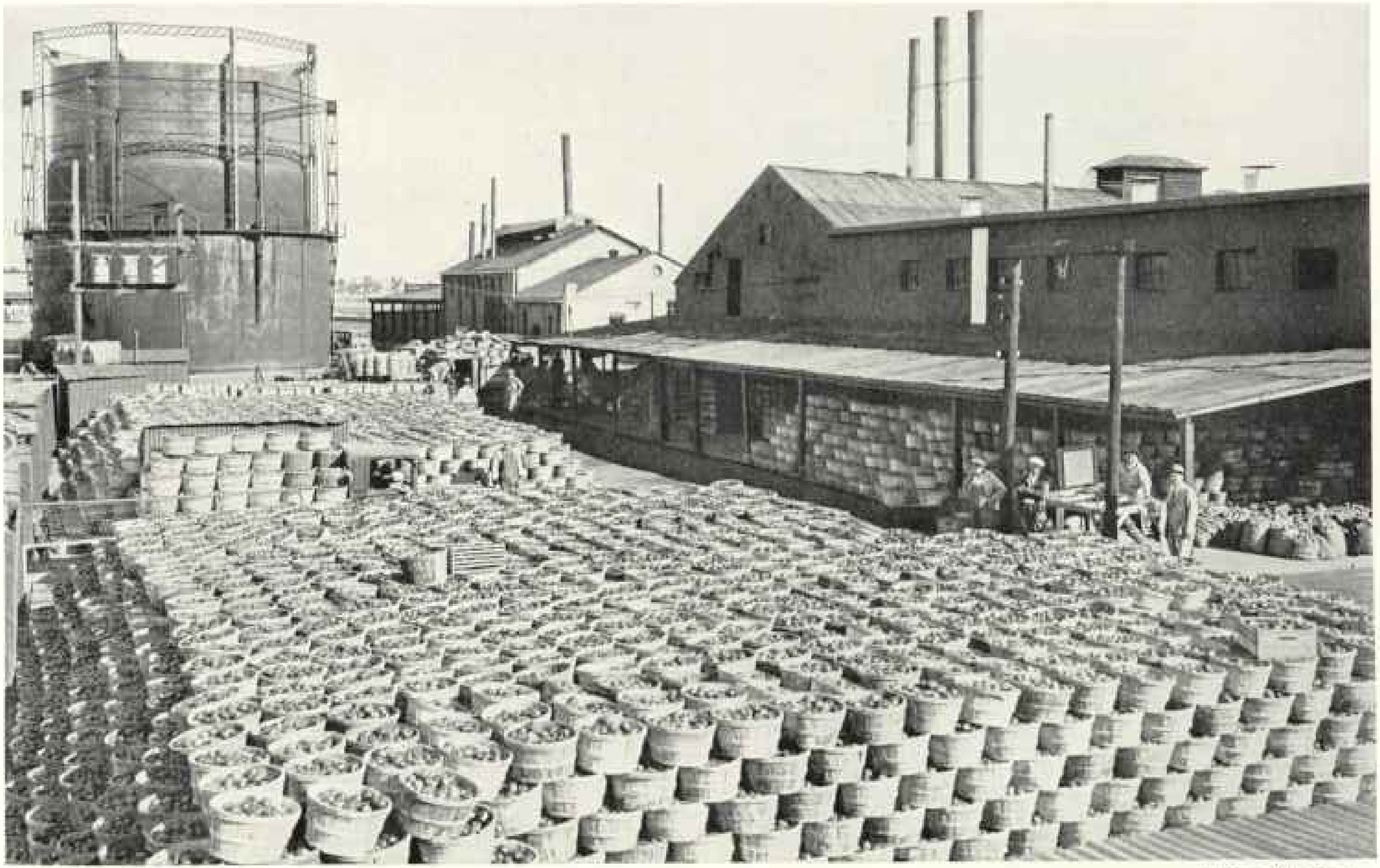
GRAND MESA: MOUNTAINS THAT MIGHT HAVE BEEN

This two-mile-high table-land near Grand Junction has escaped erosion into a small range of mountain peaks because its top is protected by a sheet of hard volcanic lava. Towering above warm, dry valleys, Grand Mesa has become a popular summer playground.

Photograph by Charles M. Smyth

FOX-HUNTING IN THE SNOW—WITHOUT THE FOX

The Arapahoe Hunt Club of Denver on one of its winter coyote hunts. Because of the dry soil, scents cannot be followed well except when snow covers the ground. In costumes, equipment, and customs the club follows all the Virginia traditions of fox-hunting except one: it doesn't hunt foxes.



Photograph by Dean

HALF A MILLION POUNDS OF TOMATOES READY FOR CANNING

A summer scene at Grand Junction, the largest town in western Colorado. The valley of the Colorado River widens at this point, and its thousands of acres of rich alluvial soil have been put under intensive cultivation with the aid of irrigation.

Photograph by J. Frank McDaniel

KEEPING MOUNTAIN ROADS OPEN THE YEAR ROUND

Formerly winter closed in on the high Rockies in late autumn and held them in its grip until early summer; but, with the increase in highway traffic in recent years, it has been found necessary to keep the chief roads and passes open. Even the most severe blizzards now cause only temporary breaks in the passage of automobiles over the Divide.

stream valley, winding and narrow. But the San Luis Valley is nothing of the sort. It is in effect a great prairie in the mountains, more than 50 miles wide and 120 miles long, an area three times as extensive as the State of Delaware.

### AN AMERICAN VALE OF KASHMIR

Like the celebrated Vale of Kashmir, the San Luis Valley was once the bed of a large lake, its waters dammed in by a mountain ridge. The Rio Grande cut through the barrier tens of thousands of years ago, drained away the lake, and left the floor almost as level as a table. Now the stream flows through the rich alluvial soil, furnishing irrigation water for hundreds of farms.

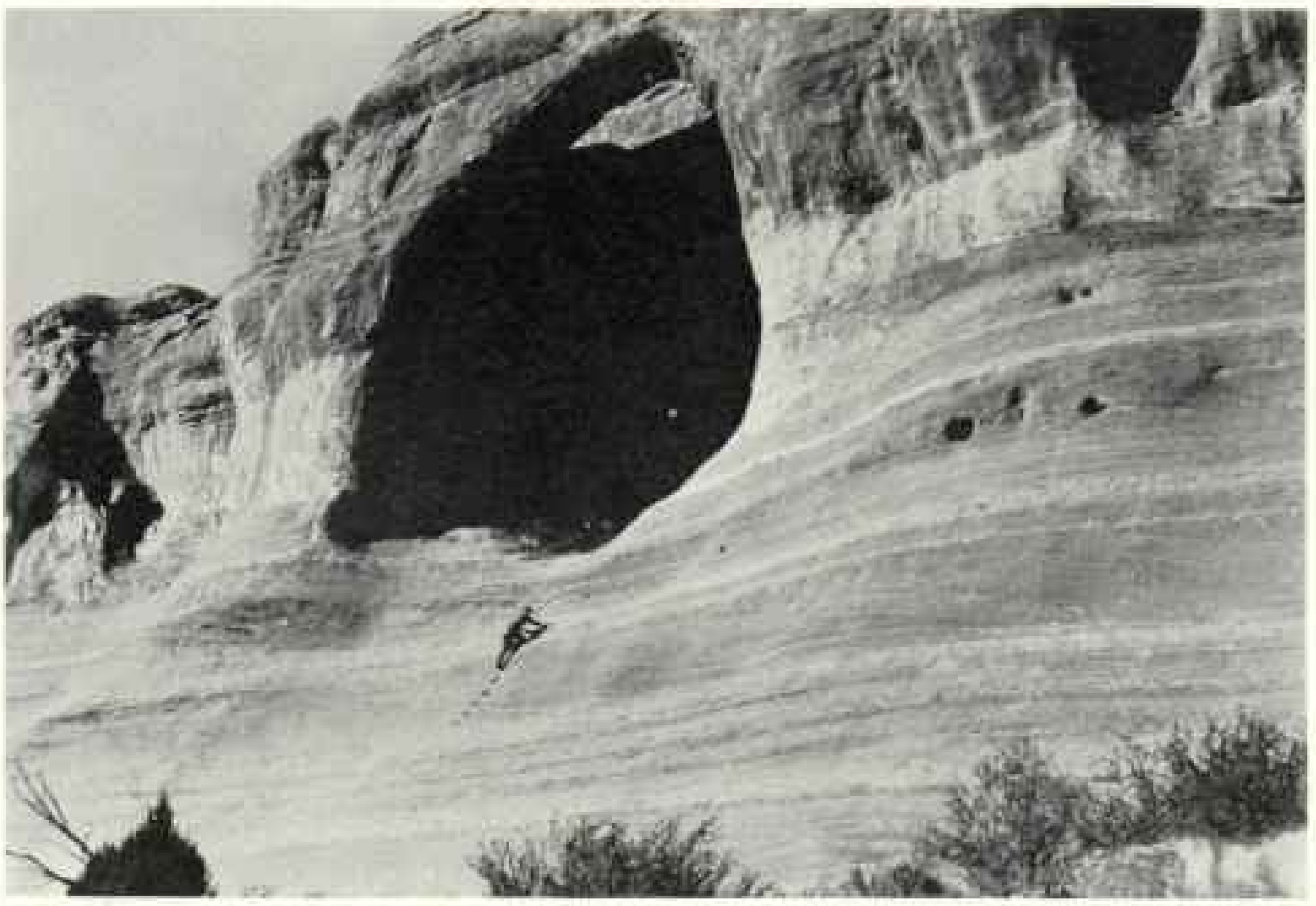
Bound eastward, you must climb the Sangre de Cristo. These are mountains dear to the heart of a plainsman—storybook mountains, a spectacular thin range rising steeply from a plain, with peak after peak set like cones of sugar in a row.

Topping the mountains at La Veta Pass, you look out again over Colorado's vast eastern plains and roll down into the strip of country nearest the Rockies, in which the State's leading cities and 80 per cent of its population are concentrated.

Trinidad, southernmost of this north-south string of cities, is near the New Mexico border and is the capital of southern Colorado's coal-mining industry. It is the gateway city to Raton Pass, over which the main north-south road and the highway successor to the old Santa Fe Trail pass into New Mexico and on to the Pacific coast.

### PUEBLO DISCIPLINES A RIVER

North a few hours, over a well-surfaced road, lies Pueblo, Colorado's second city, astride the Arkansas River. As you cross on railway or highway bridge you see a harmless-appearing, shallow stream winding its way among sand bars; but eleven years ago the Arkansas overflowed its banks, took a short cut through the city, and caused one of the greatest flood calamities in the history of the United States.



A NATURAL BRIDGE IN THE MAKING

In the eroded country in and near the Colorado National Monument are many natural bridges in various stages of formation. Such bridges are usually carved from cliffs by "pot-holes" or cave-ins, which work down from above into shallow caves. Torrents, with minor aid from winds, wear the holes larger, and after many centuries the bridge may stand far from its parent cliff.

When the water drained away, Pueblo faced a discouraging situation for any city of 43,000 inhabitants. Some pessimistic residents said the town was "through"—might as well be abandoned. But the pioneer spirit came into action, as it has so often in Colorado. The governor called a special session of the legislature, a flood conservancy district was created, and bonds were sold. With the money Pueblo rebuilt her devastated section and constructed flood-prevention works of such excellence that they are visited by engineers from all over the world.

The river has been shorn of its kinks and shoved a quarter mile away from its old location, kept in place by a deep, smooth channel wall of concrete. Six miles above the city a heavy concrete barrier has been built across the river valley—a massive dam with a narrow gap left open. Behind the barrier half the water in Colorado could pile up harmlessly, to be fed automatically into the river channel at a reasonable rate until all of it drained away.

With the flood problem solved, Pueblo has forged ahead steadily.

Along the Arkansas Valley for 50 miles above Pueblo and for nearly 200 miles downstream stretches another of Colorado's important irrigation domains: more than half a million acres of fruit and hay and sugar beets, vegetables, and flowers. In this valley is Rocky Ford, famous the world around for its cantaloupes.

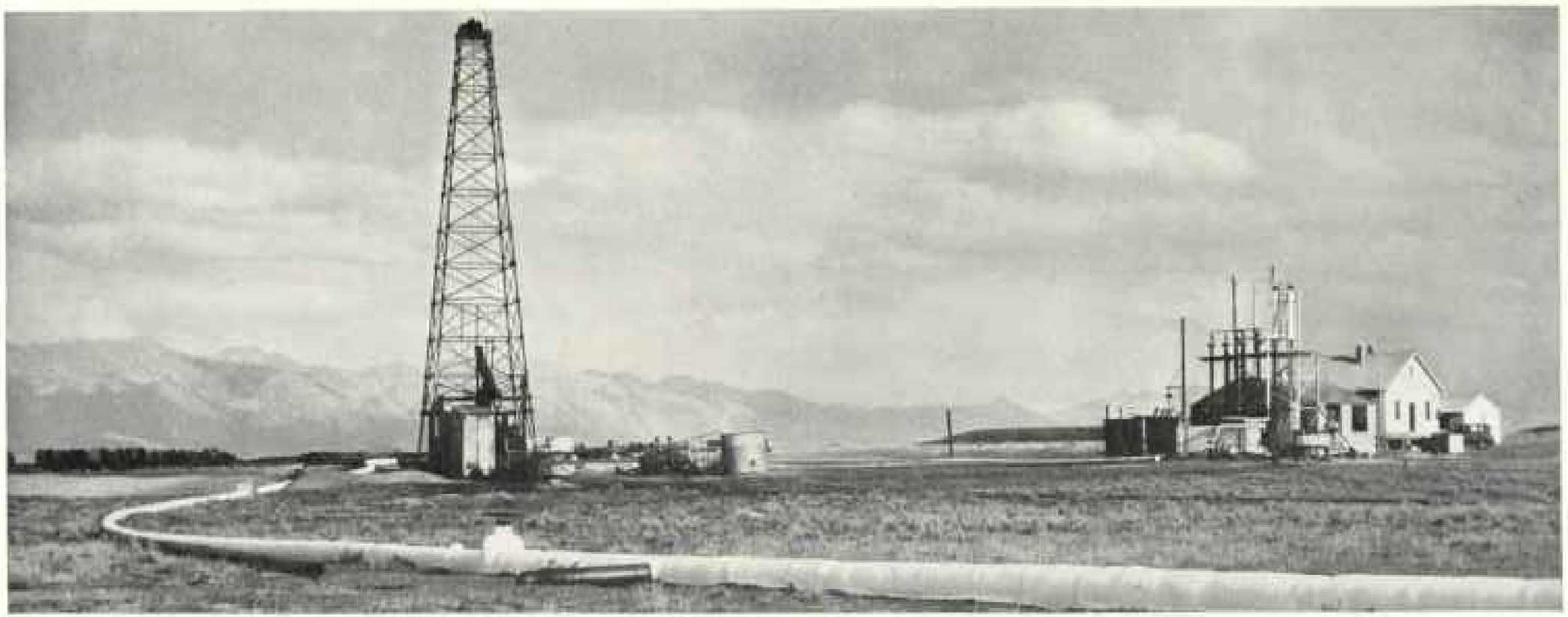
Motoring down the Arkansas in late summer, one passes beside fields of zinnias and marigolds that aggregate many hundreds of acres. They are grown for their seed, which are shipped to all parts of the world. For garden-seed production the Arkansas Valley is one of the most important areas in the United States.

Midway in Colorado's north-south string of important cities is Colorado Springs, the State's third largest urban center. In summer Colorado Springs' 33,000 population is nearly doubled by visitors, for about it are concentrated unusual scenic features.

Photograph by Dean

"COKE OVENS" IN MONUMENT CANYON, COLORADO NATIONAL MONUMENT

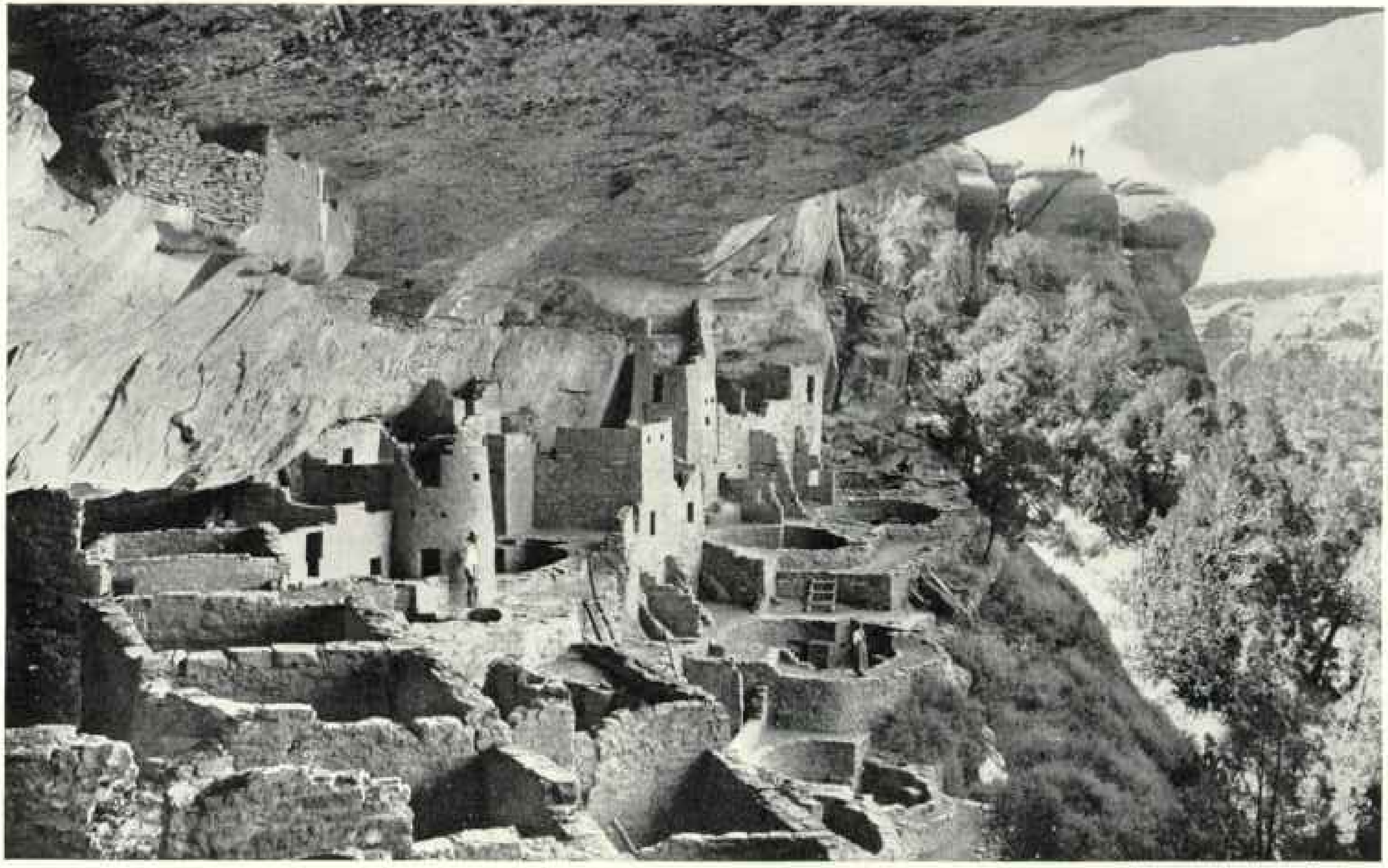
An area of weirdly eroded rocks a few miles from Grand Junction has been set aside by the National Government as a scenic wonderland.



By C. E. Soderstrom

A NATURAL SODA FOUNTAIN FREEZES ITS OWN ICE

Drilled as an oil well near Walden, in North Park, this was dubbed the "Ice-Cream Well" because oil flowed out in a frozen mass resembling lemon sherbet (see text, page 28). Even on the hottest summer days the pipe leading from well to storage tank is coated with several inches of ice.



Photograph by Charles Martin

THIS APARTMENT HOUSE BUZZED WITH ACTIVITY EIGHT CENTURIES AGO

The cliff dwellers of Mesa Verde were excellent masons, although they are believed to have acquired the art relatively a short time before this great structure, Cliff Palace, was erected. Like the other cliff houses, it was a community dwelling, with the separate units built by different hands. Some of the cubical rooms and towers are of the most careful and finished workmanship. The large circular, sunken apartments along the lower edge of the palace are the remains of kivas, which were used as ceremonial chambers and clubrooms. In them the men of the clans instructed the youths in tribal practices and ceremonies.

Photograph courtesy the Colorado Association

THE GHOSTS OF "LITTLE BOY BLUE" AND THE "CALICO CAT" MAY FROLIC HERE

In this cottage Eugene Field, children's poet, lived while writing daily comments for the *Denver Tribune*, now expired. It was during this period that he wrote "Pitty Pat" and "Tippie Toe." The cottage has been moved to Washington Park and serves, appropriately, as a children's library, in which Field's complete works and other juvenile books are kept. The Public Library, of which the cottage library is a branch, is assembling original Field manuscripts.

Over the town towers the mountain whose name is more familiar than any other in America—Pikes Peak. Capt. Zebulon Pike first saw it from far to the southeast when he went West in 1806 to explore the southern part of the Louisiana Purchase. He called it "The Grand Peak." But he never set foot on it. Like a typical tenderfoot, he tried, naïvely, to climb it before the noon meal one autumn day. After two days of hard scrambling he reached the top of a lower, near-by mountain and gave it as his opinion that "no human being could have ascended to its summit."

Climbing Pikes Peak's 14,110 feet was found in later years to be a reasonably easy matter. For 40 years now a cog railway has been carrying thousands of passengers to the cool, breezy top every summer. An automobile highway also extends to the summit now, and along it in midsummer moves a steady stream of traffic. Up the last 12 miles of the Pikes Peak Highway is run each Labor Day one of the classic American motor-car races; and cars have covered this looping, steep-climbing route in a trifle more than 17 minutes.

Near Colorado Springs is Manitou, with its medicinal springs; and in other directions caves, scenic canyons, waterfalls, the tumbled rock formations of the Garden of the Gods, and trails that thread the forests over hill and mountain. Hotels are scattered through the city and suburbs and are even perched on near-by mountain tops.

### DENVER, CAPITAL OF THE ROCKIES

When you enter Denver you come to the urban hub of nearly one-fifth of the United States. A State capital, a great Western city, a gateway to the mountains—all these Denver is and more. Spokes of influence extend from it into the entire Rocky Mountain area, and into large regions of the adjoining plains States as well, making it the financial, commercial, and industrial center of a vast area. No other city in the United States with a quarter-million population is so far removed—500 miles or more—from all other big cities.

Photograph by Edwin L. Wisherd

THE UNKNOWN SOLDIER'S TOMB AT ARLINGTON IS OF COLORADO MARBLE

A huge deposit of the finest marble, in Gunnison County, Colorado, has furnished building material for some outstanding structures: the Lincoln Memorial in Washington, the New York Municipal Building, and the Huntington Mausoleum in Pasadena.

Naturally, the people of this great region turn to Denver, whether they are out for business or pleasure, for a commercial fight or a recreational frolic. It's a habit of long standing. The miners started it when they came every so often to the rough little town that was Denver in the sixties to spend some of their gold for supplies and the rest in more or less riotous living.

Later, when great riches were made in gold and silver and cattle, the fortunate ones moved to Denver and built the mansions and hotels and business blocks that started the solid structure of the city. Globe-trotters, adventurers, and capitalists flocked to Denver in the seventies and eighties. Many "younger sons" of the British nobility and several Britons with well-known titles made the city their headquarters for extensive cattle operations, and gave glittering parties at the old Windsor Hotel and the American House that have not faded from Denver's memory.

Before its irrigation empire was even dreamed of and while its mineral kingdom was still undeveloped, Denver's location was of little value; but young Denver, despite surveys, clung stubbornly to the belief that in some way the transcontinental railway, when it came, could be pushed through the mountains west of the city. When, instead, the lines of steel were extended through Cheyenne, a hundred miles to the north, Denverites put aside their disappointment and quickly raised the capital to build a connecting line to the new highway.

With this rail contact with the eastern settlements established and with the steady growth of mining in the mountains, Denver drew to herself in a few years direct lines of railroad from the East. Now these highways of steel radiate north and south and east from Denver like the ribs of a fan.

A result of this railway convergence on Denver has been to make the city one of the country's leading livestock markets.

### THE CITY'S TUNNEL OF DREAMS BECOMES A REALITY

While the transcontinental railways went their busy ways north and south of Denver, the city never lost its dream of a line straight west through the mountains.

Photograph by C. E. Soderstrom

SKIS FLASH AND TOBOGGANS ZOOM DOWN THE SNOWY SLOPES OF THE ROCKIES

Winter sports enthusiasts have ideal conditions in Colorado. The winters are mild in the cities of the plains, near the eastern foot of the mountains; but a few miles to the west, among the foothills and mountains, is an abundance of snow. Excellent highways make it possible to reach these playgrounds from congested city streets in a few minutes or hours.

Greatest and most tireless of the dreamers was David H. Moffat, who visioned a six-mile tunnel through the Continental Divide under James Peak. He not only dreamed, but worked, and spent his fortune on the project. He did not live to see his plan realized, but on July 7, 1927, the Moffat Tunnel was holed through. Now a standard-gauge railway operates double tracks through it into Middle Park, opening up a new mountain realm to Denver. Most important, when a few more miles of steel shall have been built westward, the rail distance between Denver and the Pacific coast will be shortened by 176 miles, and for the first time the city will be on a straight, through transcontinental line.

You sense Denver's most astonishing physical achievement only when you let your imagination wander back seventy years. It is hard to believe that barely threescore and ten years ago this great city, with its hundreds of miles of streets, lined now with fine, towering shade trees, was raw prairie. Not a tree was in sight; only a level plain covered with sparse grass, dry and brown through most of the year.

### LAWNS WORK FOR POSTERITY

As the outlander drives about Denver he is struck by the beautiful lawns. There are no exceptions. Whether you view the grass plot of a humble cottage or the park of a near-palace, the lawns are perfect.

"Is it imagination," I asked a Denver woman who was guiding me through street after street of charming homes, each in a rich emerald setting, "or is this the greenest grass I've ever seen?"

"It probably is the greenest," she said, smiling, "and you couldn't possibly escape inquiring. Everyone who comes to Denver asks that question sooner or later.

"It took me a year after I moved to Denver," she went on, "to solve the grass problem. Most of the native sons just assume that grass *ought* to be a luscious green, and that Denver grass quite naturally is; but at last I found an agricultural expert who gave me the very simple explanation. It is just one more gift of the Great American Desert.

"There has been little rain in this country for thousands of years; so the soluble minerals in the soil haven't been leached out as they have in damper regions. When we moisten the soil, the minerals dissolve and the grass roots can gobble up large quantities. It's almost like fattening a stall-fed ox."

The price of the beautiful lawns is much moisture. At certain hours each day in the summer a virtual barrage of water is laid down over the 1,600 acres of lawns in the city's parks. So frequent are these drenchings that in summer the watering hose is not removed night or day from the hydrants. Driving through the parks in late afternoon, you see orderly piles of hose, as regularly spaced as the trees of an orchard, each like a coiled serpent on sentry duty, guarding its allotted plot. The public hose is of a distinctive color combination that prevents its being stolen.

Knowing that this is a dry country and that water is precious, I asked one of the officials of the Water Board about the heavy use of water in the city and ran into a surprising paradox.

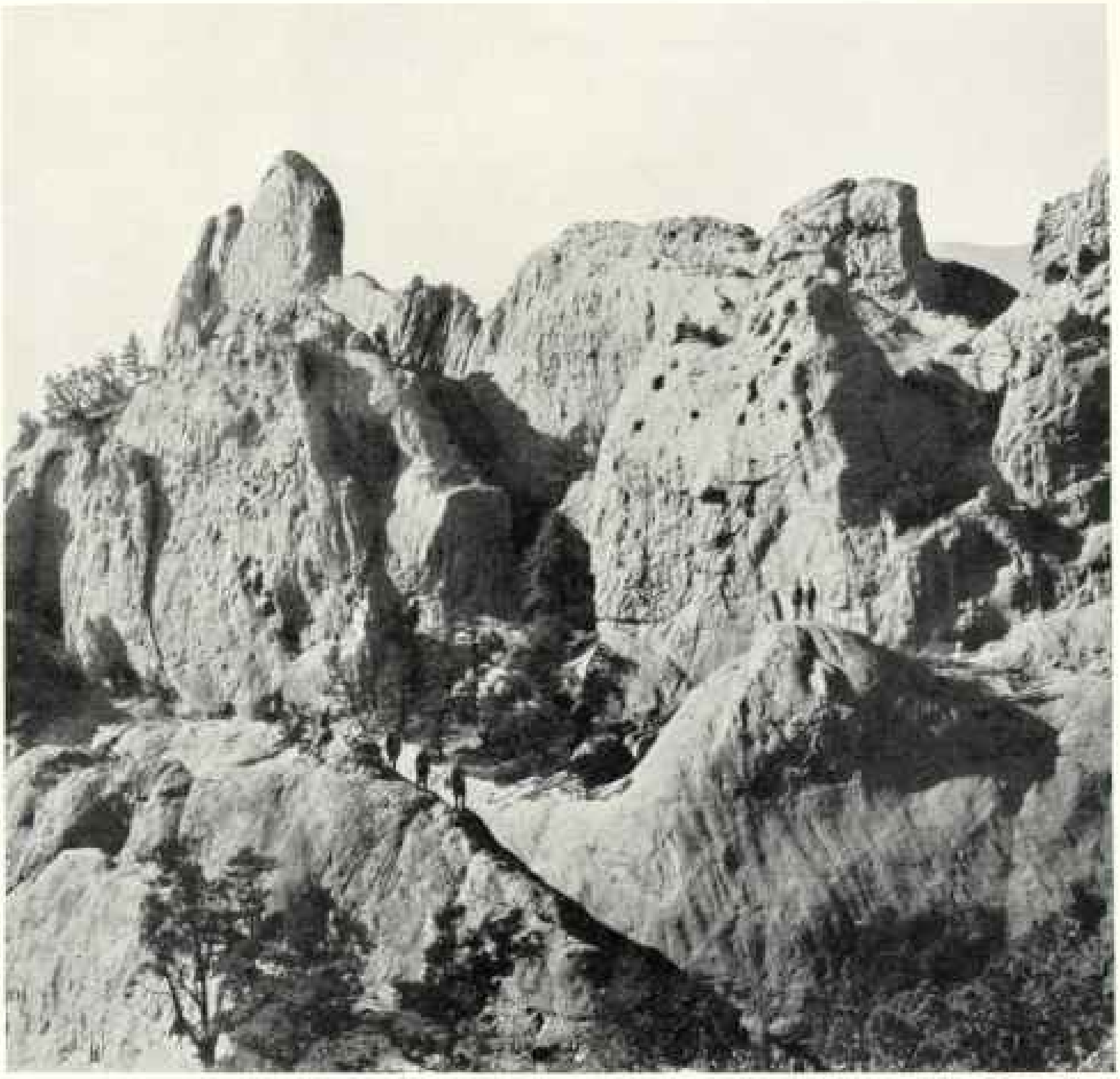
"It is very important that we use water lavishly to-day," he told me, "in order that our grandchildren shall have enough for their vital needs. Visiting water-works experts think we are crazy when we make that statement, but it is literally true.

"This is an irrigation country. Municipalities, as well as individuals, must follow the laws worked out under irrigation conditions in getting their water supplies. Once you get hold of a flow of water, if you don't use it you forfeit it to some one who will. We are looking forward to a city of half a million or more by 1950. That's why we want to keep every drop of Denver's annual water supply busy and to increase the supply in all possible ways."

One way in which Denver plans to increase its water supply constitutes an engineering romance. When the Moffat Tunnel was dug, an eight-foot-square pilot tunnel was carried through the Continental Divide beside the large railway bore. Denver leased this small tunnel, and plans to bring through the towering mountain range hundreds of millions of gallons of water that now flow into the Pacific Ocean.

### DENVER AS AN EDUCATIONAL CENTER

In education Denver's fame is great. Educators from the two hemispheres have beaten a path to this far-away city at the base of the Rockies to study its scheme of teachers' salaries, its indefatigable efforts to keep the subject-matter which it teaches



Photograph by H. L. Standley

WHEN THE ROCKIES WERE BUILT, THESE "SCRAPS" WERE LEFT

The Garden of the Gods, a jumbled disarray of huge red sandstone crags, photographed from an unusual vantage point. Many visitors scale the pinnacles, and more than once it has been necessary for the Colorado Springs fire department to "rescue" incautious amateurs.

abreast of all worthwhile developments, and even its school architecture.

The "Denver Plan" for teachers' salaries has been adopted by many municipalities. It sweeps away the idea that a teacher in higher school grades should receive more salary than a teacher of elementary classes, and puts remuneration on a basis of training and experience, whatever the grade taught. There are also definite increases for each year of service until a certain period has elapsed.

It is for the continual modernizing of its courses of study, however—the unflagging search for better material and more effective ways of teaching—that the Denver school system is probably best known around the world. Large committees of classroom teachers, who daily face all angles of practical teaching problems, make the studies and bring experts from leading institutions of learning to advise with them.

From time to time the results of these studies are published, primarily for use as teaching outlines in the Denver schools; but so great is the demand for these up-to-the-minute textbooks that the school officials have had a sizable publishing business thrust upon them. Prices have been put upon the booklets and mail orders are received from every State in the Union and from almost every country in the world.

Another famous part of the Denver educational system that draws educators from afar is its Opportunity School. From 8:30 o'clock in the morning until 10 at night this practical school is open alike to young people and old. In it elderly men and women, denied the education they wished in youth, receive high-school instruction; men displaced in one occupation may learn another; and young men and women may be trained in practical arts, from barbering to bricklaying, and from cooking to etching.

### COLLEGES GROUPED NEAR CAPITAL

Most of Colorado's institutions of higher education are naturally concentrated in and near Denver. In the city is the University of Denver, founded, when the community was little more than a village, by Colorado's Territorial Governor, John Evans, the same John Evans who previously had founded Northwestern University, Illinois, at the town which bears his name.

Thirty miles to the northwest, at Boulder, is the University of Colorado. So attractive are the mountains that cast their shadows on the campus and beckon for week-end rambles that the University of Colorado is as busy in summer as in winter. Last year approximately 3,400 students were enrolled for each session. In the summer students from outside the State far outnumbered those from Colorado.

Fifteen miles west of Denver, at Golden, is the Colorado School of Mines. Growing up in the edge of an important mining region, the institution is one of the outstanding mining schools of the country. In it in 1926 was established the first course in geophysics in American colleges. Graduates of this latest course in mining lore fare forth with dynamite and radio sets, electromagnets, torsion balances, and other devices of modern magic to map rock strata lying hundreds and thousands of feet beneath the surface of the ground.

At Fort Collins, on the edge of the plains, 50 miles north of Denver, the Colorado Agricultural College has made a name for itself among the many agricultural colleges of the country. Recognizing the importance of irrigation, it established in 1886 the first chair of irrigation engineering in the United States, and since that time has been a leader in the solution of the manifold problems of irrigation farming.

### SUNSET PAINTS GOLDEN HALO

There is no better way to bid adieu to Colorado than to go at sunset to Denver's Cheesman Park. On high ground is a marble pavilion, a sort of Greek temple, from which you can face westward and drink in beauty to your fill. Away from you slopes a wide expanse of velvety lawn, deliberately shorn of trees by some inspired landscape artist, to call to mind most effectively "the limitless prairies of the West." Beyond rises a fringe of tall trees, and above them peep the spires and domes of the city. Above all else, far to the west, tower the mighty Rockies, their peaks outlined against a golden sky.

From this vantage point your eye can sweep along a hundred miles of the lofty Front Range, from Longs Peak, in the north, to Pikes Peak, far to the south.

Just as you stand looking to the mountains, tens of thousands of farmers of the Colorado plains look each autumn, seeking a sign for the year to come. When the peaks turn white and the snow banks grow deeper, they rejoice. For every one of those countless flakes, after they shall have been transformed into droplets of water, a place has been prepared in reservoir or canal or furrow on the plains below.

Those are the bleak, icy wastes that early explorers feared and shunned. They are beneficent fingers to-day, raised to heaven to gather priceless moisture.

And, when winter passes and grass and flowers spring up, you know that Coloradans and hosts of visitors will climb the once icy slopes to live the joyous mountain life.

Yes, Colorado's mountains were a barrier once.

Now they're a goal.

THE NEST WITH A SILVER LINING

The newly hatched ruby-throated humming bird barely half fills the bowl of a teaspoon.

Photographs by A. A. Allen

YES, THEY ARE STILL THERE

A female ruby-throat, perched on the photographer's finger, examines her eggs. Of the nearly five hundred species of humming birds found in the New World, the ruby-throat is the only one in the United States which ranges east of the Mississippi River (see text, page 65).

# SEEKING THE SMALLEST FEATHERED CREATURES

## Humming Birds, Peculiar to the New World, Are Found from Canada and Alaska to the Strait of Magellan. Swifts and Goatsuckers, Their Nearest Relatives

By Alexander Wetmore

*Assistant Secretary, Smithsonian Institution*

Author of "Bird Life Among Lava Rock and Coral Sand," in the National Geographic Magazine

*With Paintings from Life by Maj. Allan Brooks*

*The Geographic presents in this number the first of a comprehensive series of paintings descriptive of all the important families of birds of North America. The series will be the most complete illustrated presentation of American bird life yet undertaken. About 500 familiar land and sea birds will be depicted in lifelike colors by the distinguished artist-naturalist, Maj. Allan Brooks, and described in entertaining, accurate text by ornithologists of recognized standing. The second of the series will appear in an early number of the* National Geographic Magazine.—Editor.

THE smallest birds in existence are humming birds—the Trochilidae. They are found only in the New World, where they range from the Strait of Magellan to Canada and Alaska, constituting one of the most brilliantly colored and specialized families of birds found in this vast region.

Approximately 488 species of humming birds are known, with 150 or more additional subspecies or geographic races, making a total of more than 600 recognized kinds.

The family is most abundant, as regards species, near the Equator, in the Andean region of South America. The Republic of Ecuador has 148 kinds of hummers and Colombia 105 known forms.

In passing north and south from these centers of maximum abundance, species become fewer; so that in North America north of Mexico (but including Lower California) only 16 kinds of humming birds are found regularly, while three others may come casually within these limits.

### Only the Ruby-throat Ranges East of the Mississippi

In the United States humming birds are found in greatest variety in the Southwest, only one species, the ruby-throat, ranging east of the Mississippi River.

The mountain meadows of our Southwestern States in midsummer, when their rich assortments of flowers are in bloom, frequently swarm with humming birds of a number of species feeding at the blossoms and pursuing one another pugnaciously in pure exuberance of life. It is under such circumstances that these sprightly birds appear at their best, and one never tires of watching them.

Humming birds are most abundant in regions where there are thickets or other woodland interspersed with meadows and openings where the birds may feed and disport themselves in the sunshine. Some kinds are inhabitants of heavy forests, these being found mainly in tropical regions, where certain species have become adapted to life in the dense rain forests.

The emerald humming bird (*Riccordia swainsonii*) of Haiti and the Dominican Republic lives in the densest of forest growths, where the vegetation drips constantly with water from the daily rains, and comes only occasionally into little openings to feed at flowers. Its deep-green coloration blends with its forest background, so that often the subdued humming of its wings, as it moves among the branches, may be heard for some time before one can distinguish the form of the bird in the somber shadows.

Photograph by A. A. Allen

A SPEAR OF TIMOTHY MAKES A PERCH FOR A HUMMER

An existence of such a type is in strong contrast to that of the beautiful long-tailed Sappho hummer (*Sappho sapho*) that I found in the Andean foothills of western Argentina, living in open valleys grown with low creosote bush, where the birds were constantly in the open.

### THE HUMMER'S PLUMAGE UNDER A MICROSCOPE

The majority of hummers are characterized by glittering reflections from their plumage, and as a general rule the males are more brilliant than the females.

The hues of the plumage are iridescent and are caused by the refraction of light. On close examination of the feather of a bird, it is found to be composed of many fine filaments, which under the microscope are seen to be divided into still finer divisions. In the shining feathers of hummers, there is an abundance of dark pigment in the tiny feather divisions known as barbules. The sheath overlying this pigment is either smooth and highly polished or has many minute lines on or under its surface. This structure causes a reflection or a refraction of the light, according to the circumstance, making the brilliant hues found in these birds. The colors vary according to the angle of the light, changing in intensity and in hue as the bird shifts position.

As for form, the variation among hummers is truly astonishing. The smallest bird in the world is Helena's humming bird (*Calypte helenae*) of Cuba, from two and one-fourth to two and one-half inches or a trifle more in length, with the wing only one and one-third inches long or less and the bill less than half an inch long.

This tiny sprite is sometimes called the fairy hummer. In contrast to it, there is the giant hummer of the central and southern Andean mountains that is about eight and one-half inches in length and has a wing five inches long. This species is as large in body as a bluebird and is strong and powerful, resembling a large swift in general appearance.

### HUMMERS WITH SICKLE-SHAPED BILLS

Variations in details of form are as remarkable as those in size. In one species of hummer, the sword-bearer (*Docimastes ensifera*), the bill is nearly five inches long, being longer than the rest of the bird. Another (*Ramphomicron microrhynchum*) has the bill less than a quarter of an inch long.

Photograph by Wright M. Pierce

THE NEST OF A BLACK-CHINNED HUMMING BIRD

Near Claremont, California, the hummer built a nest made exclusively of yellowish down from the back of sycamore leaves (see text, page 74).

Most hummers have straight bills, but there is the sicklebill, in which the bill is curved so that its outline forms one-third of a circle. Such adaptations allow feeding in special flowers, the sword-bearer frequenting long, trumpet-shaped blossoms, while the sicklebill is partial to certain orchids, palms, and other peculiar blossoms, where the throat of the flower is curved.

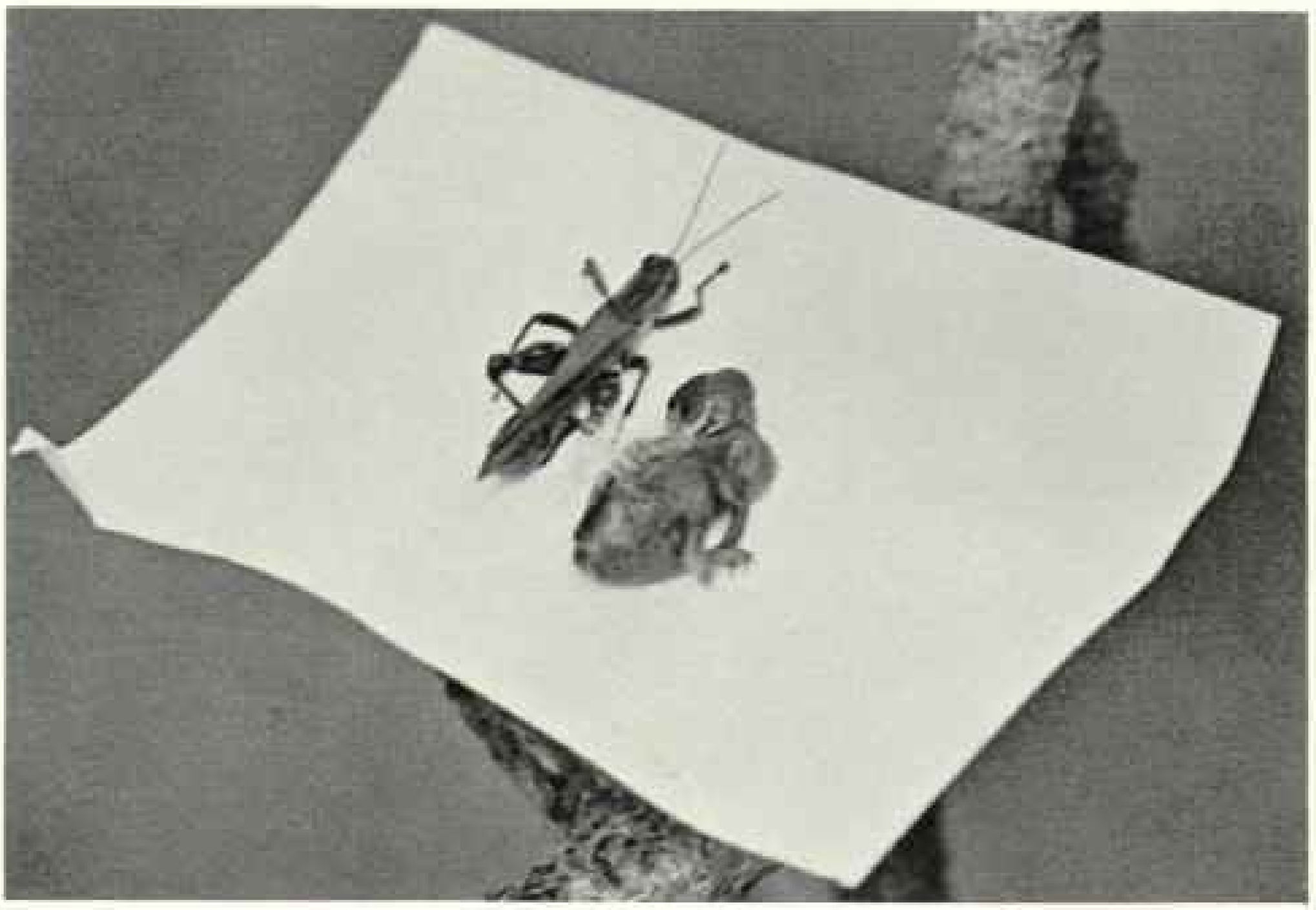
Variations in the form of the tail in this group are equally remarkable. Most species have the feathers of ordinary length, forming a square or slightly notched tail, but in contrast to these there are the racket-tailed hummers (*Spathura*), in which the lateral feathers are greatly elongated, with the tip narrowed and then expanded so that it resembles a racket. The long-tailed hummers have tails three or four times as long as the body, the longest feathers being seven inches in length.

It is usual for male humming birds to have a spot of brilliant iridescent color on the throat. With this there are often peculiar feather developments in the form of crests, or gorgets, that provide increased surface for these areas of brilliant color, and often produce most remarkable and extraordinary appearances.

I recall my pleasure and surprise at my first glimpse of the gilt-crested humming bird on the wing. In search of specimens for the National Museum, I had come to the little island of Vieques, east of Puerto Rico, in the West Indies, and on my first morning in the country collected a tiny hummer feeding at flowers in the top of a small tree. In the air it had appeared ordinary, but, to my amazement, when it came to my hand it possessed a long, pointed crest of the most brilliant green imaginable.

## CUP-SHAPED NESTS OF SOFT DOWN

The nests of humming birds are made of soft plant downs, formed into a cup-shaped structure that in most instances is placed firmly on some small twig or branch, sometimes near the ground and sometimes high above it. The outside of this structure usually is covered with bits of bark and moss bound in place with spider web, so that the nest is inconspicuous, resembling merely a knot on a limb. Some species attach their nests to leaves or to the ends of branches, so that they are semipendent.



Photograph by A. A. Allen

A NEWLY HATCHED RUBY-THROAT AND A RED-LEGGED LOCUST

The swelling on the side of the young bird's neck is its crop distended by a recent injection of nectar from its mother.

Most of the nests that I have found have come to my notice from the pugnacious attacks of the females, whose repeated darting at birds that came near, or at my head as I passed, gave notice that a nest was somewhereabout. Two white eggs, resembling pearls against their background of plant down, are laid by most species whose nesting habits are known. Occasionally one egg constitutes a set, and rarely three are found, but this is unusual. Though large in comparison to the size of the parent, in the case of the smaller hummers, the eggs are very tiny. Those of the vervain hummer of Haiti, a species that is barely larger than the smallest species known, measure less than half an inch long by one-third of an inch in diameter.

THE HUMMING BIRD IS A MEAT-EATER AS WELL AS A NECTAR-DRINKER

That humming birds feed on the nectar of flowers is universally known, but the part that nectar plays in their diet is not so great as is popularly believed, since large numbers of tiny flies, bees, beetles, and other insects, as well as spiders, are captured in the flower corollas.*

These tiny birds are hungry for meat as well as for sweets. The dozens of stomachs of the various species that I have examined to learn something of their food have been filled with fragments of insects and spiders. After the nutriment has been extracted from these, the indigestible parts are formed into tiny pellets that are regurgitated to empty the stomach for another meal.

Some kinds of hummers, particularly forest-inhabiting forms, pay little attention to blossoms, but spend much of their time in gleaning over the moss-covered bark of the trees of their forest haunt searching for animal food. I have seen others feeding on tiny gnats gathered in whirling clouds in the air. The hummers hung with rapidly vibrating wings, seizing the minute insects one by one in flight and whirling about with the greatest celerity in securing their prey.

* See, also, "Holidays with Humming Birds," by Margaret L. Bodine, in the NATIONAL GEOGRAPHIC MAGAZINE for June, 1928.

Photograph by William L. Finley and H. T. Bohlman

A HUMMER SUCKING HONEY FROM A FLOWER

The photographers filled the flowers with sweetened water regularly until the birds became accustomed to visiting the spot for their daily meal. Then the camera was focused to await the chance snapshot. This exposure was only a seven-hundredth part of a second.

Flowers, however, are attractive to most humming birds. In the semiarid sections of western Argentina I observed that a red-flowered epiphyte (*Psittacanthus cuneifolius*) was highly attractive to them. The general tone of vegetation in these desert areas was gray green, so that the red color of the flowers stood out prominently at a distance. It was evident that they were sought by the hummers, as the birds flew directly from clump to clump, even when these were separated by a considerable distance.

In their feeding, hummers, like bees, carry pollen from blossom to blossom and some species are important agents in the fertilization of flowers.

Among popular misconceptions relating to humming birds is the belief that they come commonly in the evening—a supposition that is based upon confusion between these birds and the equally large sphinx moths, that hover with rapidly beating wings over beds of petunias and other flowers to probe their cups exactly as hummers do during the day.

The Indians of northern South America still use the feathers and skins of humming birds for decorative borders or pendants from bags or other articles, and formerly tens of thousands of the skins of these birds were shipped from South America for millinery ornaments. Happily, the use of wild birds as hat decorations is no longer the fashion or is prohibited by law, so that the birds are not now destroyed in numbers for this purpose.

The countryman of Haiti knows the humming bird as the "ouanga négresse" and uses its dried body in making a love philter considered of the greatest potency. What value they may have in this direction will be left to the reader's imagination; but it may be truly said that these vivacious little creatures, with their sprightly habits, inevitably capture the hearts of all those interested in birds.

### SWIFTS ARE THE NEAREST RELATIVES OF HUMMING BIRDS

The nearest relatives of humming birds are the swifts. While it may seem strange

Photograph by A. A. Allen

A HALF-GROWN CHIMNEY SWIFT IN ITS COAT OF MAIL

The feathers do not break from the sheaths until the "pin feathers" are practically fully grown.

comes almost entirely after the young bird leaves the egg.

Swifts lead the most aërial existence of any of their bird relatives, spending the greater part of the daylight hours in seemingly tireless flight.

The one hundred known species are divided into two families—the tree swifts (Hemiprocnidae) and the typical swifts (Micropodidae). The former are found from India through the Malay region and adjacent islands. They have crested heads, brighter colors, and a softer plumage than the other swifts. They perch frequently on the limbs of trees, like ordinary small birds, and make a peculiar nest of bits of bark cemented to the side of a small limb, constructed just large enough to hold the single egg.

The typical swifts are plainly colored birds of small or moderate size. Some species have spots or bands of white in the plumage, but the majority are plainly colored in brown, gray, and black.

In general appearance swifts resemble swallows and are frequently confused with that group. The resemblance is entirely superficial. The novice may distinguish the two by the fact that swifts have only ten tail feathers, while all swallows possess twelve.

The typical swifts rest by clinging to the inside of hollow trees or chimneys, the faces of cliffs, or the hanging dead fronds of palms, never perching on twigs or limbs, as do ordinary birds. Their feet are relatively small, but their claws are strong and

at first glance to associate these two groups in one order, they are alike in their wonderful powers of flight. The plumage of both is firm and the feathers are small and compact. The body in both has strong breast muscles, with greater development of the breastbone, to which these muscles are attached, than in most other birds. The feet of both are small and the wings long and pointed.

The long and narrow bill of the humming birds seems strikingly different until we find that when humming birds are first hatched their bills are short and flattened, being not widely different from those of swifts. The growth in length of the bill

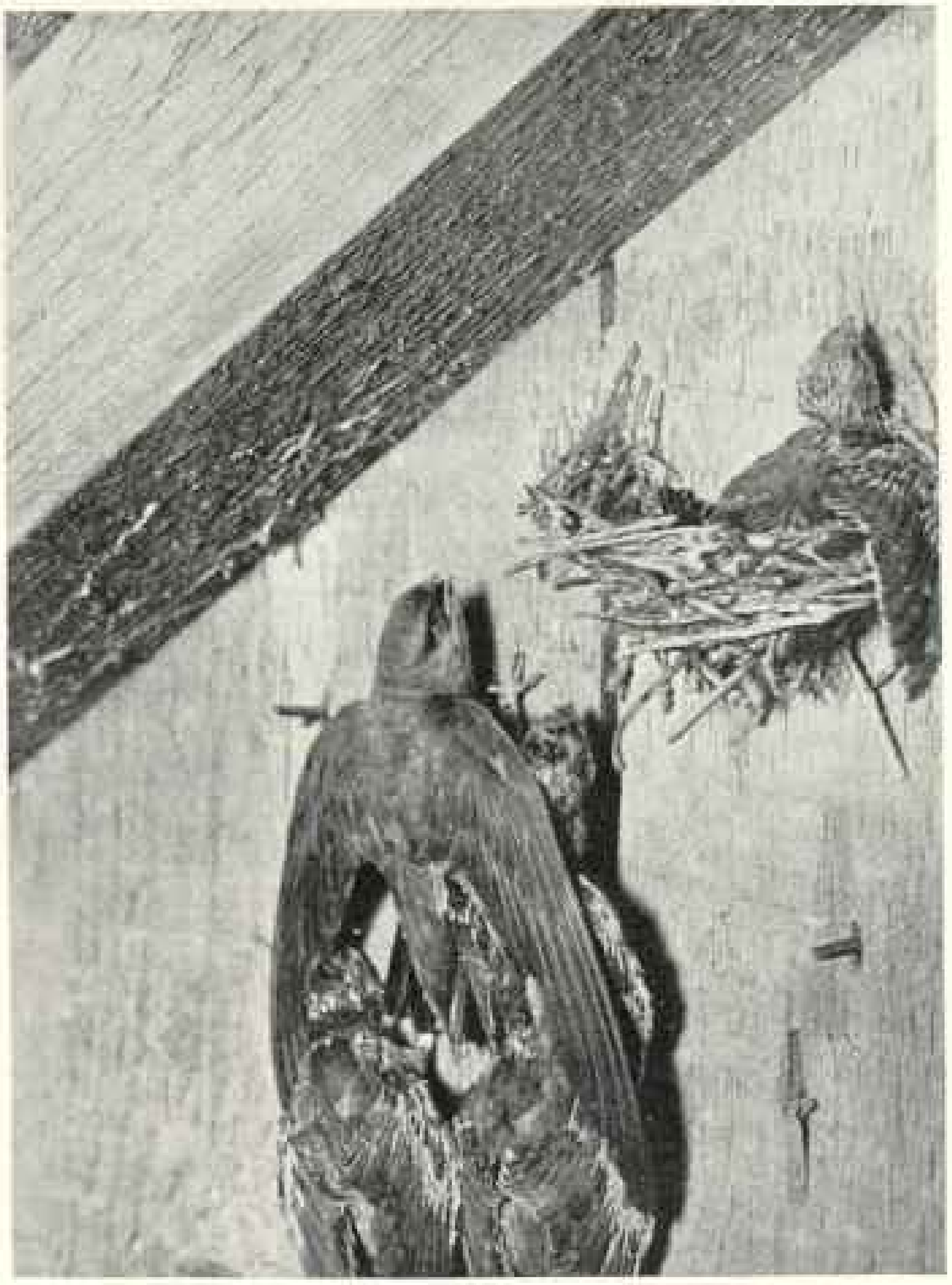
sharp, so that they can hang on comparatively smooth surfaces or clamber along them without difficulty. Many species can direct all four toes forward to assist in clinging.

### SWIFTS ARE THE SPEED CHAMPIONS OF THE BIRD WORLD

The wings of swifts are long and narrow and the plumage of the body is close and firm. Members of this family have the most rapid flight known among birds.

Among American forms, the cloud swift, which is nearly as large as a sparrow-hawk, is our fastest-flying bird.

In Haiti I found these great swifts circling about the tremendous cliffs of Morne La Selle, where it was exhilarating to a high degree to watch their skill on the wing. One of them was observed to loop the loop without pause in its rapid course, and aviators from the Marine Flying Field at Port-au-Prince told me of having seen these birds circle about their planes when they were traveling at a rate of 85 miles per hour.



Photograph by Guy A. Bailey

CHIMNEY SWIFTS, WITH A YOUNG BIRD IN ITS NEST

The photograph was made by flashlight, in a barn near Syracuse, New York.

Specimens for study and for preservation for the National Museum were obtained only by the expenditure of many cartridges, as the birds crossed the projecting point on which I stood, at the summit of a cliff, at such tremendous speed that they were gone before I could swing my gun to catch their line of flight. Their speed is far more rapid than that of the fastest-flying grouse or duck.

It is not exceptional for swifts to feed and travel at a rate of approximately 70 miles per hour—a speed that can be accelerated to fully 100 miles at pleasure. By means of a stop-watch, E. C. Stuart Baker, in India, has recorded the flight of two species of swifts over a measured course two miles in length, and found that the fastest individuals covered this distance in from 36 to 42 seconds, or at the rate of 171.4 to 200 miles per hour. These figures have given me some solace in my remembrance of the ammunition I have used in shooting birds of this family on the wing for preparation as museum specimens.

The nests of swifts are peculiar, being ordinarily formed of twigs, bits of bark, and similar material cemented together by

Photograph by Dr. Frank N. Wilson

A NIGHTHAWK EXAMINES HER NEST AND EGGS: BEAVER ISLAND, LAKE MICHIGAN

the viscous saliva of the bird to form a basket that is fastened by this same saliva to the inside of hollow trees or chimneys, to the branches or leaves of trees, or to the walls of cliffs or caves. The eggs are pure white and range in number from one to six, according to the species.

The swiftlets (genus *Collocalia*), smallest in their family, have most peculiar nesting habits. It is this group that produces the edible birds' nests prized among the Chinese for making soup.

The edible nests are made principally by two species which frequent caves, in colonies containing thousands of individuals. The nests are composed of a mucous secretion from large glands opening into the mouths of the birds. This substance is molded against the rock to form a small platform, with a hollow in the top to receive the two eggs.

The better-grade nests, which are composed entirely of the glandular secretion and are nearly white, are gathered by natives and sold for food. The second nests made are reported to be mixed with various vegetable substances, as the secretion from the bird itself seems insufficient. When these second nests are taken the bird forms a third structure, that is composed of various substances cemented together with a little saliva.

The caves where these birds nest are visited annually by natives, who take the first and second nests, leaving the third one for the birds to use in rearing their families. When the young are on the wing, this final nest is destroyed to insure that a new one of good quality will be constructed at the next breeding season.

The food of swifts, so far as known, consists entirely of insects captured on the wing. In the Tropics swifts consume termites or white ants during their periods of flight. While these birds have short bills, the gape is wide, forming a scoop in which food is seized.

The notes of swifts are chattering, squeaky calls with little musical merit.

### THE GOATSUCKERS

The order of goatsuckers, found throughout the temperate and tropical parts of the earth, includes four families: the frogmouths (Podargidae), the wood nightjars, or potoos (Nyctibiidae), the owlet frogmouths (Aegothelidae), and the true goatsuckers (Caprimulgidae).

Birds of this order are active at night, and, except for the nighthawks and their relatives, are not seen by day except when flushed from their roosting places.

The name of goatsucker comes from a superstition of Old World peasants, who hear the calls of these nocturnal birds about their herds at night and believe that they subsist on stolen milk. Nightjar is a name bestowed in England, referring to calls heard from the woodland at night.

The goatsuckers include about 100 forms of small to medium size. All have soft, fluffy feathers, colored in delicate grays, buffs, and browns, with occasional markings of white. Their wings are long and pointed and their feet small, the claw on the middle toe possessing a comb, or pecten, perhaps of use in cleaning the plumage. The bill is small and weak, but the mouth is enormous, its capacious opening extending back beneath the large eyes.

On opening the mouth, the outline of the lower portion of the eyeball is visible through the thin membranes lining the roof of the mouth. Years ago some naturalists, believing that these birds had the power of rolling their eyes inward, so that they could look out through the transparent mouth membranes and so direct the capture of their insect food, aroused a highly amusing controversy that continued for some years before it was determined that the eye was really only slightly movable in its socket.

When at rest in trees, these curious birds ordinarily perch lengthwise on limbs, so that with their dull coloration they appear to be merely knots or excrescences.

### WEIRD VOICES HEARD ONLY AT NIGHT

The voices of this family are unusual or even weird and, being heard mainly at night, have been the subject of much superstition. Most of them consist of a rapid repetition of a phrase or a series of notes that may be heard for a considerable distance and in imitation of which many species, as the whippoorwill, pauraque, and chuck-will's-widow, have been given their common names.

Like many other nocturnal creatures, the eyes of goatsuckers shine from reflected light, and one method used in securing specimens is to hunt them at night by the aid of headlights.

While studying the bird life of the Chaco in western Paraguay, I went out one evening equipped with a small electric headlight to ascertain the source of a tremulous call heard from the forest for several evenings. The time was September, spring in the Southern Hemisphere, and the night air soft and warm, as I left the house.

I walked slowly along a trail that led toward a deep forest. As I crossed an open pasture the eyes of horses glowed clear green in the reflection from my headlight. A screamer called loudly from the edge of a lagoon, but flew with heavy flight without giving reflection of any kind from its eyes. In the trees were great beetles with two luminescent spots of clear green that shone steadily like little lamps, and I saw other small luminous points that I could not identify.

The scent of blossoming trees hung heavy in the night air, and as I entered a footpath leading into the depths of a dense forest a jaguar coughed near at hand. My light threw only a small beam that illuminated a tiny circle of branches and leaves.

The tremulous note that I had heard from the tree tops came now near at hand, and suddenly I saw a single spot of deep ruby red a few feet from the ground. The point seemed to be nearly an inch in diameter and appeared and disappeared, apparently as the bird turned its head. It suggested a glowing coal, but had a deeper, more intense light.

Raising my gun so that the sight was visible in the weak ray from the headlight, I took careful aim and fired. In the dead night air the gas from the discharge crowded back in my face and the red spot disappeared. Hastening up, I found a beautiful little goatsucker (*Setopagis parvulus*), eight or nine inches long, of a kind that I had not seen before.

The food of goatsuckers consists principally of insects that the birds capture on the wing. They eat many moths, as these creatures are active at night, and also take almost anything else that flies. In the stomach of a wood nightjar (*Nyctibius griseus abbotti*) killed by Dr. W. L. Abbott in Haiti were remains of beetles of very large size.

The larger goatsuckers are known to swallow small warblers and other birds.

## RUBY-THROATED HUMMING BIRD (Archilochus colubris)

The ruby-throat is the most generally known of its family, from its extensive range in eastern North America. A subdued hum, perhaps accompanied by a mouselike squeaking note, attracts attention to these tiny birds working alertly and vivaciously about beds of flowers in gardens, or the naturalist may come across them in woodland or in fields, where they pass with the direct flight of bees, but with startling rapidity, or stop to feed at jewelweed, thistles, trumpet vines, and other blossoms.

Many interesting experiments in feeding humming birds have shown that it is possible to attract them about yards and gardens, principally in late summer, by providing supplies of syrupy sugar water in small bottles suspended from sticks where they are easily accessible. Some have concealed such containers in artificial flowers, but this is not necessary. Miss Althea Sherman has found by experiment that one hummer will consume regularly a teaspoonful of sugar daily, an astonishing amount, considering the size of the bird.

The nest of the ruby-throat is placed ordinarily in open woodland, on a small limb, at an elevation where it is difficult of access. Like other species of the family, the female makes her nest and rears the young alone, the male showing no interest in these domestic problems.

This species nests from Alberta, central Saskatchewan, and Nova Scotia south to Florida and the Gulf coast, ranging west to North Dakota, central Kansas, and central Texas. In winter it is found from central Florida and Louisiana south through Mexico to Panama.

## COSTA'S HUMMING BIRD (Calypte costae)

Costa's hummers frequent growths of sage and greasewood, other shrubbery, eucalyptus groves, or similar haunts. Ordinarily they are rather quiet, but become more active and vivacious at the approach of the nesting season. The display of the male before the female at this season is most curious. Ascending in the air to an elevation of one hundred feet or more, he swings down at dizzy speed past his mate, at rest on some low perch often near the ground, passing within a few inches of her, and then rising to an altitude equal to that of his starting point, on the opposite side. During this flight he produces a loud, whirring sound that often is the only indication of the display, as the downward speed of the tiny bird is such that the flight is completed before the eye can be directed toward it. At the finish he may dart away in a series of zigzag turns. The male utters a low whistling call that is quite peculiar.

In its nesting, Costa's hummer is not as solitary as most of its family, since in favorable locations several nests may be found in a small radius. The nest is less compactly built than in the case of the ruby-throat and its relatives.

Costa's humming bird is found in the warmer sections from southern Utah and southern California south through Lower California, Arizona, and New Mexico. It is rare in winter in California, being found at that season in Lower California and northwestern Mexico.

## BLACK-CHINNED HUMMING BIRD (Archilochus alexandri)

While this species has an extensive range in western North America, where it is common over a wide area, it is best known in the Pacific Coast region. It has the general habits and customs of the ruby-throat, of which it is the western counterpart, but from the nature of its range inhabits drier areas. It is common in foothill regions in mountainous sections, where there are flowers to furnish suitable feeding grounds. I have observed them frequently drinking at little brooks where the water trickled over stones, producing tiny falls and rapids, as their needs for water are not always met by dew, as is ordinarily the case in the ruby-throat.

The nest of this species externally is covered with spider web, into which leaves, seed heads, and similar vegetable substances may or may not be woven. Ordinarily nests are placed from four to eight feet from the ground, saddled on small limbs. The eggs, as in other species of the group, are white. Usually there are two, but occasionally nests are found with three, there being sets with this number in the collections of the United States National Museum. Two and possibly three broods may be raised in a season.

The female is closely similar in color to the female ruby-throat, differing mainly in being slightly larger.

This hummer nests from southern British Columbia to northern Lower California, Sonora, and Tamaulipas, ranging east to western Montana and central Texas. It winters in Mexico south to Guerrero and Mexico City.

## ANNA'S HUMMING BIRD (Calypte anna)

This humming bird is one of the most familiarly known of the western species of the family, as it is a common resident in thickly populated areas as well as in the wilder districts. While it examines blossoms for food as regularly as any of its relatives, in the winter season, when flowers are few or absent, it secures its food of insects and spiders by searching the leaves of trees. It has also been seen feeding on tree sap and the insects attracted by such exudations about punctures made by sapsuckers in the bark of oaks.

These birds nest from January and February until May and June, usually rearing two families each season, and at this period the male utters a series of twittering notes that form a pleasant little song. The nests ordinarily are located in the vicinity of water and are often placed on branches overhanging streams. Usually they are built of soft plant downs, but occasionally are formed of dried flowers of eucalyptus. The lining may contain a few feathers or occasionally the fur of small mammals.

Though the male is distinct, the female is quite similar to that of Costa's hummer, differing in slightly larger size, darker gray underparts, and narrower outer tail feathers.

Anna's humming bird is resident in California, mainly west of the Sierra Nevada, ranging south into northwestern Lower California. It is not known to perform regular migrations, but has occurred casually in Arizona in late summer.



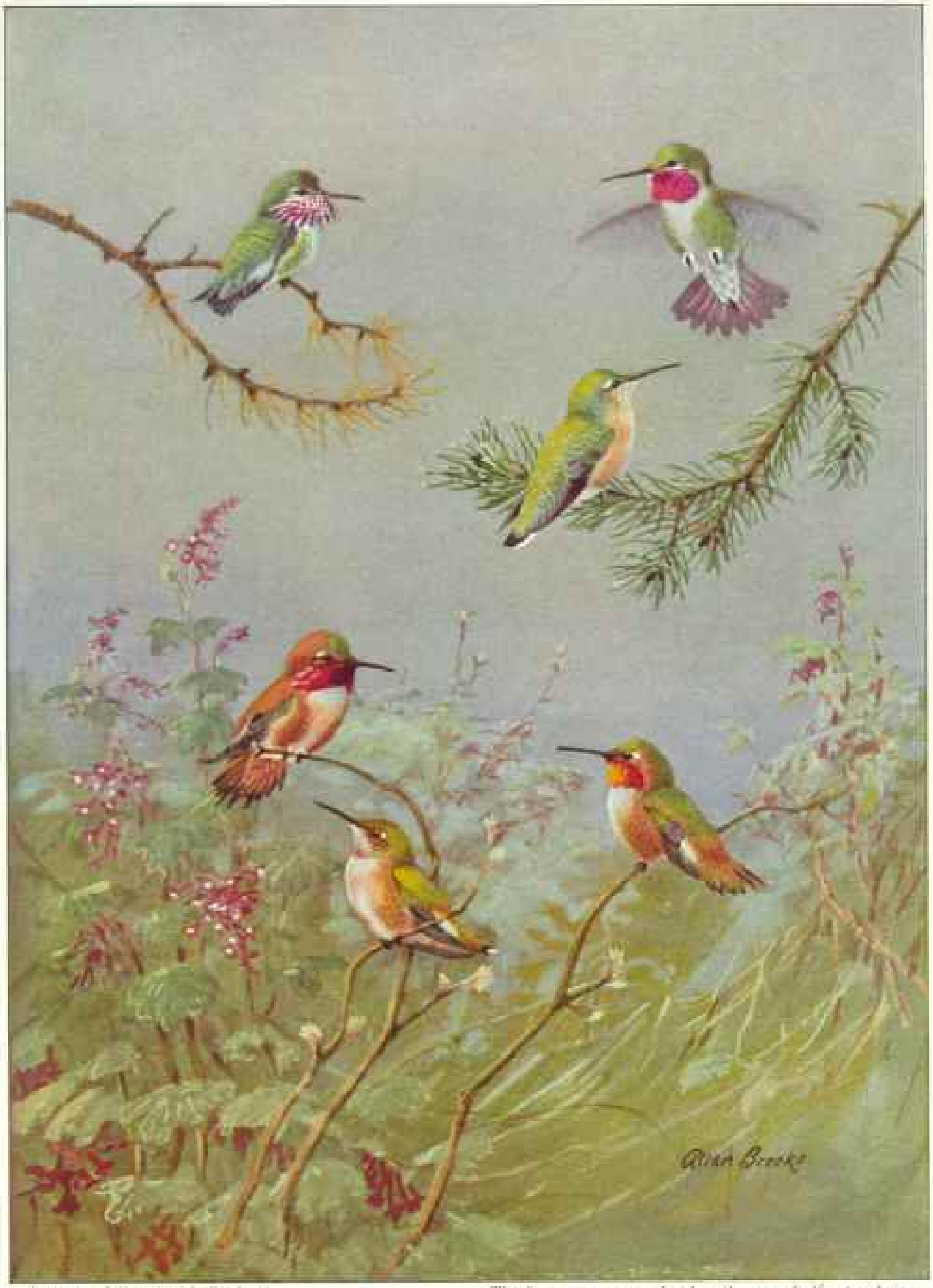

The figures are somewhat less than one-half natural size

RUBY-THROATED HUMMING BIRD
Female, above; male, below

BLACK-CHINNED HUMMING BIRD
Male

COSTA'S HUMMING BIRD
Male, above; female, below

ANNA'S HUMMING BIRD
Male, above; female, below






The figures are somewhat less than one-half natural size

CALLIOPE HUMMING BIRD
Male

BROAD-TAILED HUMMING BIRD
Male, above; female, below

RUFOUS HUMMING BIRD
Male, above; female, below

ALLEN'S HUMMING BIRD
Male

## CALLIOPE HUMMING BIRD (Stellula calliope)

This species is the smallest of the hummingbirds of the United States, and is thus the tiniest of the birds that occur in this region. In northwestern Wyoming I found them in June in little valleys, often in swampy sections, where they rested on dead twigs in the tops of alders and other shrubs. Each male had his selected perch and objected vigorously to the encroachment of others on this territory, pursuing interlopers with rapid flight and squeaky call notes. Calliope hummers feed about flowers with other species of their family, and in spite of their tiny size are as pugnacious and aggressive as their larger relatives.

The mating display flight of the male of this species is less spectacular than that of some of its relatives, the bird swinging in a semicircular path past his mate on the downward sweep, making a loud metallic sound that may be heard for some distance.

The nest ordinarily is placed in pine trees on or beside cones, and is so covered externally with bits of bark and small shreds of cone that it closely resembles a dead cone, the mimicry being so exact that nests are discovered usually by seeing the parent fly about them.

The female has the throat spotted lightly with dusky and the sides washed with brown, otherwise closely resembling the male.

The Calliope hummingbird nests from northern British Columbia, southwestern Alberta and Montana, south through the higher mountains to New Mexico and northwestern Lower California. It is found in winter in Mexico south to Guerrero and Mexico City.

## RUFOUS HUMMING BIRD (Selasphorus rufus)

This is one of the most spectacular of our hummingbirds because of the brilliant color of the male and from the abundance of the species in its range. At times these birds fairly swarm, where thistles, agaves, and other flowers are abundant. Aggressive to a degree and filled with vibrant, nervous energy, these tiny mites seem never to rest, their feeding grounds being in constant turmoil, as the birds dash about with chattering calls in an endeavor to drive rivals away from favored flowers or perches. As they turn, the males glow in the sun like coals of fire, and in following their brilliant forms one entirely overlooks the duller-colored females.

The male dazzles his mate in a courtship flight in which he swings down from high in the air to pause fleetingly an inch away, and then rises swiftly to repeat the dashing performance. The nesting is generally similar to that of Anna's hummer (see page 74). Nests are placed in trees, shrubs, and bushes. The inside is composed of cottony downs with the outside covered with fine moss and shreds of bark.

The rufous hummer nests in Transition and Canadian zones from latitude 61° north, on the coast of Alaska, to east central British Columbia and southern Alberta south to Oregon and southwestern Montana. It is abundant in migration through the Rocky Mountain region and winters in southern Mexico.

## BROAD-TAILED HUMMING BIRD (Selasphorus platycercus platycercus)

The broad-tailed hummer is one of the most abundant hummingbirds of the Rocky Mountain region, where it has wide distribution. In flight the attenuated outer primaries produce a loud, metallic, rattling sound that can be heard for some distance, which brings the species conspicuously to the attention of those who visit its haunts.

The broad-tail is preeminently a flower feeder, though it may visit the tree borings of sapsuckers to obtain sap and the insects attracted by this fluid. In its seasonal movements it is governed largely by the flowering of plants, following the changing season from the mountain foothills into the higher parks as summer advances and plants bloom at increasing altitudes. These hummers come regularly to gardens in towns located in their haunts.

The male has a diving nuptial display resembling that of some of the other hummers, executed with much metallic rattling of the wings.

The majority of nests are placed near the ground, and there is more variation in the appearance of the nest than customary in other species. Two broods, and possibly three, are reared each season, the eggs being two in number, as usual.

The broad-tailed hummer nests from southern Idaho, Montana, and southern Wyoming to eastern California, western Nebraska, and western Texas, south to the Valley of Mexico. It is found in winter in Mexico.

## ALLEN'S HUMMING BIRD (Selasphorus alleni)

This species is generally similar to the closely allied rufous hummer and is often confused with that species, particularly when the plainly colored female is concerned. The latter is distinguished from the related species by being slightly smaller, with the tail feathers narrower (not more than one-tenth of an inch wide, instead of more than one-eighth inch, as in the rufous).

This species, like the rufous hummer, is more than commonly aggressive among species noted for their pugnacity, and has even been known to drive large hawks to flight by its vigorous attacks.

The male has a display flight somewhat like that of the broad-tail, in which he rises high in the air and then darts down with a loud metallic sound, produced by the rushing of air through the flight feathers. The species breeds principally in the coastal region of California, and after the nesting season scatters widely before the fall migration carries it southward. The nests are like those of Anna's hummer and may be in trees or in bushes. It is said that two broods are reared each season.

Allen's hummer nests in Transition and Upper Austral zones from Humboldt County, California (possibly extending into Oregon), south to Ventura County and the Santa Barbara Islands. It is found in migration in eastern and southern California, Arizona, and Lower California, and winters on the Santa Barbara Islands and probably in northwestern Mexico.

### LUCIFER HUMMING BIRD (Calothorax lucifer)

This handsome species is apparently a casual visitor from Mexico along our southern border, being, so far as known at present, rare and unusual in occurrence. The first one known within our limits was taken by Mr. Henry W. Henshaw near Camp Bowie, in southern Arizona, on August 7, 1874. It was found, with a host of other hummers, about the flowering spikes of the agave. Subsequently this species has been obtained by the United States Biological Survey in the Chisos Mountains, in western Texas.

In southern Mexico the Lucifer hummer is common. While it feeds at flowers, it is said also to visit the great spider webs, abundant in its southern home, to pick off small insects that have become caught in these nets, the hummer moving circumspectly through the mazes of the web to avoid being entangled in turn. The larger spiders resent this pilferage and rush at the bird, which darts to a safe distance instantly.

The beautiful feathers of this species were among those used by the ancient Mexicans to cover the famous feather mantles made in the time of the Montezumas, the gorgeous reflections of the Lucifer hummer being especially decorative.

In a family noted for its aggressiveness, this species is reputed to be more active and pugnacious than most. The nest and eggs are of the usual type found in this group.

Lucifer's hummer is found in Mexico south to Mexico City, Puebla, and Chiapas.

### BROAD-BILLED HUMMING BIRD (Cynanthus latirostris)

Within the United States, this handsome hummer is found in the foothills of the small mountain ranges of southern New Mexico and Arizona. It inhabits arroyos, canyons, and the borders of streams, perching on dead twigs at the tops of bushes or low trees, resting in the sun on cool mornings, and seeking perches in shade in the heat of the day. The light color at the base of the bill, prominent even at some distance, is a field mark that serves to distinguish this species from others of this region.

The broad-bill seems quieter and less active than some of the species that have been described, and frequently, after aggressive flight in pursuit of some intruder, I have seen the two combatants perch four or five inches from one another for a few seconds, while with raised wings they gave a low, chattering call.

The ordinary flight is accompanied by a subdued humming sound. The birds feed at flowers and also glean small insects and spiders from the underside of branches and among leaves.

A nest in the National Museum collection in Washington is made of fine shreds of bark and plant fibers, bits of lichens and similar materials, bound together with spider web, the whole being coarser in construction than ordinary in this family.

This species ranges from the mountains of southern Arizona and southwestern Mexico to the City of Mexico and Guerrero.

### XANTUS'S HUMMING BIRD (Hylocharis xantusi)

This handsome hummer was discovered in 1859 by the naturalist John Xantus de Vesey, who, through arrangement by Spencer F. Baird, then Assistant Secretary of the Smithsonian Institution, had been sent to Lower California as a meteorological observer for the Signal Service. Xantus's hummer is most common in the Cape region of Lower California, being found in a variety of situations, from the hedges in the towns of the coast region to the live oaks of the highest mountains of the interior.

The courtship display of Xantus's hummer is said to be confined to a flight during which the birds pursue one another through the trees. Though some nests are saddled on limbs, as in many other hummers, others are hung from several small twigs or leaves at the tip ends of branches. The nests are made of the usual fine materials and soft linings common to the family. Though two eggs are found frequently, in numerous instances nests contain only one egg or one young bird, indicating that either one or two eggs may constitute a complete set. The eggs vary greatly in shape, ranging from oval to elliptical. Many eggs and young are destroyed by ravens, who seek this small prey regularly.

The male of Xantus's hummer has a pleasing song, uttered from some dead twig, and is heard often toward nightfall. While not particularly aggressive, these birds guard the nest locality jealously. The female differs from the male in having the entire undersurface brown and in being lighter green above.

This species is restricted to the Cape region of Lower California, ranging north to latitude 29°.

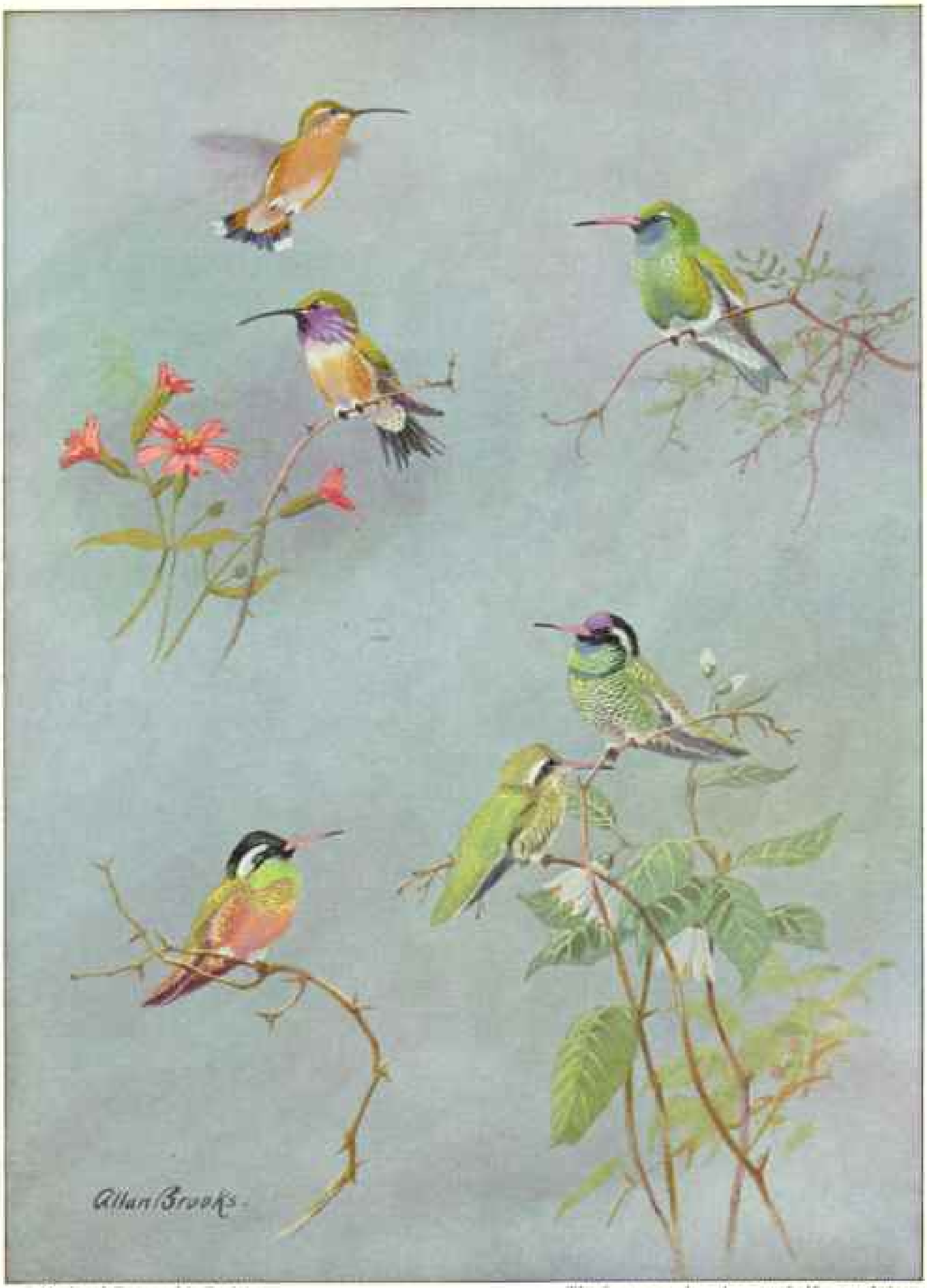
### WHITE-EARED HUMMING BIRD (Hylocharis leucotis leucotis)

This interesting species, one of the rarer hummers of our list, found within our limits in the mountains of southern Arizona, is comparatively little known. The first specimen known from the United States was collected by Dr. A. K. Fisher in Fly Park, in the Chiricahua Mountains, in 1894. Since that time it has been found in other mountain ranges in southern Arizona and seems to be regular in its occurrence north of the Mexican boundary. It ranges from 4,500 feet to 10,000 feet altitude and feeds principally at flowers, the honeysuckle being a favorite.

The white line behind the eye is very prominent in life and attracts immediate attention, so that on one occasion in the month of July, while watching the abundant hummers in Barfoot Park, in the Chiricahuas, I singled out a male of this species instantly when it appeared among the swarming individuals of other species.

In Mexico this hummer is reported to be one of the most common of its family in the highlands, where it feeds principally at blossoms. The nest has been mentioned by one author, but no detailed description of the nest and eggs seems to have been given. It has been reported as seen carrying nesting material in the Huachuca Mountains. An allied race is found in Nicaragua.

This form ranges from the Chiricahua, Huachuca, and Santa Rita Mountains of southeastern Arizona south through Mexico to Guatemala.






The figures are less than one-half natural size

LUCIFER HUMMING BIRD
Female, above; male, below

BROAD-BILLED HUMMING BIRD
Male

XANTUS'S HUMMING BIRD
Male

WHITE-EARED HUMMING BIRD
Male, above; female, below



The figures are less than one-half natural size

RIEFFER'S HUMMING BIRD
Male, above

BLUE-THROATED HUMMING BIRD
Male

BUFF-BELLIED HUMMING BIRD
Female, flying above; male, at left below Rieffer's Hummer

RIVOLI HUMMING BIRD
Female, above; male, below

### RIEFFER'S HUMMING BIRD (Amazilia tzacatl tzacatl)

The claim of this species to inclusion in the present list is based on one captured alive at Fort Brown, Texas, in June, 1876, and brought to Dr. James C. Merrill. A careful description was taken of it, and shortly after the bird escaped. As no other specimens have been obtained, this one individual is believed to have been only a straggler.

In certain lowland areas in Central America this hummer is reported as the most abundant of hummingbirds, ranging from the coast to an altitude of 6,000 feet above the sea, being a familiar species that is found regularly in cultivated regions and about houses. It is inquisitive and active and darts here and there with shrill, chirping calls.

In the lowlands of eastern Nicaragua, Rieffer's hummer has been found placing its nest in trees and shrubbery, but seldom at an elevation of more than six feet from the ground. Many of the nests are covered externally with moss that continues to grow in its transplanted location, so that the small, cuplike structures are handsomely decorated in green.

The female is so closely similar to the male as not always to be distinguished, but usually has the white markings of the undersurface more extensive, the abdomen paler gray, and the brown streak in front of the eye less distinct.

This species ranges regularly from Tamaulipas south through eastern Mexico and Central America to Colombia and Venezuela.

### BUFF-BELLIED HUMMING BIRD (Amazilia yucatanensis chalconota)

The buff-bellied hummer is plainer and less decorative in color than our other species. It is found among dense, tangled thickets, where it darts about with ease, coming out frequently into open gardens and among the bushes of pastures, where it is more easily observed.

Its shrill notes often advertise its presence and call attention to birds that otherwise would be overlooked.

This is another hummer, with its range mainly in Mexico, that barely crosses our borders. In the lower Rio Grande Valley, in Texas, it is common during the summer, arriving from the south about the first of April and remaining until September and October.

These birds nest usually in open woodland and at the borders of chaparral thickets, placing their nests on small, drooping limbs or on the fork of a horizontal twig from three to eight feet from the ground. Their tiny homes are compactly and neatly built of shreds of vegetable fiber, covered externally with bits of dried flower heads, lichens, and fragments of bark and lined with thistle down. The two eggs are rather small for the size of the parent. It is believed that two broods may be reared each season.

The buff-bellied hummer has a more restricted range than the majority of the species under discussion in these pages, being found from the lower Rio Grande Valley, in Texas, south into southern Tamaulipas and Nuevo Leon. In winter it is reported to go as far south as southern Vera Cruz.

### BLUE-THROATED HUMMER (Lampornis clemenciae)

The blue-throat is one of the larger forms of its family that inhabits narrow canyons and mountain valleys, occurring to the tops of the small mountain ranges, where it is found in the United States, and in the higher mountains of Mexico being reported to elevations of 12,000 feet above sea level. While having a swift, bulletlike flight, like many other hummers of similar size, it is quieter than some of the smaller species, resting for long periods on low, open perches on dead twigs or on the tips of mastey leaves.

The birds utter sharp, squeaking calls, and the male has a simple song of three or four notes, repeated at short intervals while the singer perches upright with head elevated.

Few nests of this species have been recorded. One, obtained by E. W. Nelson on the volcano of Tolnca, was placed on a fork in a small shrub growing on the face of a cliff. In Arizona nests have been found inside small buildings, placed in the crook of a suspended lard pail handle or on a loop of wire. Others are reported built in an old black phoebe's nest, and among ferns.

Two geographic races of this interesting species are known—the Texas blue-throat (*Lampornis clemenciae clemenciae*), ranging from the Chisos Mountains, in western Texas, south to Michoacan and Oaxaca, in Mexico, and the Arizona blue-throat (*Lampornis clemenciae bessophilus*), found in the Santa Catalina, Huachuca, Chiricahua, and Santa Rita Mountains of southern Arizona, the San Luis Mountains of southern New Mexico, and the Sierra Madre of Mexico. The Arizona form differs from that of Texas in having the bill slightly shorter and the coloration somewhat duller.

### RIVOLI HUMMING BIRD (Eugenes fulgens)

In addition to its handsome coloration, the Rivoli hummer is noteworthy for being one of the largest of its family in the United States, as it is from four and one-half to more than five inches long, with proportionately heavy body. It is found in open pine forests, where it feeds at flowers that happen to be in season. The flight is rapid, but differs from that of smaller hummers in having an apparently less rapid wing motion, resembling to some extent that of a swift.

The nest has been found among pines, fifty feet from the ground, saddled on a small limb in a location difficult of access. It is described as built of plant downs, with an external covering of lichens held in place with spider web, the structure being similar in appearance to that of the ruby-throat but considerably larger, as it measures more than two inches across.

The first sight of this species is not likely to be forgotten, as among its small fellows it appears a veritable giant, with handsome coloring enhanced by its size. It is one of the most attractive birds of a region noted for interesting species.

The Rivoli hummingbird is found in the United States in the mountains of southeastern Arizona and southwestern New Mexico, ranging from 6,000 to 10,000 feet altitude. To the south it occurs through Mexico and Central America to Nicaragua.

### BLACK SWIFT (Nephoecetes niger borealis)

In the United States the black swift is local in occurrence and is counted as one of our rarer and more unusual birds throughout much of its range. While in dark coloration it resembles the chimney and Vaux's swifts, it is larger, and when size is not a sufficient criterion may be told by the longer, narrower wings and the decidedly longer, forked tail. Like all its relatives, it is entirely at home in the air and is usually seen darting and turning high above the earth. Though ordinarily silent, at times it utters loud, chirping calls that may be modified to a rolling twitter. Usually it is found in little flocks.

For many years the nesting of this species remained a mystery, until it was found breeding on cliffs above the sea, in southern California, on small shelves, where the single white egg was placed on a slight depression, on moist sod. In the Yosemite nests have been found on cliffs in mountain gorges, built of fern leaves to form a cup. It is believed that these swifts may nest also in hollow trees, but this has not been definitely established.

This form of the black swift is found from southeastern Alaska and southern Colorado to southern Mexico, wintering in the southern part of its range. An allied form occurs in the West Indies, where in places it is very abundant, being found at times in groups containing hundreds of individuals.

### CHIMNEY SWIFT (Chaetura pelagica)

This species, known to many as the chimney "swallow," from its swallowlike form, is one of the well-known summer birds of the eastern half of our country. In pairs and trios, with rapidly moving wings, these birds pass swiftly overhead, with chirping, twittering notes that at times increase in rapidity of utterance, so that they almost become a song. In the early days in our country this swift inhabited hollow trees, but with the advent of the white man's houses it began to occupy chimneys, until now, though the birds are found occasionally in ice houses or other dark buildings, it is exceptional for them to live in tree trunks. They never perch except on the inside of a chimney, hollow tree, or on a wall.

The nest of the chimney swift is formed of small twigs cemented together by a salivary secretion to form a semicircular saucer, glued against the side of a chimney or other wall, in which there are deposited from four to six white eggs. The young leave the nest when partly grown and cling to the wall like the parents.

In fall migration swifts gather at nightfall in great flocks that wheel in funnel-shaped clouds over chimneys, into which they descend to roost. For many years their winter home was unknown, and when they disappeared in fall the ignorant believed that they had gone into hibernation for the winter. Recently, however, they have been recorded as migrants in Haiti, Mexico, and Central America, and it is assumed that they pass the winter somewhere in northern South America.

The chimney swift is found in summer from southern Canada to the Gulf coast, ranging from the Atlantic seaboard west to eastern Texas, Montana, and central Alberta.

### WHITE-THROATED SWIFT (Aëronautes saxatilis saxatilis)

In a family remarkable for power of flight, the white-throated swift is preeminent among the species found in the United States. I recall distinctly my amazement at its seemingly incredible speed, on my first sight of these birds wheeling over the great abyss of the Grand Canyon. Without seeming effort, they swing back and forth over courses a mile or two in length, with a power and ease that on many subsequent encounters have remained interesting and attractive.

This swift is most common in mountainous regions, where it is found principally in the vicinity of the cliffs on which it nests, but ranges at times in level country, particularly during its migrations. When feeding, it may come near the ground to fly about with ordinary speed, but at other times darts about high overhead, its presence advertised by shrill, high-pitched, laughing calls.

White-throated swifts breed in crevices and crannies in cliffs, caves, and old ruins, making their nests of soft vegetable materials and feathers, fastened together by a gluelike substance from the mouth secretions and fastened by this same cement to the rocks against which they are placed. The eggs are pure white and number four to six in a set. From the rapidity of their flight, these birds have few enemies except the owls and small climbing mammals that capture them at night in their roosts in cliffs and caves.

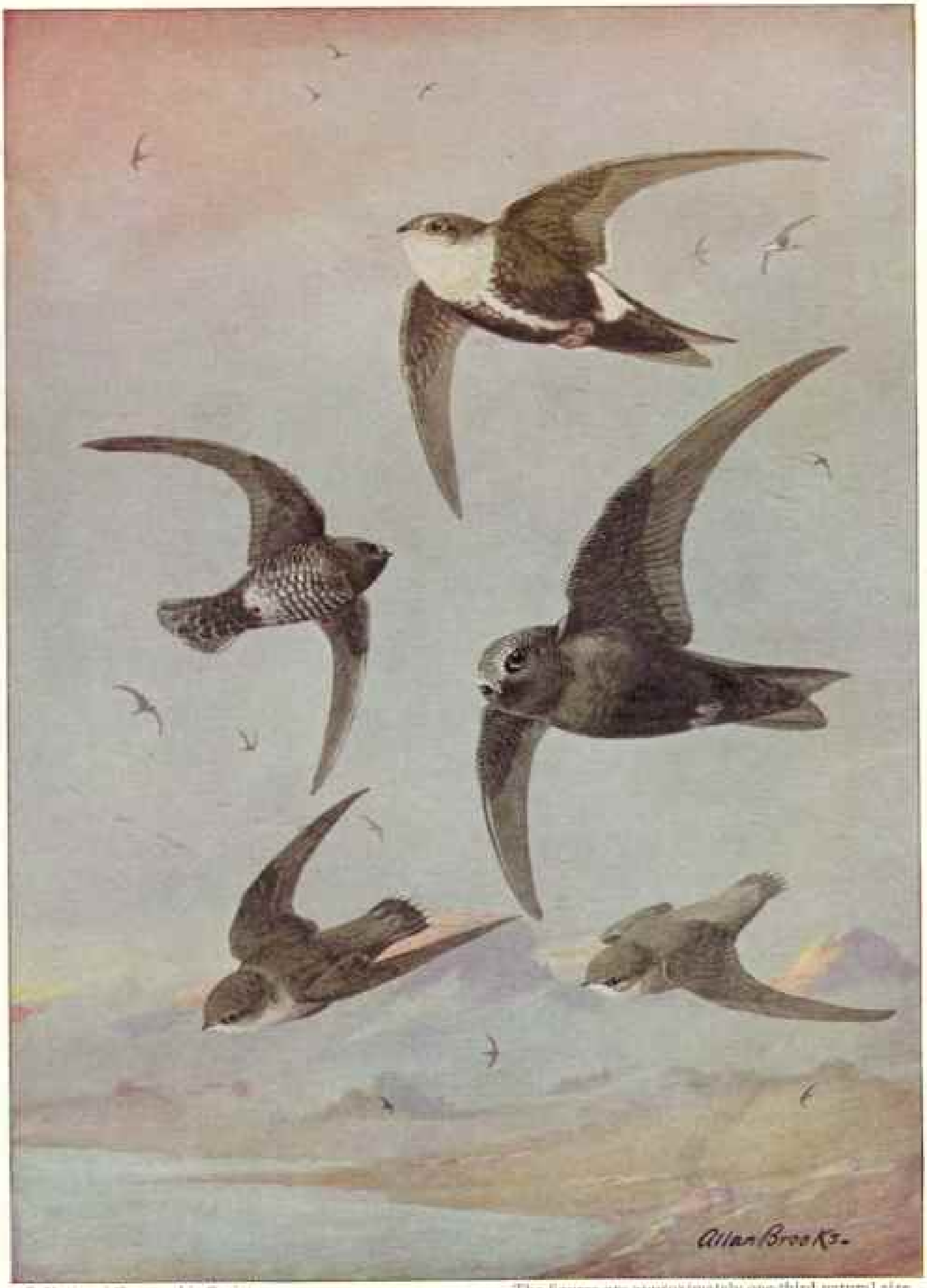
The white-throated swift is found in summer from south central British Columbia and southern Alberta to the Black Hills and Lower California. In winter it occurs from central California southward.

### VAUX'S SWIFT (Chaetura vauxi)

This western species is similar to the chimney swift, from which it differs in slightly smaller size and somewhat paler coloration. It is far less numerous than the chimney swift and in many areas in its range it is found only casually. The flight and general habits of Vaux's swift are also like its eastern cousin, it having similar squeaking calls and like mannerisms in flight. It often feeds high in air for long periods during the day, so that most observations pertaining to it are unsatisfactory glimpses of its small form darting erratically through the sky, perhaps in company with swallows, from which the swift is readily distinguished by its more rapid flight.

In nesting, Vaux's swift still resorts to the hollow trees of its ancestors, constructing a shallow saucer of twigs or of pine needles fastened together with the salivary secretion and with this glued to the walls of its safe retreat. The eggs are four to six in number and are pure white. While usually it nests in tall, dead stubs, the birds ordinarily select those that are hollow throughout their length, descending inside to near the bottom. Instances are on record where the nests have been placed actually below the surrounding ground level.

Vaux's swift nests from southeastern Alaska, central British Columbia, and Montana south to the Santa Cruz Mountains, California, and Nevada. It migrates through Arizona and Lower California to winter in Central America.






The figures are approximately one-third natural size

WHITE-THROATED SWIFT
Upper figure—

BLACK SWIFT
Two central figures
immature, at left; adult, at right

CHIMNEY SWIFT
Lower figure, at left

VAUX'S SWIFT
Lower figure, at right




The figures are less than one-third natural size.

WHIPPOORWILL
Male, above

CHUCK-WILL'S-WIDOW
Male, below

## WHIPPOORWILL (Antrostomus vociferus)

To most the whippoorwill is a voice of the night, that repeats its name loudly and persistently in the evening and again before dawn, and by many is supposed to be the same as the nighthawk, that is seen frequently by day. That the two are distinct species can be seen easily by comparison of the figures and accounts here given. Rarely in daytime whippoorwills may be flushed in the thickets in which they sleep during the daylight hours, resting on the ground or on low limbs, where they always perch lengthwise of the branch. In either case their mottled coloration is so similar to the background against which they rest that they are not seen until they rise in flight and dart away with noiseless wings.

When heard near at hand, the call is loud and strident, and it is found that usually there is a low, harsh note at the beginning, in addition to the three syllables ordinarily heard, so that the call resembles *chuck-whip-poor-will*. It comes more pleasantly to the ear when its loudness is softened by distance.

The birds may call from the ground, but more usually perch on posts, on fallen logs, or on the limbs of trees. In camping in their range, I have had them fly in to scold with low notes at the apparition of a tent suddenly erected in their usual haunts, and on one occasion, while sleeping on the ground in a light rain, had one perch on the canvas I had drawn over my head. Their calls are most vociferous in spring and summer, but are continued occasionally until their departure in fall.

The food of the whippoorwill is entirely animal, consisting principally of large insects. Occasionally, at dusk or in exceptionally bright moonlight, they may be seen darting up from some open perch to seize passing insects, their food, so far as known, being taken principally on the wing.

The whippoorwill deposits its eggs on a bed of leaves, without other pretense of a nest than the slight hollow sufficient to hold them. The site chosen is secluded and little disturbed and ordinarily is heavily shaded by bushes. The eggs number two, in the bird of the Eastern States being white blotched and spotted with various shades of brown and lilac. The eggs of Stephen's whippoorwill, the Western form, are pure white. When disturbed, the female tumbles about with widely spread mouth, uttering strange whining, hissing sounds, in an endeavor to distract the attention of the intruder from her treasures. The illustration shows the adult male, the female being similar, but having the light tips to the outer tail feathers buff instead of white, and the general coloration browner.

The eastern whippoorwill nests from Manitoba, New Brunswick, and Nova Scotia south to northern Louisiana and northwestern South Carolina, and west to eastern North Dakota and eastern Kansas. It is found in winter from the lowlands of South Carolina to Central America.

Stephen's whippoorwill (*Antrostomus vociferus arizonae*) is similar in color, but is larger, with the bristles about the mouth longer and stouter. It is found from southern Arizona, southern New Mexico, and southwestern Texas south through the mountains of northern Mexico. In winter it ranges south to Guatemala.

## CHUCK-WILL'S-WIDOW (Antrostomus carolinensis)

The present species is the largest of its family found within our limits, being from ten and one-half to nearly thirteen inches long. The mouth seems enormously broad and capacious when the small size of the bill is considered, and is bordered by long bristles that differ from those of any of our other goatsuckers in having lateral filaments instead of being smooth. The bird figured is a male, the female differing in having the inner webs of the outer tail feathers mottled instead of white or buffy white.

The chuck-will's-widow is another nocturnal species that inhabits woodlands, being found in densely wooded swamps or rock-strewn hillsides. During the day it rests on the ground or perches longitudinally along low limbs near the earth, where it is shaded from the sun, or enters hollow logs, where it is entirely concealed.

The flight of this species, and of its relatives, is noiseless, so that when disturbed it darts away without the slightest sound.

At nightfall it flies forth to take up search for food and other activities. Like the whippoorwill, it derives its common name from its call of *chuck-will's-widow*, the first note being low and the first syllable of the third strongly accented. This call is repeated in regular chorus and is audible for long distances.

As already indicated, the mouth of this bird is tremendous, so that it is fully two inches across from corner to corner. More than half of its food is composed of large beetles, among them May beetles, or "June bugs," seemingly harsh and unpalatable fare. Other insects taken include the largest kinds of dragon flies, large moths, locusts, and roaches. Apparently anything of proper size is swallowed; small birds, including among them warblers, small sparrows, and humming birds, have been found in stomachs of this species by many observers. The greater part of the food, however, consists of insects.

The chuck-will's-widow makes no nest, placing its two eggs on dry leaves or occasionally on the bare ground, in wooded localities where the earth is well drained, so that the nest site will not be flooded by rains. The eggs are handsome, having a ground color varying from rich cream buff to nearly white, marbled, and spotted with various shades of brown, lavender, and gray.

When a nest is discovered the female tries frantically to draw the intruder away by fluttering and tumbling on the ground as if injured. The mouth is widely opened at such times and the bird presents a most grotesque and strange appearance. Some have claimed that this bird, like the whippoorwill, when disturbed at its nest, will move the eggs to another site, carrying them in its capacious mouth; but this has not been certainly established and is disputed as untrue by several observers. The young, when first hatched, are covered with long down of a peculiar cinnamon-buff shade.

The chuck-will's-widow nests principally in the Lower Austral Zone, in the southeastern United States, from southern Missouri and southeastern Kansas and southern (occasionally central) Maryland south to the Gulf States and central Texas. In winter it is found from Florida to the Greater Antilles, Central America, and Colombia.

## NIGHTHAWK (Chordeiles minor)

In a family whose members are known principally as voices of the night, the nighthawk is the most frequently seen and most familiar, since, though it shares the nocturnal habits of its relatives, it is also regularly abroad by day, when its long-winged form is prominently seen, as it quarters the sky in its migrations or in search for food. Its common name is given from its hawklike appearance when on the wing, a resemblance that is entirely superficial, since it has no close affinity with the falcons and their relatives.

The specimen figured is a male, the female differing principally in the lack of the white bar across the tail. The white mark across the wing is prominent when the bird is in flight.

The nighthawk is largely a bird of the open country, being partial to open pastures, plains, and prairies, where it rests on the ground, on stones, stumps, and fence posts and at times in trees. In the latter case it always perches lengthwise of the limbs, like its near relatives. In wooded country it ranges in the borders of the forests where the tree growth is open.

The food of the nighthawk is composed entirely of insects, including almost everything in this group that flies, ranging from the largest moths and dragon flies to mosquitoes and tiny gnats. The food is captured entirely on the wing, during the intricate aërial evolutions for which these birds are famous, the prey being gathered in the widely opened mouth, which, though it lacks the long rictal bristles found in its relatives, is highly effective as a net or scoop.

Some of the gatherings of small insects secured by these birds are truly remarkable, as several thousand individuals, including more than 50 species, have been found in the stomach of one nighthawk. Flying ants are eaten in large quantities, and these birds on the whole are decidedly beneficial in their destruction of injurious insects.

The nighthawk nests on gravel bars, sand spits, in pastures, particularly in rocky soil, and in similar locations, placing its two eggs in the open, in some slight depression, on the bare ground. With the development of modern cities, the flat, gravel-covered roofs of tall buildings have provided suitable sites where the birds may nest in safety, with the wide sky overhead as a feeding ground—an interesting adaptation to change in condition brought by modern civilization. The eggs vary from cream to olive gray, blotched and speckled with blackish brown and lavender.

In the mating and nesting season the male nighthawk indulges in rapid, erratic flights, which terminate in a thrilling downward plunge at high speed with stiffly set wings. As this rapid course is suddenly checked, the vibration of the air through or against the flight feathers produces a vibrant, roaring sound that may be heard for a considerable distance. Formerly this species, under the name of "bull-bat," was shot for sport, a practice that now is prohibited by law.

The nighthawk as a species ranges from Yukon, Mackenzie, and Newfoundland south into northern Mexico, the Bahama Islands, and the Greater Antilles. In winter it travels south into South America. Nine geographic races, differing in size and color, have been recognized, of which seven occur in our limits.

## TEXAS NIGHTHAWK (Chordeiles acutipennis)

In general appearance this bird resembles the ordinary nighthawk, from which it differs in being slightly smaller and in having the white bar on the wing located nearer the tips of the primaries. When seen close at hand, it has a distinctly browner appearance.

The Texas nighthawk is found in the warmer sections of the Southwest, being especially partial to desert areas, where it may live and nest many miles from the nearest water. It is most active during early morning and late evening, being seldom on the wing during the middle of the day, unless disturbed by some intruder, when it flies without confusion, seeming unaffected by the light. It rests on the ground, or on low branches of mesquite or greasewood, in the latter case perching always lengthwise of the branches. On the ground, it moves about to some extent, and when disturbed frequently raises the head and neck and moves the body up and down.

The flight of this nighthawk is easy and graceful, but the birds ordinarily remain near the ground, not rising as high in the air as the related species. The wing motion is somewhat quicker and less vigorous than in the larger nighthawk.

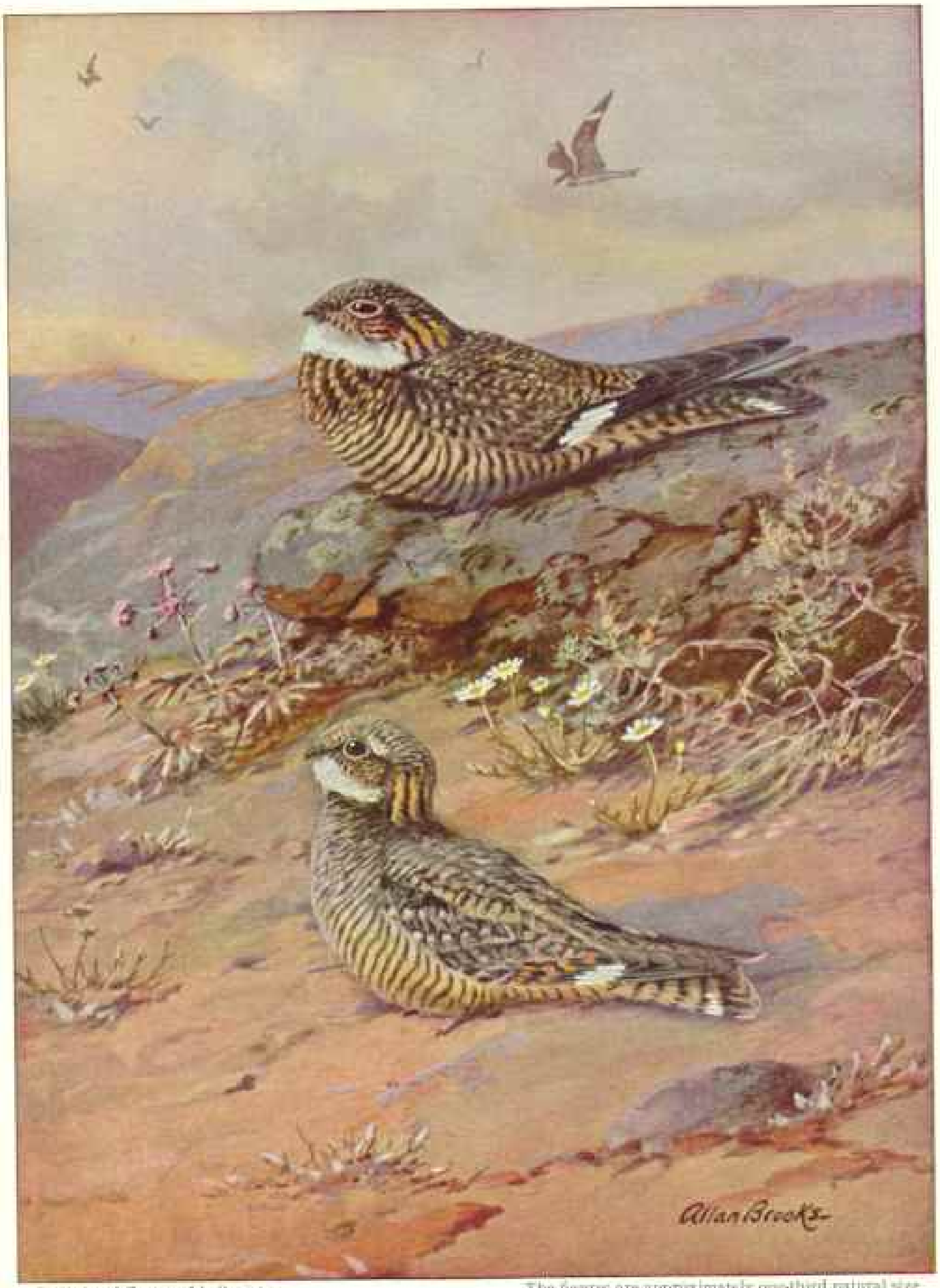
The Texas nighthawk in courtship indulges in display flights in which the birds pursue one another quickly, the males at times sailing with the wings held stiffly decurved at an angle below the level of the body. Their ordinary call is a mellow, rolling trill, given when the bird is on the ground or flying, that may be continued for many seconds. It utters a variety of whining, complaining notes in addition, but does not produce the booming sound peculiar to the courtship of its larger cousin.

The two eggs are laid on the open ground, without nesting material, ordinarily where there is not the slightest shelter from the blazing sun. The eggs are pale gray to light cream color, minutely marbled, and spotted with shades of gray and lilac, with a few bolder markings of slate and brown. Occasionally an egg is found with only a few very minute markings. All are paler-colored than in the other nighthawk.

Within a day or two after hatching, the young are able to crawl about and move from place to place over the nesting area, selecting sections of partial shade, where they get some protection from the sun. Both eggs and young are so closely similar to the ground on which they rest that they are not easily detected, being even difficult to see when their exact location is known.

It is reported that this species in some localities has begun to nest on the flat tops of low adobe houses, so that it is showing an adaptation to the encroachment of man in its haunts.

The true Texas nighthawk (*Chordeiles acutipennis texensis*) nests in the Lower Austral Zone from north central California, southern Utah, and central Texas south to about latitude 30° in Lower California, and to south central Mexico. It is found in winter casually in southwestern Arizona and regularly from central Mexico to Panama. A related race, the San Lucas nighthawk (*Chordeiles acutipennis inferior*), occurs in Lower California from about latitude 30° south. Another form is found in southern Mexico, Guatemala, and Honduras.






The figures are approximately one-third natural size

NIGHTHAWK
Male, above

TEXAS NIGHTHAWK
Male, below




The figures are approximately one-third natural size

NUTTALL'S POORWILL
Male, above

MERRILL'S PAURAQUE
Male, below

## POORWILL (Phalaenoptilus nuttalli)

Like the whippoorwill, the present species to most is a voice of the night, as the bird itself is seldom seen, its calls being the usual evidence of its presence. It is nocturnal in habit, resting by day in thick brush, in places where it is not easily disturbed. When flushed by chance, its dark form resembles that of a short-tailed whippoorwill, as with erratic flight it seeks some secure hiding place.

At times poorwills are found in growths of low forest, but they are more often encountered in regions where dense clumps of brush are scattered over otherwise open ground, as is common in desert and semiarid localities, or in brush-grown, rocky canyons, where the ground is rough and strewn with bowlders. They rest during the day on the ground, though after night, when feeding or calling, may seek higher perches on stones or posts or on low branches. On one occasion I saw one by bright moonlight calling from a bush, where it perched crosswise on a small limb, like any ordinary bird, though ordinarily they rest lengthwise of branches, like others of their family.

The call of this species resembles the syllables *poor-will poor-will, poor-will-low*, in imitation of which the bird is given its common name. Near at hand these calls are harsh, but with distance the first two assume a pleasant, somewhat melancholy cadence. The third, often omitted, is harsher and does not have the carrying power of the others. Occasionally, in the nesting season, one may be heard calling during the day.

The poorwill feeds on insects—beetles, moths, and various species of the locust group being favorites. When feeding, the birds at times course along the ground, and at times rest in open places, rising in short flights to seize passing insects in their capacious mouths, which are fringed with long bristles. They have been seen watching for insects attracted by electric lights, even seizing them as they fluttered against the globes. Hard portions of their food are ejected after digestion, in the form of pellets.

The eggs are placed on a patch of gravel, on flat rock exposures, or in slight hollows scratched in the bare earth, without other semblance of a nest. They may be in the open or under shelter of brush. Two eggs constitute a set. They vary considerably in color, ranging from white to cream, unmarked or with delicate purplish spots.

Both birds are said to assist in incubation. When disturbed about the nest, they tumble about and with widely opened mouths make a loud hissing sound terrifyingly like the hissing of a snake.

Four geographic races of the poorwill are recognized at present within the limits of the United States. Nuttall's poorwill (*Phalaenoptilus nuttalli nuttalli*) is found from southeastern British Columbia and North Dakota to eastern Kansas, southern Arizona, and eastern California. It winters from California and Texas to central Mexico. The dusky poorwill (*Phalaenoptilus nuttalli californicus*) is found in California west of the Sierra Nevada, south to northwestern Lower California. The desert poorwill (*Phalaenoptilus nuttalli hueyi*) occurs in the valley of the Lower Colorado River. The San Ignacio poorwill (*Phalaenoptilus nuttalli dickeyi*) ranges in Lower California south of latitude 30°.

## MERRILL'S PAURAQUE (Nyctidromus albicollis merrilli)

The present form is a nocturnal species belonging to a group of tropical distribution that barely crosses our border in the lower Rio Grande Valley. It is found in wooded areas in the winter months, frequenting dense thickets in the lowlands, and in the nesting season spreads to sections where the cover of shrubs and trees is more open. It rests during the day on the ground, or on low limbs, where it perches lengthwise of the branch, and is only flushed by chance, when it darts off with rapid, erratic flight to a more secure station. Though sensitive to light, it seems to fly easily and without difficulty, when frightened during the day.

The length of the tarsus, or lower part of the leg, and the strength of the toes in these birds is marked, compared with our other species. Seemingly this would indicate greater ability and ease of movement on the ground, though this is not fully understood, as the habits of the bird are imperfectly known.

The name pauraque, in early accounts of the bird erroneously written "parauque," is given in imitation of its call, according to the interpretation of these notes by the Mexicans who live near its haunts. The song is in three syllables and may be written *poo re lee*, uttered in loud, harsh tones and repeated steadily, as is usual among its relatives. In addition, it has an explosive note that resembles the call of a turkey.

The pauraque lives on insects that it captures in its large mouth on the wing, watching for its prey from a perch on the top of a bush, on a log, or from an open spot on the ground, and flying out quickly to seize those that pass. Not much is known of its food, except that it eats beetles of various kinds and moths. One naturalist records that he found the stomach of a pauraque filled with the beetles known as fireflies.

The nest is placed on the ground, among scattering bushes and cacti, at times at the borders of fields. The nesting season along the lower Rio Grande begins during the second week in April, reaches its height in May, and ends toward the close of June. It is possible that two broods may be reared each season.

The two eggs are placed on the bare ground, usually near a clump of bushes, with no attempt whatever at nest-building. The eggs differ from those of other species of this family found in the United States in color, varying from cream to deep buff, spotted and blotched with varying shades of brown and lilac. Their bold markings are quite distinctive. Occasional eggs are nearly plain, with a few markings that are so fine that they pass unnoticed except on close examination, but this is unusual. The adult is said to offer little objection when the nest is approached, sitting closely until it is forced to take wing, and then flying only a short distance before settling quietly on the ground.

Merrill's pauraque ranges from the Gulf coast of southern Texas and the lower Rio Grande Valley south into Tamaulipas. In winter it is found in Mexico south to Vera Cruz and Puebla. It is a geographic representative of a wide-ranging species that is distributed through tropical America to Brazil, dividing in this great area into five or more subspecies.

# THE PERAHERA PROCESSIONS OF CEYLON

By G. H. G. Burroughs

TO THINK so many would come so far to the shrine of a sacred tooth! And then, not having seen the tooth, go back quite satisfied!

To Kandy, the ancient hill capital of Ceylon, thousands of devout pilgrims of high and low degree journey annually in midsummer. The pilgrimage is inspired not so much by the hope of catching sight of the supposed two-and-a-half-inch right eyetooth of Buddha as by the wish to see the dramatic spectacle of the Perahera, at once fantastic and splendid.

The sacred relic is enshrined within the richly jeweled vault of the Dalada Maligawa, Temple of the Tooth.

"Well, here we are! We have come all the way from Kashmir to see this show and we won't be disappointed." Such was the greeting from one of my two American friends on the balcony of the Queen's Hotel at Kandy. It was a beautiful, clear night and there was a strange undercurrent of tense excitement about the place. Elephants went swinging up the roads, their bells tinkling, and the multicolored crowds in the town were visibly swelling from the endless stream of holiday-bent villagers.

"I am sure you will find the Perahera a wonderful and thrilling sight," I told my friends, for as an alien long resident in Ceylon I felt that I spoke with the voice of authority. Indeed, through my acquaintance with some of the Kandyan chiefs, I had learned many of the legends associated with the festival.

### ANNUAL CELEBRATION FOR SIXTEEN CENTURIES

There is a tradition that the Perahera processions have been held annually since the time when Buddha's Tooth was brought to Ceylon, hidden within the coils of the hair of a Kalinga princess, some eight hundred years after the death of the Hindu sage, about 483 B. C.

Despite the later wanderings and at times violent history of the Tooth—it was carried off to Goa, on the Indian mainland, in 1560 by the Portuguese, who maintain that the present relic is only a reproduction—the sacred festival has changed but little in barbaric splendor through the centuries.

To-day the Perahera also commemorates the birth of the God Vishnu, who first saw light on the day of the new moon in Esala (July-August).

Another version of the origin of the processions concerns the activities of a certain King Gajabahu, who is credited with having liberated 12,000 of his own people from foreign rule in India: then returned with them to his own domain, bringing in addition 12,000 captives and a number of sacred objects of which his kingdom had been despoiled 300 years previously. The celebration of this victory took the form of a great parade, which has been observed annually up to the present time.

### TEN NIGHTS OF CELEBRATION

The processions take place nightly over a period of 10 days, beginning with the first evening of the waxing moon in Esala. Each one has a special religious significance, but for the first five days the general public takes no active part. From the sixth evening on, everybody in town participates, even if only to carry a lamp or urge the dancers to further effort.

The wild and eerie effect depends largely upon the glowing torches and silvery light of a brilliant moon, for upon the "day" Perahera (only one procession takes place in daylight hours) the sunshine gives a garish touch to the glistening costumes. Perhaps the actors themselves feel the lack of spotlights and footlights which the stage of an eastern evening so amply provides.

My veranda overlooked the main street and provided an excellent point of vantage from which to see and to photograph the beginning of the day procession.

On the morning of the daylight procession my friends and I went first to the Temple of the Tooth, a small two-story structure, crumbling and ancient.

In a cool, dark room, upon a table of solid silver, is the golden, bell-shaped shrine, studded with jewels. Protected from all eyes except the sons of kings and other high personages to whom occasionally it is unveiled, the Tooth rests on a gold lotus-leaf mount. A wall of glass reaching from the ceiling to the floor



BEARING A KING'S RANSOM IN HIS GLITTERING TRAPPINGS, THE TEMPLE ELEPHANT BEGINS THE PERAHERA

His headpiece is covered with gold and jewels, his blanket is embroidered in gold and silver, and even his tusks are encased in golden sheaths. He is the focal point for all eyes in this festival, which takes place in Kandy every August. The elephant is the symbol of Ceylon and its carved image appears everywhere on the island, especially on temple walls (see, also, page 97).

© G. Burroughs

TOM-TOMS BEAT IN STACCATO TIME, PIPES AND CYMBALS SHRILL AND CRASH, ELEPHANT BELLS JANGLE, AND ONLOOKERS CHATTER TO INCREASE THE DIN

On moonlight nights, when all except one of the Perahera processions take place, a weird and ghostlike effect is produced by the thousands of torches whose red glow shines upon the rich accouterments of the elephants, the fluttering flags, and the gay and gilded costumes of the elegant headmen and frantic dancers.


© G. Burroughs

WHIRLING AND REVERSING, ADVANCING AND RETREATING, THESE MEN DANCE MADLY IN TIME TO THE QUICKENING BEAT OF TOM-TOM

The drummers and dancers twist and pirouette in snakelike file for a good twenty-five miles through the main streets of Kandy. The Perahera processions last for ten days, but it is not until the sixth night that the public participates, even if only to hold a brazier filled with flaming coconut husk or to yell and excite the dancers.



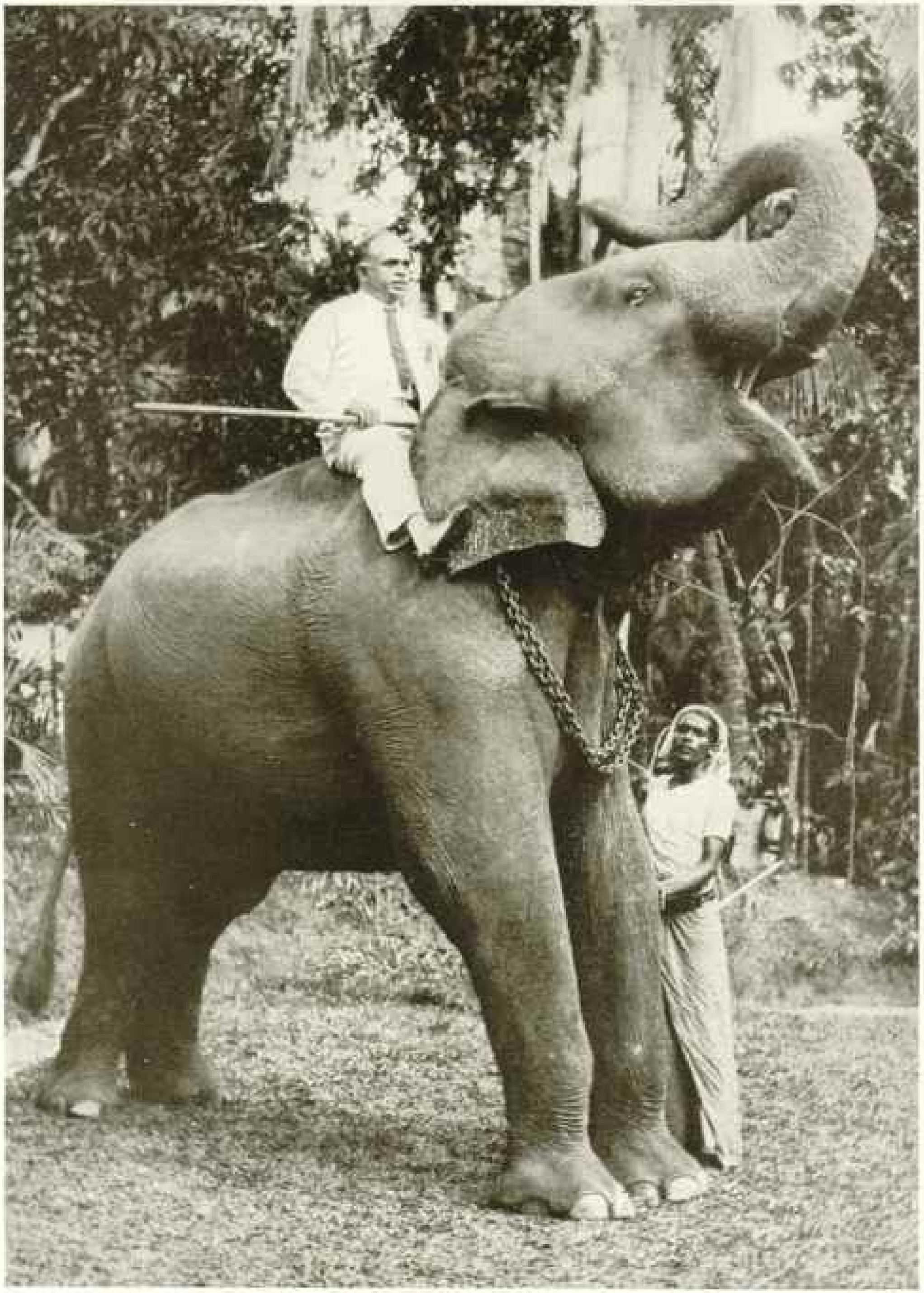
FRENZIED DANCERS PRECEDE THE KANDYAN CHIEFS, WHOSE GOLD-TRIMMED UMBRELLAS ARE A MARK OF DISTINCTION

When they appear in the Perahera processions, the headmen are gorgeously appareled. A scarf of 150 yards of fine silk, draped from the shoulders and tapering to the ankles, is caught at the waist by a wide gold-embroidered belt which is studded with jewels. Over this is worn a jacket of bright brocade whose full sleeves are fastened at the wrist. The peculiar hats, worn sidewise, are flecked with many precious stones that scintillate in the reddish glow of the spectators' many torches or in the bright glare of a hot August sun, as in the case of this "day" Perahera.

© G. Burroughs

KANDYAN DANCERS PERFORM THEIR INTRICATE ACTS WITHIN THE PRECINCTS OF THE TEMPLE OF THE TOOTH

Hats, earpieces, and waist belts are of shining silver, the beads on the chest and around the neck are red, white, and blue, and the bracelets and shoulder guards are yellow brass. These particular artists receive no pay for their services, but the temple rewards them with grants of land. Many of the performers have excellent voices and some have toured Europe and America as exponents of Ceylonese acting.



© G. Burroughs

TEMPLE ELEPHANTS ARE NOT ALL AS DOCILE AS THIS PONDEROUS ANIMAL

Once in a while an elephant runs amuck while in procession and kills his keeper or tramples an onlooker. On the back of this huge beast, whose upward stretching of the head accentuates his powerful leg and shoulder muscles, rides one of the Kandyan chiefs in European dress.

© Lionel Green

SUPPLIANTS FOR ALMS OUTSIDE THE TEMPLE, IN CONTRAST TO THE RICHES WITHIN

Unbelievable treasures are stored in the inner room of the Sanctuary of the Tooth, guarded by silver doors set in beaten gold and silver and carved ivory frames. The silver floor, solid silver table, many huge jewels and golden plates dazzle the eyes of visitors.

© G. Burroughs

THE PERAHERA SUGGESTS AN AMERICAN CIRCUS PARADE, BUT WITH THIS DIFFERENCE—THE AUDIENCE ALSO IS IN BRIGHT COSTUME

Many of the trappings and regalia worn by circus performers and parading elephants under the "Big Top" originated in India. The stately elephant in the center, who has been fattened and cared for until he is the largest of his kind in Ceylon, is the main attraction of the ceremony. The narrow white rug in the foreground is for the stately animal's special use. Often he becomes so disdainful that he will not advance unless the white strip has been placed in front of him.

shields the sacred relic and many other jewels and treasures. Over the shrine stands a glittering silver peacock, from whose tail hangs the scintillating emerald of Kandy, known the world over for its size and luster.*

As we returned, hot but enthusiastic, to my cool veranda, we heard the boom of a gun, heralding the start of the magnificent procession from the Temple.

Back! Back, everybody! A clear road for His Highness the Temple Elephant and for the troupes of whirling dancers yet to come!

Hark! The whip-crackers, who in earlier days cleared the street with their snapping thongs, herald the approach.

We, too, catch the spirit of infectious excitement that prevails when the crowd takes up the shouting, which swells to a roar as the Perahera at last comes into view.

Nearer and nearer draw the elephants. They stop, but the halt is short, and on they come again.

CYMBALS AND DRUMS PROVIDE RHYTHM FOR FRANTIC DANCERS

So tense is the excitement when the head of the column draws near that we almost forget to snap our cameras and press the trigger of the "movie" machine. What a sight lies before us! Thousands upon thousands of brightly clad Ceylonese from all over the island, interspersed with many foreign visitors armed with all kinds of cameras, straining and leaning forward to see the procession.

The staccato beat of many drums reaches the ears and the gorgeous Temple elephant and his two flanking companions come into view (see page 98). Then the first of the frantic dancers weaves in and out, with rhythmic step, to the beat of drums and clash of cymbals.

It requires three-quarters of an hour for the richly caparisoned elephants, the glittering groups of dancers and dignified chiefs in gorgeous robes to pass in front of our private reviewing stand, my veranda.

Every now and then the procession stops. At such times the music becomes faster and faster. Drummers, beating madly, leap into the air and pirouette in a frenzy of excitement (see illustration, page 100). Trumpeters blow shrilly, adding to the ear-splitting din. Tirelessly whirl the dancers, stamping their feet, waving their arms, advancing and retiring, as they spin to the ever-quickening rhythm. Rarely, even in the East, does one see such utter abandon to the accompaniment of such clamor.

The participants in the ceremony cover many miles in their gyrations during the course of the Perahera, and at the end are in a state of complete exhaustion. There are no women dancers.

To convey some conception of the brilliant colors of this kaleidoscope of swaying elephants and wild dancers requires the services of an artist rather than a writer. A particularly large and specially bedecked elephant, with gold and silver howdah, not disdaining the use of science in its decorations, has a bright electric eye in the center of his forehead! Another in cloth of royal blue, heavily embroidered with silver, carries on his back a king's ransom in jewelry.

There was a time when the King of Kandy took part in the annual processions. Surrounded by his chiefs in resplendent costumes, it is easy to imagine his progress through excited throngs of loyal subjects. To-day the King is gone, but the chiefs remain to carry on the tradition. Perhaps some of the chiefs would gladly discontinue the practice of appearing in the processions, but the simple countryman expects to see his lord in all the glory of jewels and cloth of gold. He makes the journey to Kandy only once a year, and on that day wants to see the parades as his father saw them.

Having taken many photographs from our veranda, we went to the Temple Square, bordering Kandy's beautiful artificial lake, where the two sections of the day Perahera eventually meet and circle the greensward three times. With the aid of willing helpers, we managed to set up a large table on the fringe of the crowd, which took a keen interest in our batteries of cameras.

But it is at night that the Perahera takes on all the glamour and weirdness of oriental pageantry.

A beautiful, clear night, with a full moon and myriads of stars overhead, makes a

* See "Ceylon—Adam's Second Eden," by Eliza R. Scidmore, in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1912.

Photograph by Pilate, Ltd.

A MOMENT OF RELIGIOUS FRENZY DURING A PROCESSION OF THE HOLY TOOTH

The leading elephant, richly caparisoned and flanked by two other members of the temple herd, is preceded by frantic dancers and their drummers.

perfect setting for the flowing stream of lights and gyrating human beings. Smoking censers swing from hand to hand and braziers, in which glow husks of burning coconuts, are held aloft by hundreds of torchbearers to augment the street lamps in casting a fairylike spell over the scintillating costumes and shining brown bodies of the marchers.

The coconut husks burn with a fitful yellow-red light and emit acrid fumes, too pungent for occidental tastes, but they have illuminated Perahera parades for centuries and still serve that purpose well. It is an incongruous sight, amid such pomp and circumstance, to observe quantities of coconut husks being rushed along in modern jinrikishas to keep the braziers constantly supplied with fuel.

At the end of the procession come the water-carriers bearing palanquins of sacred water taken the year before from the Mahaweli Ganga, one of Ceylon's largest rivers, which flows through Kandy. This ceremony of the "water-cutting," when Temple priests slash the surface with their swords and attendants scoop up the water in golden pitchers, is the closing event of the Perahera.

Behind the palanquins press masses of humanity, which stretch as far as the eye can see, completely filling the streets. Orderly, patient, and cheerful is this vast multitude, as it beholds the final ritual.

# THE FEUDAL ISLE OF SARK

## Where Sixteenth-Century Laws Are Still Observed

By Sibyl Hathaway
(La Dame de Serk)

IT IS strange to find, in these days of change and unrest, a land where time has, to a large extent, stood still; yet, within a few hours' journey of London or Paris, there remains a miniature feudal State, the island of Sark, the only purely feudal State remaining in the world.

Situated in the English Channel, it is the fourth largest of the Channel Islands,* and lies 70 miles south of England and 22 miles from the coast of France. It is three and a half miles long and one and a half miles wide; and yet, because of its numerous bays and coves, it has 35 miles of coast. It is the highest land in the Channel Islands, as the base of my windmill, built in 1571, is 365 feet above sea level (see page 112).

The cliffs, rising on all sides almost perpendicularly, are covered with innumerable varieties of rock plants and flowers, while below are sandy bays and wonderful caves, whose sea-hewn walls are covered with seaweeds and sea anemones of every color of the rainbow. On the beaches may be found semiprecious stones, such as amethysts, cat's-eyes, and moonstones. And we are not without minerals; at one time mines were worked which produced copper, silver, antimony, and galena.

The interior of the island is undulating, with valleys full of wild flowers, and in the spring the whole is covered with a blaze of golden gorse, blue bells, and primroses. No venomous beast lives in Sark, not even a toad!

### A TUNNEL FROM HARBOR TO ISLAND

On landing at our harbor, which is one of the smallest in the world, the visitor finds himself entirely surrounded by steep cliffs, and the only means of access to the island from here is by a road passing through a tunnel 200 feet long, pierced in the cliff, and thence by a steep, winding road which leads to the center of the island, where there are a few small shops and four hotels.

The highway continues to La Coupée, where the island is divided into two parts, Great Sark and Little Sark, joined by a huge natural causeway of rock nearly 300 feet high and 415 feet long, across which runs a road just wide enough for one cart and horse to cross at a time. On one side of this causeway is a sheer cliff; on the other a sloping way down to beautiful sands.

In spite of its minute size, Sark has a history of no little interest, as its written records begin in A. D. 565, and there is ample evidence of occupation in the Stone Age. In the sixth century Saint Magloire, Bishop of Dol, in Brittany, established a monastery here, the ruins of which, including an old wall and two chapels, stand just beside my own house. Here an order of 62 monks flourished until 1412, when they were withdrawn to the Abbey of Montebourg, in France (see page 116).

Years rolled on and Sark became the haunt of pirates, said to be from Scotland, who were a constant menace to shipping in the Channel and against whom expeditions from England were sent out. The island was cleared of their presence, but ruin was left in their wake. It was occupied by the French some time early in the sixteenth century, and it was wrested from them by a ruse, the details of which were recorded by Sir Walter Raleigh himself, who was Governor of Jersey some fifty years later, as follows:

A Flemish vessel arrived off the coast, and the sailors pretended that their captain was dead and asked leave to bring his body ashore for burial. On permission being granted, they carried the coffin up the hill to the little old church of Saint Magloire, and there, closing the door, they opened the coffin, which was full of arms, turned on the French garrison and surprised them, killing some and taking the rest prisoners.

### "THE ISLAND OF THE FORTY"

Soon after this the island was again deserted, until from the island of Jersey arose the man who was finally to establish the future constitution of Sark. This was Sir Helier de Carteret, the fifty-eighth seigneur

* See "The Channel Islands," by Edith Carey, in the National Geographic Magazine for August, 1920.

Photograph by Wide World

A ONE-WAY ROAD LEADS ACROSS THE COUPÉE, THE ISTHMUS CONNECTING GREAT AND LITTLE SARK

This trail, 415 feet long and six to eight wide, is 260 feet above the sea. The rushing waves of the English Channel will one day separate the two parts of the island. In stormy weather high winds blow spray over the ridge and make passage dangerous for pedestrians.

Photograph by Wide World

AT LOW TIDE THE HARBOR IS DRY AND SARK IS SHUT OFF FROM THE WORLD

Queen Elizabeth's 40 musketmen (see text, page 104) could have held the island against an army; for ships can land passengers only when the sea comes in, and even after reaching the shore invaders would have to penetrate to the interior by way of a 200-foot tunnel (left background) through a well-nigh unscalable cliff. What a scene for a Norman hero like Roman Horatius!


Drawn by A. H. Bomstead

SARK, ONE OF THE SMALLEST OF THE CHANNEL ISLANDS, EPITOMIZES THE BEAUTY OF ALL

The island is only three and a half miles long and a mile and a half wide. In summer it is reached by a daily steamer from St. Pierre, island of Guernsey. There are no villages on Sark.

of Saint-Ouen, in Jersey, to whom, in 1565, Queen Elizabeth granted the island conditionally by letters patent under the great seal of England.

This royal grant gave to Sir Helier and his successors almost unlimited powers on condition that he colonize the island with forty families, to each of whom he allotted a portion of the land to farm. Each man was equipped with a musket for the defense of the island; so that to this day it is often spoken of as "the island of the forty," and even now, when a farm changes hands, it is still cited as one of the conditions of the deed of conveyance that a man with a musket shall be kept on the farm.

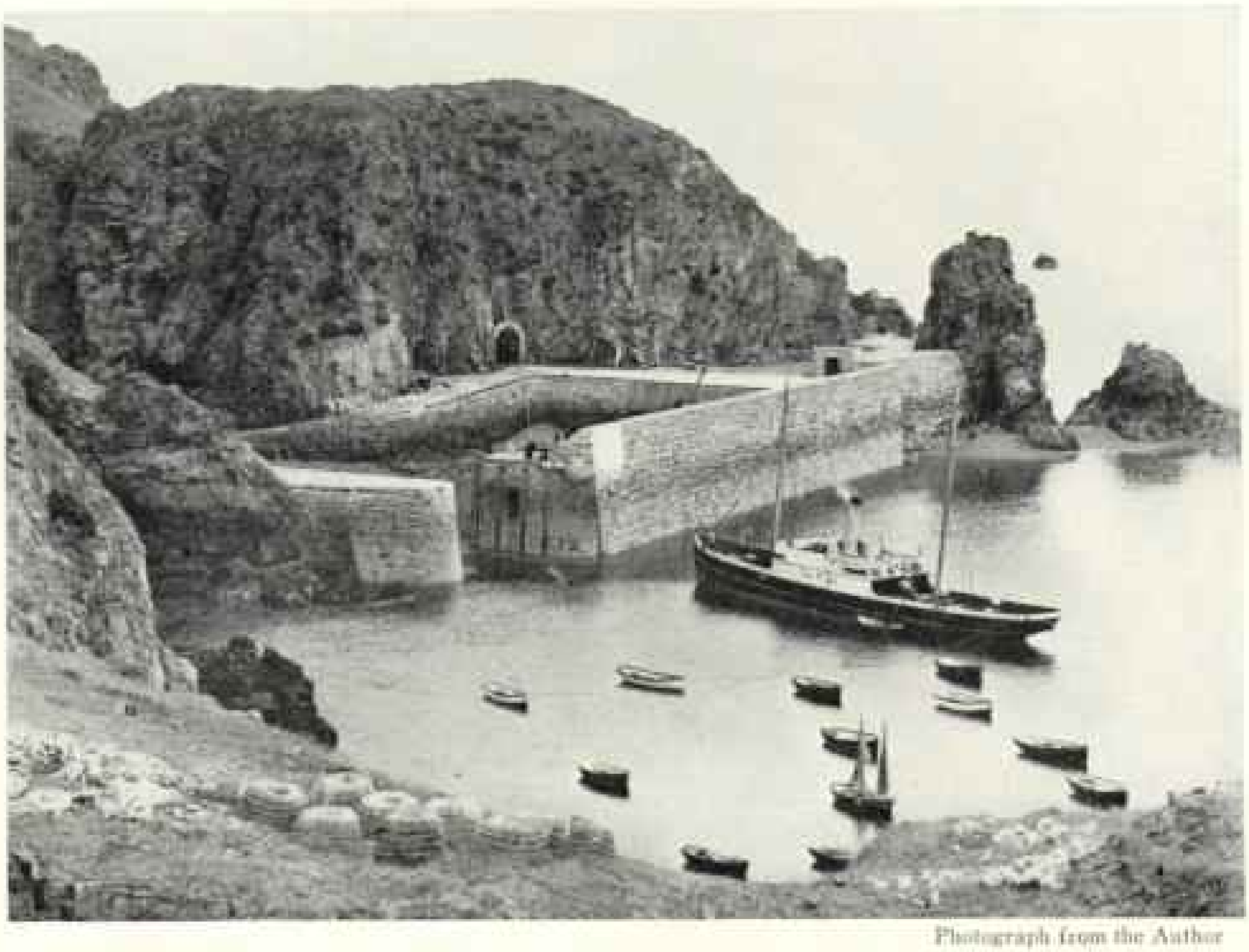
Though the DeCarteret family still owns the Manor of Saint-Ouen, in Jersey, Sark passed out of its hands when, in 1732, it was sold, with all its rights and privileges, and eventually came to my great-grandmother in 1852.

For many years an artillery militia was maintained, consisting of about one hundred men, of which my grandfather was the last colonel; but now all that remains are a few old cannon, lying disused and half hidden in bracken and gorse on the cliffs, while in the grounds of my house is a fine old bronze cannon which was presented to the first Seigneur of Sark in 1572 by Queen Elizabeth, and bears an inscription to that effect.

My house, or "Seigneurie," lies in a sheltered part of the island and, like all the old houses, is built of gray granite. The original or main part of the house, dating from 1565, stands on the site of the old monastery, and no doubt many of the stones used to build it were taken from the ruins. The fireplace in the hall bears the date 1675 and the sundial on the outside 1685. The gardens are opened to the general public, free of any charge, every Monday.

Great privileges are always accompanied by grave responsibilities; so that our home may be described as the clearing house of all island controversy. It is open at any time to any inhabitant of the island who wishes to see me for any reason, and I sometimes long for the leisure of the "tired business man" when often both sides of a difficulty are brought to me for final judgment. Discussions take place on subjects which range from whether bathers shall wear beach pajamas to whether the Chief Pleas shall pass a measure to deal with the prevention of infectious diseases among our cattle.

Here I should explain that our Parliament is called the Chief Pleas, and it sits three times a year unless called by me in an emergency. Over this Parliament my husband, the Seigneur, and I preside, the members being the forty holders of the farms



Photograph from the Author

THE GUERNSEY STEAMER AWAITS HIGH TIDE TO ENTER THE HARBOR

At the far corner of the walled haven is the seaward end of the cliff tunnel (see page 103), and on the shore, in the foreground, are some of the lobster pots used by Sark fishermen.

Photograph by Mrs. Malet de Carteret

FROM THE LANDWARD END, SARK TUNNEL AFFORDS A GLIMPSE OF THE SEA

Heller de Carteret, first Seigneur, had this gateway to his snug island domain cut through solid rock in the time of Queen Elizabeth. Forty families were his retainers, and among them he parceled out the land in farms averaging 15 acres.

Photograph by T. Singleton

BESIDE A QUIET WAY AN OLD COVERED WELL INVITES TO A COOL DRAFT

Sark remains one spot on earth where the gardener may wheel her barrow in the highway unmolested by careering motorists (see text, page 109). Here the charm of the graceful days of old remains.

Photograph by Wide World

GOOD QUEEN BESS GAVE THESE BRONZE CANNON TO SARK

In 1572 they were presented to the first Seigneur for use against sea rovers who menaced Channel shipping (see text, page 104).

Photograph from the Author

HERE THE ANGLICAN SERVICE IS READ IN FRENCH

Though the islanders speak English, the official language is that of Normandy (see text, page 109). This building was erected in 1820.

Photograph by Wide World

THE CIDER PRESS DATES FROM 1600

Even in the days of Helier de Carteret, the feudal estate produced everything needed for the comfort and pleasure of its owners. Towering above the wall is the old pigeon cote, the only one permitted on Sark (see text, opposite page).

allotted originally in 1565, plus twelve deputies elected among the rest of the inhabitants, who now number 675.

### TO SUBJECTS OF SARK, KING GEORGE IS THE DUKE OF NORMANDY

Here we make all our own laws and regulations, and are subject to no imperial taxation at all, and only to such special legislation as may be enacted by order of His Majesty the King in Council.

To us the King of England is our feudal Lord the Duke of Normandy, and he has no more loyal and devoted subjects than we, who have from time immemorial been part of the Duchy of Normandy, whose Duke, William the Conqueror, invaded and took England and was thereafter recognized as King of England, but to us has always remained Duke of Normandy.

In point of fact, the Channel Islands were never part of England, but part and parcel of the Duchy of Normandy, and as such, no doubt, took part in the conquest of England.

We are the smallest self-governing part of the British Empire and the only part which has no public debt; in fact, we have a substantial credit balance: for, though we have no income tax and only a very small tax on property, this, in conjunction with our income from the landing tax of one shilling per passenger and the revenue from a small tax on alcoholic beverages and tobacco, is sufficient adequately to balance our budget. But then, you see, we are almost self-supporting, have no unemployment, and best of all no politicians!

The language of the island officially is French, though everyone speaks English, which is taught equally with French in the schools, so that everyone is bilingual. Among ourselves we always speak our own "patois," which is a survival of the old Norman French as spoken at the time of the Conquest. It is never written and cannot be understood by anyone not brought up in its midst.

We have a boys' and a girls' school, in regard to which it is interesting to note that we were the first part of the British Empire to adopt compulsory education. I inspect both schools at examination time and ask the children questions in French and English and satisfy myself as to their general mental progress.

We have passed a law against the importation of motor cars, and this will be strictly enforced so long as I am Dame de Serk, for I believe there should be one spot left on earth where modern transportation can be forgotten and where peace and quiet are undisturbed. I also refuse to allow the importation of any female dog, the ownership of such, except by the Seigneur, being forbidden under an old custom upheld by law for centuries. It is also the old right of the Seigneur alone to keep pigeons—an excellent law, as in this way their number is controlled and damage to crops is minimized. The large stone pigeon cote is an essential part of any feudal seigneurie.

It is also a seigneurial privilege that none but he may grind corn or build a mill, and although the old windmill is now no longer used, I still grind all corn brought to the Seigneurie, by the more modern methods of motor and machine, charging each farmer a small fee for grinding.

While the Chief Pleas, or Parliament, is held only in the presence of my husband and myself, there is a court of justice presided over by the seneschal, an officer appointed by me for a term of three years, who has power to inflict fines and imprisonment. We have our own jail, though it is hardly ever used, the inhabitants preferring to settle their differences out of court. I remember hearing how in my grandfather's time it was once used when a young servant maid had stolen some clothes from her mistress. When the culprit was put in jail, she wept so bitterly that the authorities relented and allowed the door to be opened, so that her friends and relatives might come and sit on the step with their knitting and comfort her! (See page 115.)

The secret of our immunity from crime is, no doubt, the impossibility of escape from the island after an offense has been committed. Our constable serves for one year. He is elected by the Chief Pleas and cannot refuse to serve. By this system almost every able-bodied man at some time will take his turn as constable, which is a splendid means of diffusing knowledge of the law throughout the island. There is also a clerk of the court, a sheriff, and a treasurer.

### THE SEIGNEUR COLLECTS TITHES

All cereals grown in Sark are subject to seigneurial tithes, and no man may harvest his crops until these tithes, called "dimes," have been collected. The farmer has to

© Photochrom Co.

LASHING WAVES HAVE HEWN LES AUTELETS FROM SOLID ROCK

Little imagination is required to picture these "altars" peopled in times of storm by ancient sea gods at their play.

Photograph by Wide World

THE DAME AND SEIGNEUR FEED THEIR PIGEONS NEAR AN OLD CHAPEL

Only the feudal lord may raise these birds (see text, page 109). The first church on Sark was built in 1576 by Helier de Carteret.

Photograph by Wide World

CENTURIES HAVE MELLOWED THE CHARM OF THE GARDEN

Everywhere on the island is a wealth of wild bloom—hyacinths and primroses smiling in dells and valleys, furze blossoms and marguerites blanketing grassy slopes, heather and gorse mantling the cliffs. Here the fuchsia flourishes throughout the year and the rarest plants grow with the rankness of weeds.

notify the Seigneur 48 hours before he intends carting, so that some one may be sent to the fields to see that every tenth sheaf is set aside for the Seigneur, who also has a tithe of cider, lambs, wool, and a royalty on all minerals. Each of the forty pays a yearly tithe or ground rent on his property, and the old chimney tax, or *poulage*, as it is called, is still in force, paid in live chickens every year to the Seigneur.

By a law passed about 1735, modeled on the old French *corvée*, every man above the age of sixteen must give two days' labor every year toward the repair of the roads, or pay for a substitute, and every owner of a horse and cart must send the same for two days' cartage.

### NO LAND MAY BE LEFT BY WILL

The greatest and most important right belonging to the Seigneur is the right of succession; that is, to him reverts the absolute possession of any property to which there is no heir within the fifth degree of affinity, as no land may be left by will.

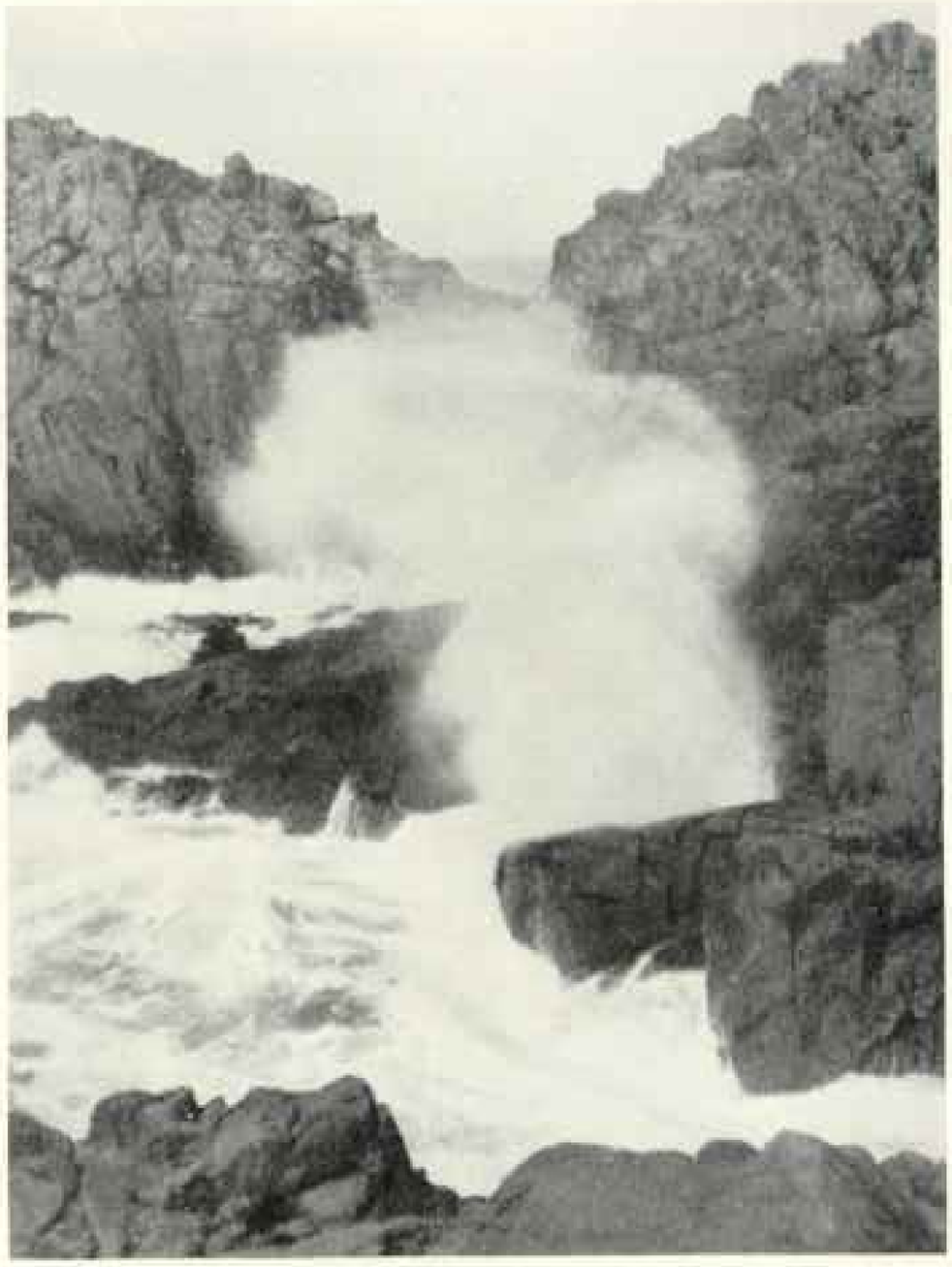
With regard to the regulations for the sale of land in Sark at the present day, the laws of the old Norman fiefs still exist to a great extent. Before a property can change hands, the prospective purchaser must obtain the Seigneur's permission to acquire the property and must pay him the thirteenth of the sum agreed upon to be paid for the property.

No landowner may sell a part or parcel of his holding, as the original charter of 1565 provided that "a man may not break up or sell in portions or divide in any way whatsoever his inheritance." This proviso is strictly adhered to, thus insuring that each of the original forty farms remains intact.

There are the usual closed seasons for birds, but in the case of sea gulls the law

SARK GRAIN WAS GROUND HERE IN THE 16TH CENTURY

Helier de Carteret, first Seigneur by grace of Queen Elizabeth, built the mill in 1571. It stands on the highest point in the Channel Islands, its base 365 feet above the sea (see text, page 101).



SARK FLINGS BACK THE ANGRY SEA

Always rugged, the rocky coast becomes awe-inspiring in rough weather, when a *souffleur* (blower) often tosses waves and spray 100 feet or more in the air.

Photographs from the Author

Photograph by Wide World

LIKE THE LAWS OF SARK, THE ARCHITECTURE OF LA SEIGNEURIE IS NORMAN

The center block of the Manor House, with chimneys provided with benchlike "witches' stones" at their bases (see text, page 119), was built in 1565. The wings are of later construction. This is the only feudal castle in the world which maintains the state it knew in Elizabethan days.


Photograph by Wide World

A FIREPLACE 257 YEARS OLD

Though most of the house is modern, a part of it, dating from 1565, contains stones from the ancient monastery established by Saint Magloire in the sixth century (see text, page 101).

ordains that they shall not be killed at any time under a penalty, the reason being that during time of fog these birds fly round the rocks and by their loud cries warn the fishermen of danger.

It will be seen that all these laws and customs make Sark unique, and we endeavor to do all in our power to retain this originality, to keep our organization and old constitution, and to continue to maintain the independence and traditions which even in 1932 make us a living and flourishing example of a feudal State of the sixteenth century. Our peaceful prosperity should prove to all who advocate modern methods of government that our ancient system has a great deal to recommend it.

The age of machinery has not really begun in Sark. True, we have motor boats and radio sets to enliven our winter evenings, but the island is not for those who require jazz bands and motion-picture houses. After 5 o'clock any afternoon, when the little daily steamer has returned to Guernsey, six miles away, peace reigns in Sark, and all you will meet on the roads are a few people wandering home. And I literally mean wandering, for there is nothing more dangerous to meet around a corner than a farm cart or a weary horse and trap plodding home. The lovely, soft summer night closes in with its balmy air off the sea.

But we must not forget the winter, when great Atlantic storms lash the coast, and the little steamer vainly tries to make the harbor, only to be forced to anchor finally in some sheltered bay and land her cargo and mail bags on the beach by launching a small boat.

During the World War forty young men left to serve in the fighting forces. Of these seventeen lost their lives. But even so, there are now nearly as many men as women on the island.

Many women help to work on the land and tend our wonderful cattle, every one

Photograph from Wide World

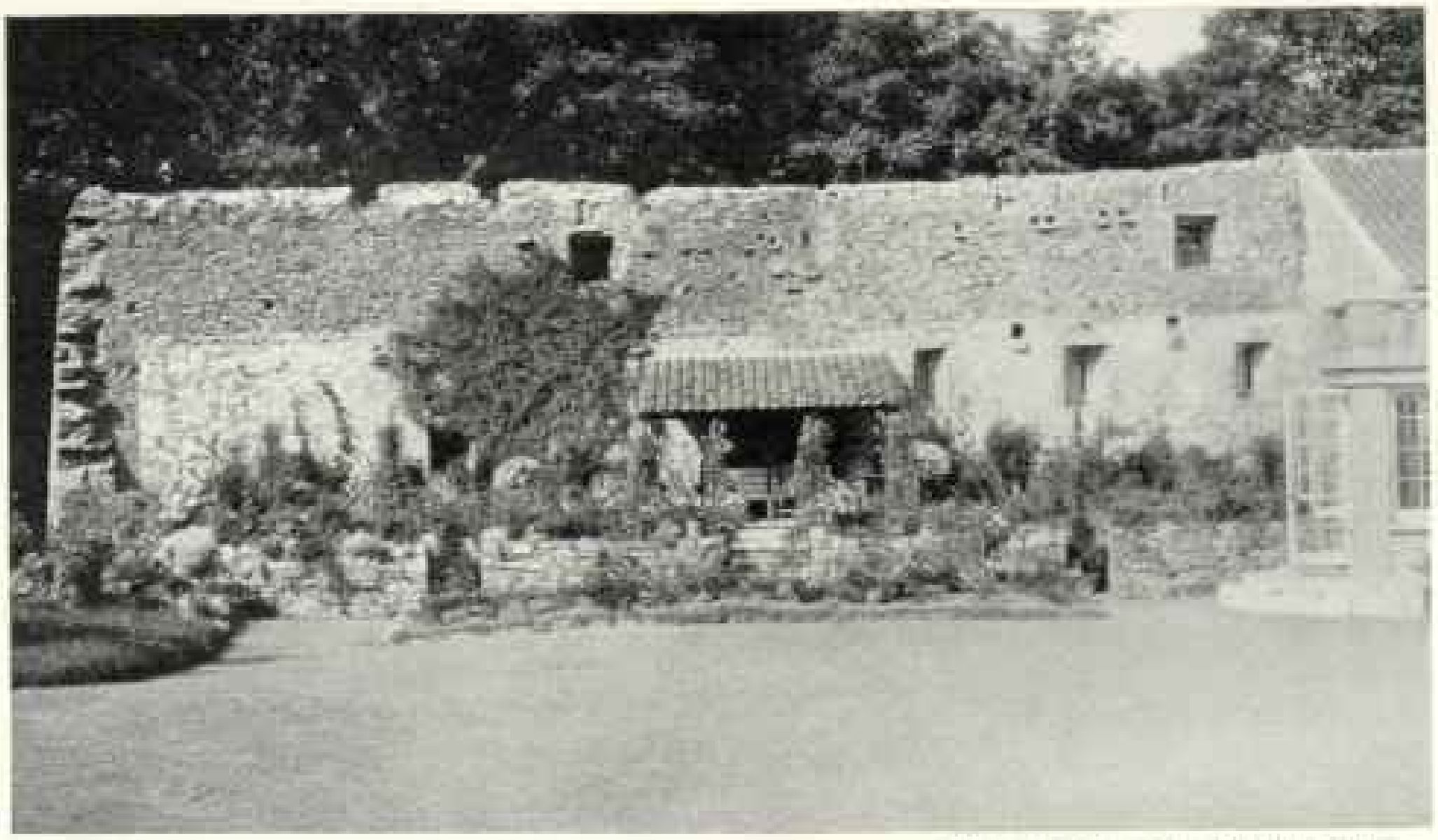
HOMES ARE BUILT OF GRANITE QUARRIED ON THE ISLAND

Placed on the farms on sites dictated by the tenants' fancy, they are simple and comfortable and somehow in perfect keeping with the landscape.

Photograph by Wide World

RUST HAS CLAIMED THE LOCK ON THE JAIL DOOR

Offenses against the law are virtually unknown in Sark, and the bread-loaf prison with its two cells is seldom used (see text, page 109).



Photograph from Mrs. Sibyl Hathaway

PART OF SAINT MAGLOIRE'S SIXTH-CENTURY MONASTERY STILL STANDS

And no wonder, for the wall, built without cement, is eleven feet thick at the base and tapers to one and a half feet at the top (see text, page 101).

Photograph from Edith Carey

THE ISLE HAS MANY IDYLLIC NOOKS

Roads and paths are not straight, but wind here and there, with delightful surprises at each turn.

Photograph from Wide World

HERE RISES NO TOWN—ONLY A POST OFFICE WITH A FEW HOUSES NEAR BY

There are, besides the farm cottages, a church, a chapel, the Seigneurie, and four hotels. In one of these last, the *Dixcart*, Swinburne wrote his "Ballad of Sark."

of which is a pedigree animal. They are all kept tethered in the fields to economize the pasture, and are most friendly and love to be petted. The farmers are all very courteous and hospitable and allow visitors to roam over their land and wander about the beautiful cliffs. Half the male population are farmers and the remainder are fishermen. All are able to make a satisfactory living out of their chosen occupations.

### A FORMER AMERICAN IS NOW LORD OF THE ISLAND

It may be of interest to American readers to know that my husband, Robert Woodward Hathaway, was born in New Jersey, was graduated from Yale University, served in the British Royal Flying Corps during the World War; then settled in business in London and became a naturalized British subject. This last fact is of material importance to me, for Sark can be held only by a British subject.

Under our old feudal laws my husband owns everything that I possessed before my marriage, and this applies to the lordship of the island. Thus he becomes Seigneur of Sark. Though we have no married woman's property act here, the wife's estate and property are very well protected, because her husband cannot sell or dispose of her property without her consent, and even if the estate is actually the husband's own property, his wife can claim a dower on it in the event of his selling it. In fact, she can legally insist on keeping a third of all the rooms in the house for her own use; also, a third of the stables, gardens, fields, and fruit lands. So you see she is well protected.

On the sale of an estate the wife is usually asked to waive her rights, and in some cases she agrees to take a fixed sum, paid into court or paid to her annually, in return for which she will agree not to claim her actual share of the property.

Thus it will be seen that, though the wife cannot actually prevent the sale of her estate, she can, by refusing to waive her dower and by taking the share of the house to which she is legally entitled,

Photograph from the Author

WHEN GALES RENDER ITS HARBOR UNSAFE, SMALL BOATS FIND SHELTER IN TINY COVES

Sark has a precipitous coast, but is indented with numerous protected bays such as this one, Port-es-sees.

make the property a decidedly undesirable purchase.

A divorce cannot be obtained by any couple living in the Channel Islands; so that the utmost the law can do for unhappy marriages is to grant a legal deed of separation. A minor comes of age at twenty, but majority can be postponed for a year should the child have incurred the displeasure of the court.

### THE "CLAMEUR DE HARO"

Perhaps the oldest and most interesting of the feudal laws and customs of the old Duchy of Normandy which is still in force in Sark is the *Clameur de Haro*. Formerly if a person were assaulted or any trespass committed on his property, he thrice repeated the word *Haro*, and all who heard it were bound to come to his assistance. Nowadays the procedure is as follows: The injured person, after having commenced by kneeling and saying aloud the Lord's Prayer, rises and calls aloud, "*Haro, Haro, Haro! A mon aide, mon Prince, on me fait tort*" (To my aid, Prince, some one does me wrong).

The matter is then deferred for the decision of the law, and no further action can be taken until the plea has been heard in court. A *Clameur de Haro* was actually raised at the burial of William the Conqueror, in Caen, in 1087.

In any community that has been isolated from the latest developments of science for a great many years, it will invariably be found that superstitions persist to a marked degree and play no little part in the lives of the people. I have here in Sark seen many things done for which I can offer no explanation, and as the following incident is my own personal experience, it may be of interest to both believers and disbelievers in witchcraft.

Some years ago I had a valuable cow to which some accident was always hap-

pening, such as nearly choking to death or suddenly going lame, or developing a swollen hock, for no apparent reason. I may say that no one had access to her who could in any way wish to harm her.

At last one day, on going to the stable, I found a piece of white knitting wool tied around her leg, which my cowman told me I must on no account remove, as the cow had certainly been bewitched, and he had got some one with power to unbewitch to come in and take off the evil spell. The cow must wear the piece of wool to keep off the evil eye. She has had nothing wrong with her since and is still in my herd.

I have no comment to make upon all this except the important fact that I still have the cow.

A still more personal charm was exercised on behalf of my daughter, who, when a child, developed a crowd of small warts on her face. I was greatly worried, and two different doctors prescribed various treatments, which were of no use at all. Finally, in desperation, I sent her to an old man who was reputed to be successful in charming away warts. This he actually did and refused any payment for doing so. Again I have no explanation, but the warts disappeared, which to me is the important part of the story.

### GHOSTS AND LEGENDS

With regard to this subject of witchcraft, it is interesting to note that all the ancient houses have wide stone ledges projecting from the base of the chimneys just above the roof. These are for the witches to rest on, so that they will not come down the chimneys into the house. I am glad to say that the Seigneurie has no less than four of these stones, and so effective are they that not a single witch has come down the chimneys within living memory!

Of ghosts there are many stories. There is said to be one of a lady wearing high-heeled shoes, who can be heard tap-tapping down the staircase in the old part of this house whenever one of the family is about to die. My grandmother's maid vowed she had seen her not long before my grandfather died.

There is also said to be a ghost on horseback, headless, who dashes across the coupée, and a legend that any person daring to draw water from a well at midnight on Christmas Eve will hear a voice calling him by name, and he will die before the year is out.

It is related that when this superstition was put to the test many years ago, the bold man who wished to prove its truth or falsity became so elated at the thought of his bravery that he drank far too much brandy before the exact moment arrived, so that when he got to the well he fell into it and was drowned—which certainly proved the story as far as he was concerned, though he was unable to leave any record of whether he heard the "voice" or not!

In the Eve of St. John it was said that at midnight all the cattle would be found on their knees, and that they were gifted at that moment with the power of human speech. On the same day there used to be a very charming custom, always observed, of driving about the island in decorated carriages and carts. This practice having fallen somewhat into desuetude, we have recently tried to revive it by holding a horse parade on that day and at the same time offering prizes for the best decorated conveyance.

I would like to conclude this account of my island and its interests by assuring my readers that my husband and I are determined to do all we can to maintain its ancient traditions and the laws and customs which have made Sark what it is in this hustling twentieth century—a little feudal paradise of peace and quiet, where "the wicked cease from troubling and the weary are at rest."

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*Notice of change of address of your* NATIONAL GEOGRAPHIC MAGAZINE *should be received in the office of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your September number, The Society should be notified of your new address not later than August first.*

DRINKING FROM A DISMAL SWAMP BEAR "WELL"

Instead of walking miles to lake or stream when he is thirsty, the swamp's black bear digs a "well" down to the water level—in dry seasons several feet.

Photographs by H. W. Gillen

A GOOD PORT IN ANY STORM

Caught in a high wind in the forest or overtaken by darkness on starless nights, the swamp man crawls into a log for safety or to sleep. "We always 'pudge' around first to rout out any copperheads."

# DISMAL SWAMP IN LEGEND AND HISTORY

## George Washington Owned Large Tracts in Region Which He Described as a "Glorious Paradise"

By John Francis Ariza

EVER since it was first explored, Dismal Swamp has remained a mystery place. Its last Indian disappeared around the 1790's, but in its depths it is almost as wild to-day as it was then. Neither fire nor ax has tamed it. Though it has yielded about a third of its original area to the plow, much of the remainder is an unbroken wilderness on the Virginia-North Carolina border.

George Washington's name is permanently linked with Dismal Swamp and Lake Drummond. Soon after the French and Indian War, Washington and others, attracted by the wealth of "juniper" in this region, obtained a grant of land and organized the Dismal Swamp Land Company. Washington made at least six visits to the great wilderness, to which he refers in correspondence as a "glorious paradise." *

One of the six ditches connecting Lake Drummond with the outer world bears his name. It extends five and a half miles from the northwest shore of the lake to a point on the White Marsh Road, and was dug to get timber from the swamp to the Nansemond River, near Suffolk. Thence the timber went by ship to its destination. Some went to England.

A hamlet known as "Dismal Town" grew up at the White Marsh Road end of the ditch. It has disappeared completely and the road's course has been slightly changed.

In his will Washington valued his 4,000 acres of Dismal Swamp holdings at about $20,000.

### MYSTERY ENSHROUDS GREAT DISMAL

To-day, to all except a very few, the swamp's interior is as much of a mystery as Yucatan. Men are born, live, and die in towns that touch Dismal Swamp's very edges without ever having entered it.

The name given to the swamp by Col. William Byrd in 1728; stories of the ghosts of Lake Drummond; of venomous serpents and poisonous plants; of savage descendants of runaway slaves still roaming its depths; of fugitives hiding out and, in recent years, of moonshiners that kill on sight; of wild beasts and "the noxious vapours that infest the air"—all have created a feeling of fear that has contributed to the grim atmosphere that enshrouds Great Dismal.

There are miles of dry forest around Lake Drummond, but here and there along the west "shore" are holes that would mire you to the waist. Near the headwaters of Pasquotank River are holes that would engulf you; quicksands, also. All over the peat areas are deep fire-holes. When the swamp is full of water and covered with vines, travel is difficult and dangerous.

Dismal Swamp Canal, connecting Hampton Roads with Pasquotank River and Albemarle Sound, begins at the village of Deep Creek, six miles southwest of Portsmouth. It is 50 feet wide and navigable for vessels with a 7-foot draft.

However forbidding many people regard Dismal Swamp's exterior or recoil at the thought of entering it, few can view the mouth of the Feeder Ditch from the George Washington Highway without becoming enthusiastic. While it passes through the wide, reedy, treeless, and vine-matted expanse, the Feeder's banks are lined with stately trees for most of its three miles.

In springtime there are jasmine, honeysuckle, and other fragrant flowers. In places it resembles a sylvan tunnel, as, enchanting and alluring, it runs straight as an arrow into the mysterious and romantic depths toward Lake Drummond. Otter slides along the banks, and bear trails, where old Brain swims the canal in passing from open space to open space, add zest to the journey. In summer the logs and roots that jut from the banks, and often the overhanging limbs, swarm with snakes, most of them harmless, however.

The Feeder is 30 feet wide. Clogged with debris from years of log rafting, the former 7-foot normal stage has dwindled

* See "The Travels of George Washington," by William Joseph Showalter, in the National Geographic Magazine for January, 1932.

CYPRESS SNAGS NEAR THE SHORE OF LAKE DRUMMOND

A century or more ago the cypress trees that stood here were cut down. Time, winds, and waters disintegrated the stumps. When the water is low, their fantastic shapes give the lake a strange, ghostly appearance.

Photographs by H. W. Gillen

IN ONE OF DISMAL'S GRIM "LIGHTS"

Traveling is difficult in the wide, reedy, treeless, and vine-matted jungle known as "light"; dangerous, too, because of the vine-covered fire-holes in which the water rises and falls as the swamp water does. Large flocks of robins and many varieties of migratory birds feed here in winter.

Photograph by H. W. Gillen

WHERE WASHINGTON DITCH AND JERICHO CANAL UNITE

During Civil War days, blockade-runners brought salt and other necessities through the Union lines by way of Washington Ditch and the Dismal Swamp Canal to the hard-pressed Confederacy.

Photograph by H. W. Gillen

THE SWAMP MAN BLOWS FOR HIS DOGS

A well-trained hound will recognize his master's peculiar blasts on a cowhorn, leave the hottest trail, and come straight to the spot.

to three, and with low water the ditch is almost impassable.

## "JUNIPER WATER"

The so-called "juniper water" of the Feeder and Lake Drummond is in reality a blend of the leachings of water from gum, cypress, maple, and "juniper" (southern white cedar) peatland, which covers several hundred square miles.

The occasional visitor to Dismal Swamp cannot distinguish between the various waters or the blends; but a small amount of juniper leachings is required to make other swamp waters palatable. Pure gum water is dark in color and causes a feeling of distress after drinking. Cypress water is palatable and of a lighter color and will keep longer than gum water, which will not remain sweet an entire summer. Pure juniper water, however, is smooth, healthful, and palatable. It is of a beautiful, sparkling color, between rich chrome yellow and orange. Given the same kind of food, timber workers who drink other swamp waters never look as healthy as those who work in the cedar forests and drink pure juniper water. Formerly juniper tea, made from steeped cedar "straw," was a standard beverage in swamp lumber camps.

Journeying up the Feeder in seasons of low water, where underlying roots are exposed, the traveler gets an idea of the source of the swamp's rich amber-colored waters. There are places in the cedar and cypress growths where roots, logs, limbs, stumps, and snags are lapped and tied and twisted to a depth of 17 to 20 feet. Such a natural laboratory will produce juniper or cypress water for years. Where fire has destroyed all vestige of living roots that would renew the growth, the leachings continue to produce juniper or cypress water. For a long time after a fire the water has an ashy taste.

## THE JUNGLE ALWAYS RECLAIMS GREAT DISMAL

The ax means little to Great Dismal. It was wild before the lumberman came, and after he passes it reverts to its former state. The jungle, with its claws and thorns, returns, and the bear, the deer, the panther, the raccoon, again come into their own.

One lumber company operates more than 30 miles of narrow-gauge log railroad in the section lying southeast of Lake Drummond and extending well into North Carolina. Two other firms own smaller roads. A number of companies and individuals cut piling and operate small sawmills along the swamp borders.

There is little high-grade timber left. The greater portion lies south of Lake Drummond. There are immense areas of hardwoods in which most of the trees are worthless; still others where the never-failing cedar will appear and the slower-growing cypress; and miles of scorched standing timber of all kinds, unfit for any use except firewood. Then there are the square miles of scattered clearings, where, in places, the peat has burned eight and ten feet, down to the sand and clay.

Photograph courtesy R. E. Steger

A HUNTER OF THE SWAMP

If he has enough skill, the Dismal Swamp trapper can catch the wily otter, raccoons, and other animals.

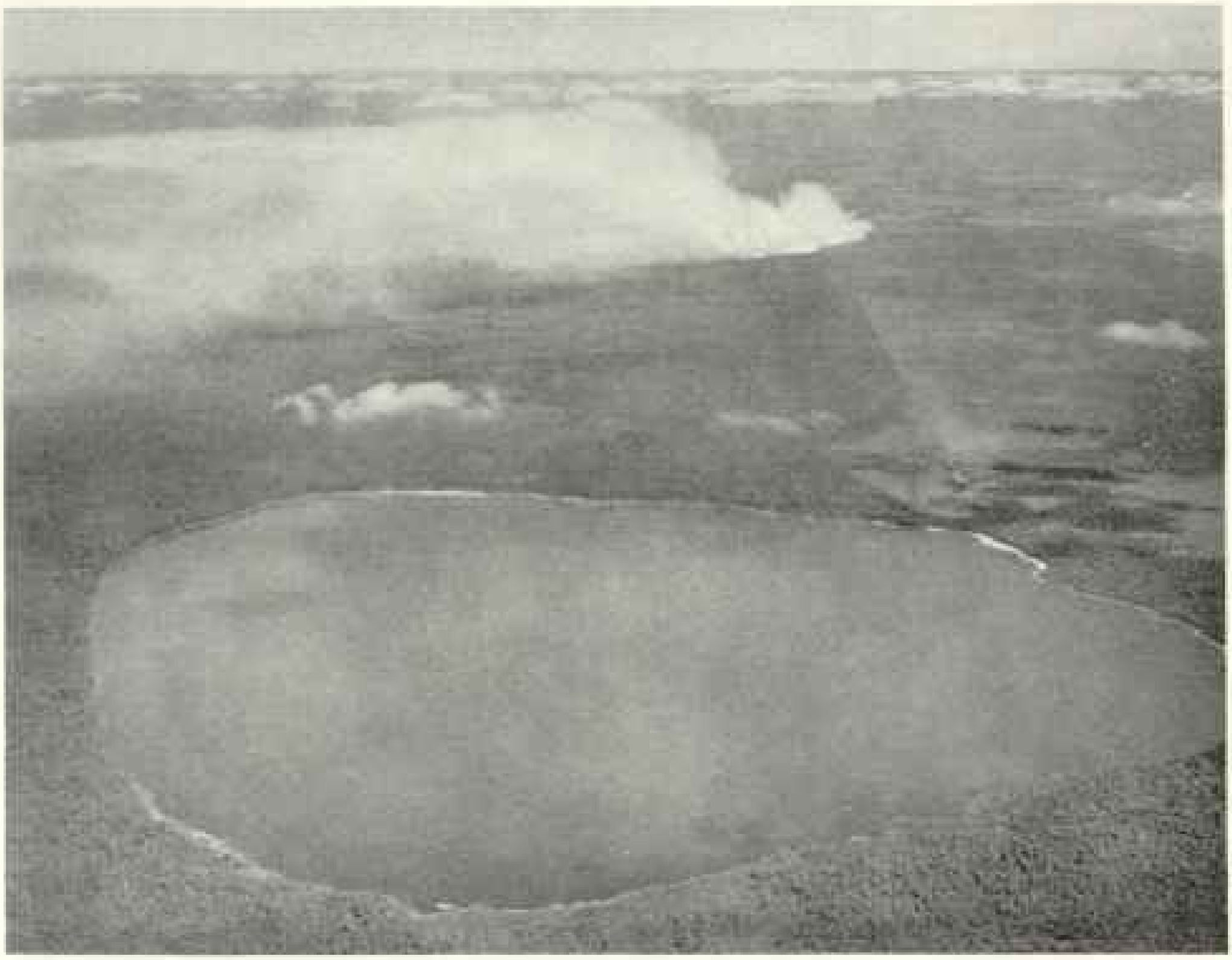
The only permanent human habitation in the Lake Drummond wilderness is the house of the Government-employed lock tender at the Waste Weir clearing, two and three-quarter miles west of Dismal Swamp Canal and a quarter of a mile from Lake Drummond.

### ARMY ENGINEERS CONTROL CANAL

Six gates, or wickets, regulate the flow from the lake. Until the Government obtained possession, in 1929, the Feeder and canal were privately operated. Now the lake and canals are controlled by the United States Army Engineers, whose orderly methods are bringing a new day to Dismal Swamp.

Although the Government owns only a narrow strip on each side of the Feeder and around the shore of Lake Drummond, this strip is the key to the swamp. Now, for the first time in Dismal's history, the shooting vandal and the hoodlum have been definitely curbed. The rest of the main body of Dismal Swamp is owned mostly by lumber companies.

During the abnormally low water of the winter of 1930-31 many sand bars were exposed along the shores of Lake Drummond. In places the water receded more than a thousand feet. I found numbers of Indian arrow-heads, hammers, and other weapons and implements along the north shore, where the Indians had hunted and fished for generations.



AN AIRPLANE VIEW OF BEAUTIFUL LAKE DRUMMOND, NEAR THE HEART OF THE SWAMP

Both lake and swamp owe much of their literary fame to Thomas Moore's ballad, "The Lake of the Dismal Swamp," written at Norfolk, Virginia, more than a century ago. It tells of a young man who lost his reason upon the death of his sweetheart. She was not dead, he said, but had gone to the Lake of the Dismal Swamp, "where all night long, by a firefly lamp, she paddles her white canoe." Other poets and writers have also paid tribute to the swamp, notably Longfellow in "The Slave in the Dismal Swamp," and John Boyle O'Reilly.

Few Indian relics are ever found ashore. They were soon covered by the decaying vegetation that forms the peat, while acids in some of the woods disintegrate the very bones of men and animals.

## WASHINGTON'S INTEREST IN DISMAL SWAMP

Only three of the swamp's many canals and ditches are now in use—Dismal Swamp Canal, the Feeder, and the Albemarle and Chesapeake Canal. All the rest have been abandoned. Many of them were dug by slaves.

The Jericho Canal, for the most part, passes through clearings. Near the lake its banks are lined with stately trees whose tops lean inward. East of the Jericho Ditch deer abound.

Washington always insisted that the best route for a canal connecting the Pasquotank and Elizabeth rivers was through "Drummond Pond." His surveyors proved it, he wrote Governor Patrick Henry, of Virginia, in 1785. Such a canal would be immensely profitable to Virginia and "make this the most favored country in the universe."

For its entire length the Washington Ditch traverses thick gum, cypress, and maple forests, where the sunlight trickles through grape and woodbine.

In accounts of Washington's connection with Dismal Swamp, it is often said he dug the ditch "to drain Great Dismal"; but the fact is he dug it to drain into Lake Drummond the scattered swamps and wet lands lying to the westward and also to use the ditch for transportation.

There is a tradition that Washington

Photograph by H. W. Gillen

SAWMILL-BOUND

One lumber company owns large areas of cedar and other valuable timber. Sometimes logs are transported 30 miles on a narrow-gauge railroad to its sawmill at Camden Mill, near Norfolk.

tried to introduce rice culture in the Dismal Swamp area. If he did make the experiment, the first President soon learned that Dismal Swamp's chaffy peatland is not adapted to raising that cereal.

Corn, certain kinds of beans, oats, rye, and cucumbers are practically the only things that will grow on new peat, which cakes and cracks. Sometimes a hot sun burns a crop up within a few hours. Blackberry bushes grow rank in Dismal, attaining a height of 20 feet or more. Other things grow to unbelievable size. Cotton stalks grow ten feet tall and produce worthless "blue" and "yellow" cotton.

Neither horses nor mules can enter the peatlands. They would sink to their bodies. Oxen, however, can walk on the peat, and were used for years in the timber.

### BIRDS OF GREAT DISMAL

In spring one may find nests of various species of birds that winter in Dismal. In mid-May I saw a hermit thrush and white-throated sparrows that presented the appearance of nesting birds, but I heard no hermit thrush songs after March. Up to late June I have neither seen nor heard veery thrushes, but every day the forest resounds with the glorious organ notes of the wood thrush.

In Bear Swamp, 20 miles southeast of Lake Drummond, a hunter saw more than a dozen ivory-billed woodpeckers in one

THE DEEP-CREEK LOCKS HARDLY RIVAL THEIR PANAMA BRETHREN

Many yachts and small pleasure craft, going to and coming from Florida, like the leisurely Dismal Swamp Canal route because of the wild surroundings south of the locks.

day in October, 1907, and another near the Waste Weir in the summer of 1930. In all my rambles about the swamp I have looked for this rare bird; but all my "big moments," when I thought I had found it, revealed the ivory-bill's slightly smaller cousin, the handsome pileated woodpecker. It is shot ruthlessly by hunters in Dismal Swamp; I have seen half a dozen of their wings around camps where hunters stayed.

A few years ago Lake Drummond teemed with fish, but commercial netting almost exterminated them and is no longer permitted. Netting by occasional fishermen, however, still goes on. Where fishermen had their weirs in the lake half a century ago, their ash stakes can still be seen during low water. When the water is low and there are no stumps where the fish can find safe retreats, their enemies reap a heavy toll. Among these are the otter, mink, raccoon, eagle, and the hateful garfish. Ospreys, or fish hawks, come to Lake Drummond only when coastal storms drive them in.

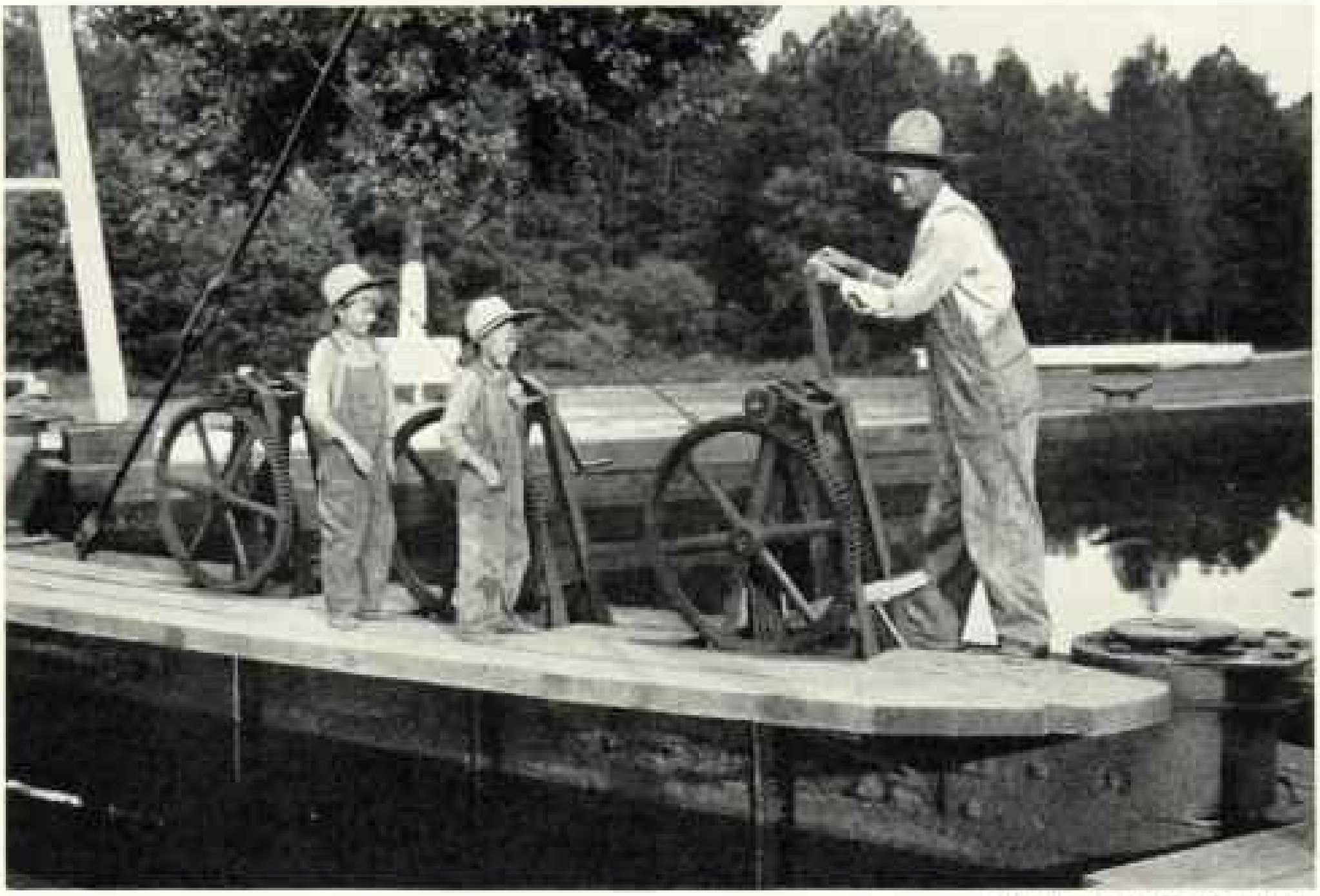
"What creature is master in here?" I asked a swamp man one day.

"The king snake, or chicken snake, as he is sometimes called, is the boss of the reptiles," was the answer. "Nonpoisonous and immune to venom, in a half second's time he can tie a rattlesnake, a copperhead, or a cotton-mouthed moccasin into three knots, break its back, and begin swallowing it. Blacksnakes are his victims, also." The diamond-back rattlesnake is found on ridges where there is grit in the soil. Copperheads like the gum sections.

### A TINY INSECT IS MAN'S MASTER IN THE SWAMP

Man's master in Dismal Swamp is a tiny insect almost invisible to the naked eye—the ferocious little demon known in the South as the red bug.

"After you've been here awhile and acquire the 'swamp odor,' red bugs don't bother you much," the swamp man explained. "I never scratch when I feel them on me and I don't suffer from their bites. They like well-powdered city people. Men perspiring freely are not troubled much by them; like some other insects, they won't bother perspiring negroes at all.



Photograph by H. W. Gillen

AT THE CAROLINA END OF DISMAL SWAMP CANAL

The smaller boy was born and bred in old Dismal. His father (opening gate) spent more than 30 years in the swamp, and probably knows the great tract better than any other living person.

"One day I was working a gang of blacks in the timber. 'Boys, watch out for those ground bumblebees!' I warned and hopped to safety. The men kept right on working, while the maddened insects swarmed and buzzed.

"'They ain't going to bother us, chief; we's sweatin'!"

Yellow flies, which suddenly appear about the tenth of June and disappear about the tenth of August, are another fierce pest. Sand flies along the shore of Lake Drummond are pernicious. A wet spring brings myriads of mosquitoes, but if it is dry they are not as numerous in the heart of the swamp as they are in some cities and towns.

My nominee for the worst insect pest in Dismal Swamp is the tick. Neither man, beast, nor bird is safe from it. Ticks appear with the first warm weather. Wherever bears walk—and they walk nearly everywhere in Dismal—ticks are left on the grass and lie in wait for victims. Bears and deer are infested with them. Raccoons and bobcats can rid themselves of ticks, but quail, wild turkeys, and small birds die. A single tick will kill a young quail. It was thought several years ago that by exterminating Dismal Swamp's wild cattle, ticks would be eradicated. The cattle have disappeared, but there are as many ticks as ever.

At the height of the hunting season, in November and December, bears come nightly to the jungles that touch the very walls of my camp, back of the Waste Weir clearing. Luscious pokeberries and trees laden with sweet-gum berries are the lures. A pail of wild honey left on a table in front of the camp was devoured by a bear one night while a family was asleep.

There are no foxes, chipmunks, red squirrels, and few muskrats in the peat section, and only one skunk has been captured there in 30 years.

The swamp's wildest area is in the Cold Water Ditch section, south of Lake Drummond, in North Carolina. It is practically inaccessible; only experienced swamp men ever venture in.

Game is plentiful there and will remain safe from hunters, provided fire does not sweep through it. Only a small per-

centage of Dismal Swamp hunters ever leave the few trails. The fear of becoming lost and the formidable thorns and vines are the reasons.

Formerly Jack's Camp, on the southwest shore of Lake Drummond, was a thriving place. Jack was a mulatto who operated a commissary and rationed out food to laborers in the camps. The original camp has disappeared, but a building where hunters stay until a warden orders them out stands on the old site.

Several years ago two novelists came down from New York to get "color" and "experience" in Dismal Swamp. They wanted "the raw," they said. A guide left them at Jack's Camp.

Like any other inexperienced persons in that wild, trackless domain, they were bewildered and lost within an hour. Before they were rescued, two days later, they had almost perished in a fierce March storm. They were so terrified they had forgotten to eat the food they carried. It was merely an accident that a searcher heard them talking, as they shivered in Yadkin's Camp.

### SOUNDS CARRY TO LONG DISTANCES

Sounds can be heard for immense distances in Dismal Swamp. The puffing of locomotives, their whistles, and the coupling of cars in the railroad yards at Suffolk, 10 miles from the Waste Weir clearing, and gunshots 10 and 12 miles away can be heard easily. When atmospheric conditions are right—which means either on calm, clear nights or mornings, before the sun has risen, or on a certain kind of foggy morning—the sound of ordinary conversation between two men 30 yards apart can be heard across Lake Drummond, three miles away. If they raise their voices slightly, words can be understood.

Many of the winter nights are profoundly still. Following their occasional hoo-hoos, catcalls, and screeches soon after sunset, the various owls seldom are heard again until about 3 a. m. I have heard wild cats fighting occasionally; a "pond toes," or swamp rabbit, making his strange, minklike snarl, and now and then an opossum's hissing snarl, but I have listened in vain for panthers.

Of all the night sounds, the most impressive is that of a tree falling miles away. When the water level rises, many of the top-heavy giants fall, as they have no secure anchorage in the peat, where there are no rocks. Many of Dismal's immense gum, maple, and ash trees are diseased, due to the work of sapsuckers and borers, and because of their insecure anchorage, many of them are windshaken—cracked inside—and a surprising number lean 10 or 15 degrees.

Frost ruins many big cypresses. During intensely cold weather the sap freezes and bursts the tree, causing "freeze cracks." Later the tree develops a long gash, as if it had been struck by lightning.

Smokers are an added menace to the swamp, for they do not realize the danger of the discarded cigarette. The very ground under one's feet will burn. After the destructive fire of 1923, which destroyed 150 square miles in the swamp, peatland near the Feeder mouth burned until March, 1926.

"I'll put that fire out for four bits," an old negro hand told a woods foreman one Saturday evening several years ago, pointing to a smoldering fire near a cedar thicket. Many of the old man's evenings and Sundays had been occupied putting out fires which careless workers had started. He had never received any pay for his efforts, or as much as a "thank you."

The foreman refused. By Monday morning, however, he wished he had accepted the offer, for a disastrous fire was roaring through the cedars. Thousands of dollars' worth of timber burned before the fire was under control.

If Dismal Swamp were drained, the dried peat would be a tremendous fire menace. Lightning, a log train, or a careless smoker might start a disastrous conflagration.

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# NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDINGS

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## ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

TO carry out the purposes for which it was founded forty-four 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 which the Magazine can use, generous remuneration is made. Contributions should be accompanied by addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole, and contributed $35,000 to Admiral Byrd's Antarctic Expedition.

NOT long ago 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 of California were thereby saved for the American people.

THE Society's notable expeditions to New Mexico have pushed back the historic horizons of the Southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region The Society's researches have solved secrets that have puzzled historians for three hundred years. The Society is sponsoring an ornithological survey of Venezuela.

TO further the study of solar radiation in relation to long range weather forecastings, The Society has appropriated $65,000 to enable the Smithsonian Institution to establish a station for six years on Mt. Brukkaros, in South West Africa.

# WATCH MUST BE ACCURATE

## OR RADIO-TELEPHONE SYSTEM FAILS

### HOW HAMILTON WATCHES HELP UNITED AIR LINES

THE pilots of United Air Lines must have watches that keep accurate time. Otherwise, the elaborate and costly airplane radio-telephone system used by this company would not function.

Every ten minutes, to the second, United pilots *must* telephone to one of thirty-two ground stations and give their exact position.

Many United pilots use Hamilton Watches in this exacting service.

Accuracy! Faithful timekeeping day after day. Reliability! Honest performance year after year is carefully built into every Hamilton. That is why railroad men, air pilots, explorers, men of affairs—the men who *must* have accurate timekeeping watches or fail in their work—turn to Hamilton.

The Hamilton Watch times so many of America's fast trains that it is known as "The Watch of Railroad Accuracy."

If you are interested in owning a watch that will keep honest time, ask your jeweler to show you one of his beautiful new Hamilton models.

* * * *

Hamilton Watch prices have been reduced to meet 1932 requirements. *Watches pictured*—*Left:* WARREN, 17 jewels, 14k filled gold, white or natural yellow, $47.50. *Right:* RUSSELL, 17 jewels, 14k gold, natural yellow or white, $65. *Below:* FORNEY, 17 jewels, With new accurater dial, 14k filled white or natural yellow gold, $55.

**FREE BOOKLET**—Christopher Morley, distinguished poet, essayist and novelist, went through the Hamilton factory and wrote a fascinating story of what he saw. It is now in booklet form and is called "When We Speak of a Tenth." It is gladly—even proudly—sent free upon request. Address Hamilton Watch Company, 882 Columbia Ave., Lancaster, Pa.

# HAMILTON

*the Watch of Railroad Accuracy*

# LAST CHANCE to get into this $25,000 argument

**Here are the prizes for each month—464 in all!**

| For best Colgate "blurbs" | | For best Palmolive "blurbs" | |
|---|---|---|---|
| 1st | $500 | 1st | $500 |
| 2nd | 125 | 2nd | 125 |
| 3rd | 50 | 3rd | 50 |
| 9 next | 25 | 9 next | 25 |
| 20 next | 10 | 20 next | 10 |
| 200 next | 5 | 200 next | 5 |

Names of prize winners sent on request

## Write your "blurb" now
## Contest closes July 31


GET in on this $25,000 argument! You Palmolive users—Hank wants your help. You Colgate shavers—Pete says, "Stick with me!"

Just write a "blurb" like those above. In your own words, say YOUR say—in favor of Palmolive OR in favor of Colgate's.

Here's the idea. Palmolive and Colgate's are far and away the world's most popular shaving creams. They out-sell all others in a field of 176 competing brands. Millions of Colgate users swear there's nothing better. Millions of shavers are sold solid on Palmolive.

We want to know where *you* stand. Here's your chance to tell us—and a chance to get a slice of that $25,000! In ONE of the empty "blurb" spaces at right (or better on a separate sheet of paper) write your boost for Colgate's or Palmolive—*not both*. Just get into the argument. Say your own say in your own words.

**Here's where you take your shot at some of that $25,000**

Pete wants you Colgate users to back him up. Hank wants every Palmolive shaver's help. Start *now* and get into this $25,000 argument! This is your last chance. Contest closes finally July 31st.

**Palmolive Users**

**Colgate Users**


## CONTEST RULES

Mail your "blurb" with name and address to Contest Editors, Dept. J-7, P.O. Box 1133, Chicago, Ill. Residents of Canada, address: 64 Natalie Street, Toronto, 8.

The prize money (totaling $25,000) is divided into 6 sets of monthly prizes (each set totaling $4200). At the end of each month prizes are awarded (see list above) for the best "blurbs" received during that month, as follows:

| | | | |
|---|---|---|---|
| Feb. 29 | $4200 | Mar. 31 | $4200 |
| April 30 | $4200 | May 31 | $4200 |
| June 30 | $4200 | July 31 | $4200 |

*(Contest closes July 31, 1932)*

Contest is only open to residents of the United States and Canada. Employes of the manufacturers and their families are *not* eligible to compete.

In event of a tie, each tying contestant will be awarded full amount of the prize tied for. Decision of the judges shall be final.

### *Some hints to help you win*

At the right are some facts about the world's two largest selling shaving creams —Colgate's and Palmolive. Here are some of the reasons why men prefer these famous shaving creams.

### PALMOLIVE

1. Multiplies itself in lather 250 times.
2. Softens the beard in one minute.
3. Maintains its creamy fullness for 10 minutes.
4. Fine after-effects due to olive oil content.

### COLGATE'S

1. Breaks up oil film that covers each hair.
2. Small bubbles soften each hair at the base of the beard.
3. Gives a close, skin-line shave.
4. Gives a lasting, 24-hour shave.

# She's worth *the* best

# Buy the grape juice *doctors recommend*

JUST picture your child back of this glass of Welch's Grape Juice. Bright eyes, rosy cheeks, radiant smile . . . symbols of health . . . the result of protecting care.

Welch's Grape Juice is nature's own energy builder—a glowing purple liquid food containing practically all the health-giving properties of ripe grapes, fresh from the vine. A famous scientist and physician who took Welch's into the test tube declares it rich in blood-building and body-energizing properties (286 calories to each pint) — the very elements your child needs in plenty to develop red blood corpuscles . . . to build strong bones and hard teeth.

The scientific care with which Welch's is prepared is unequaled in the grape juice industry. Only the finest of sun-ripened grapes are selected. They are twice washed . . . stems removed . . . and their juice pressed, sealed in new bottles and pasteurized.

Do not sacrifice this known purity for an unknown substitute—cheaply made to sell on price alone. Not even for a supposed economy, because Welch's is *full strength . . . never adulterated . . . never a preservative added.* Just dilute Welch's with one-third cool water, as most children prefer. Serve as the breakfast fruit juice for the whole family.

Buy the family package of one dozen pints—at the lowest price in 35 years. Remember, "she's worth the best!" Insist on Welch's.


*Welch's*—Makers of quality products since 1869. "Pasteurized" Grape Juice, Grape Jam ("Grapelade"), "Vitamin-protected" Tomato Juice, Pure Jellies (Grape, Red Currant, Crabapple, Quince, Mint), and Welch-ade, a pure grape sparkling drink, at the better fountains, all under the famous Welch label. Send for free recipe booklet of delicious frappés, ices and desserts.

Address Dept. 26, Welch's, Westfield, N. Y.

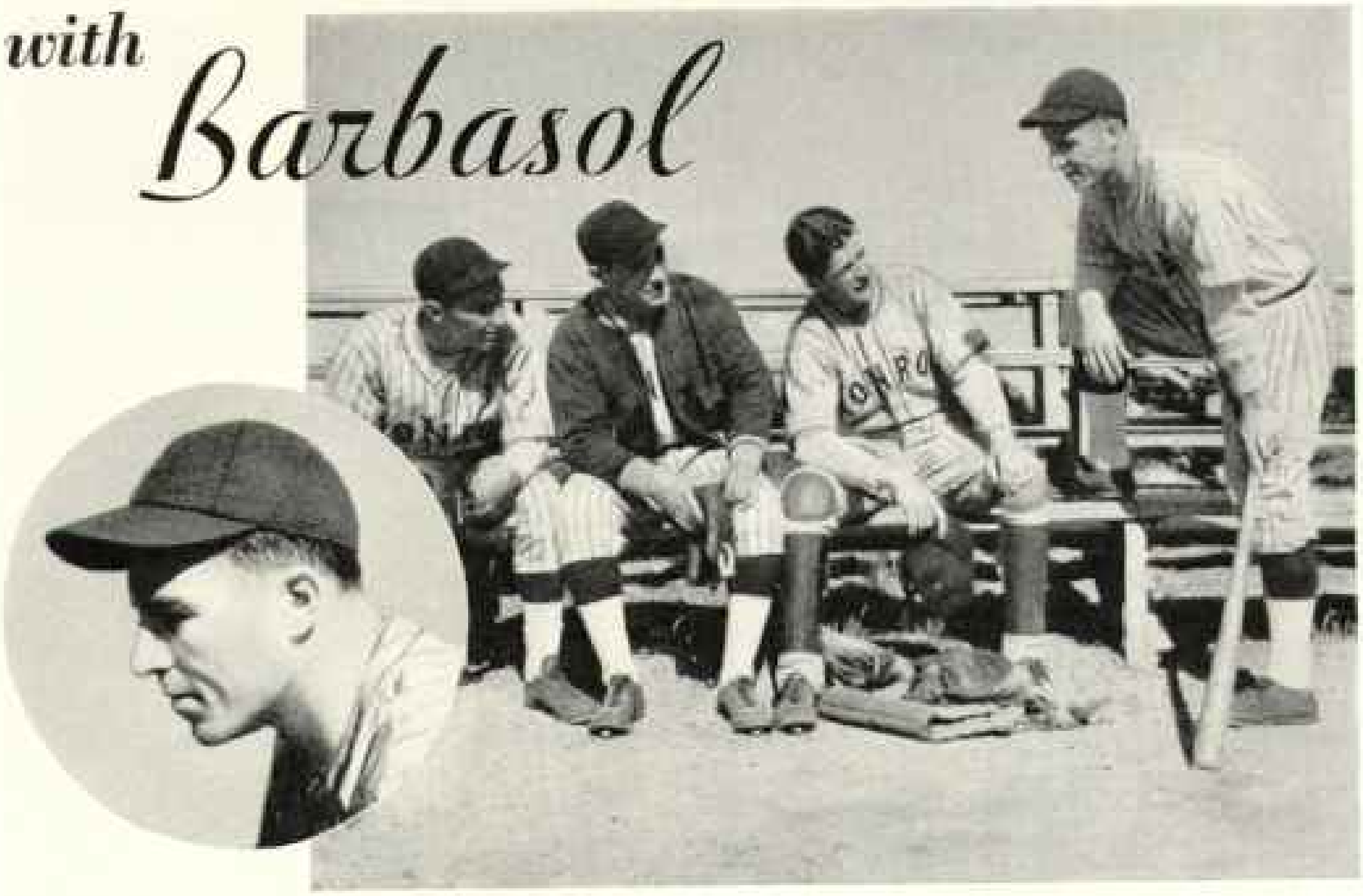
# Welch's

PASTEURIZED

## GRAPE JUICE

# Faces that laugh at weather *are shaved*

*with* Barbasol



## SHAVE WITHOUT LATHER

*It takes a* cream *to keep the face soft, smooth, pliable. That's why* Barbasol *prevents dry, harsh skin, chapping and windburn.*

IT'S the sun and breeze and dust these days that dry and roughen the skin.

No wonder, then, Barbasol is the favorite with men accustomed to being out of doors. They know what a blessing it is to *shave without lather.*

Go ahead, try Barbasol yourself. Granted, you may miss that soapy lather at first. But if you treat your face to an entire tube, you'll banish tender skin and be sold for good on Barbasol.

That's because Barbasol is a *cream*—soothing, cooling, healing—100% free from the bite of soapy alkalis.

It softens whiskers instantly. Its creaminess makes them stand up straight to take a clean-cut trimming.

No pull, no scrape. The natural oils held in. The skin left smooth, protected from wind and sunburn. Barbasol makes it hard to believe a razor passed that way.

Now use Barbasol right. Follow these directions, and follow the millions of men who have made it the world's fastest-selling cream.

**1.** Wet your face and leave it wet. **2.** Spread on Barbasol. (No need for a vigorous rub-in.) **3.** Wet a good blade—and SHAVE.

That's all there is to the finest shave in the world. It's simple, easy, quick. Try it today. Generous tubes at all druggists', 35¢ and 65¢, or large jar, 75¢, will quickly make you a Barbasol Believer, too.

*Barbasol recommends* TEFRA TOOTHPASTE

In every 50¢ tube there is a free Tefra toothbrush refill, to fit a lifetime Tefra refillable toothbrush handle. For full information, tune in Barbasol radio programs listed below.

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Singin' Sam, the Barbasol Man, in songs you can't forget. Every Monday, Wednesday and Friday evening, at 8:15, Eastern Daylight Saving Time, over an extensive Columbia (WABC) Broadcasting hook-up.

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Ray Perkins, Barbasoloist and Peter Van Steeden's Barbasolians, WEAF—N.B.C. Red Network, Tuesdays and Thursdays, 7:30 P. M. Eastern Daylight Saving Time.

*Consult radio page of your local newspaper for stations*


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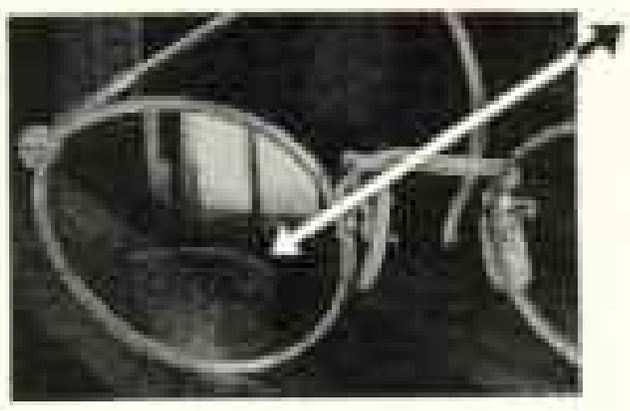
You would be in a deck-chair headed for the Orient . . . if you realized how cheaply you can go *this* season —with steamship fares the lowest in the world, considering service and the distance traveled—with the rate of exchange in your favor—and with a series of all-inclusive tours prepared for your benefit by the Japan Tourist Bureau, a non-commercial organization.

Within six weeks you can make the round trip and have 14 days to enjoy Yokohama, Tokyo, Kyoto, Kobe, Kamakura, Nikko, Fuji, the Kegon Waterfall, and other choice localities with all expenses paid. Longer tours at correspondingly low cost. Send for complete booklet detailing these itineraries.

*Japan, Korea, Manchuria and China are reached from the United States and Canada by the Nippon Yusen Kaisha, Osaka Shosen Kaisha, Canadian Pacific, the American Mail Line, and the Dollar Steamship Line. Full information will be furnished by any of these Lines, any tourist agency, or by the Japan Tourist Bureau c/o Japanese Gov't Railways, One Madison Ave., N. Y. C., or c/o Nippon Yusen Kaisha, 545 Fifth Ave., N. Y. C.*

JAPAN
TOURIST BUREAU

# THINGS DON'T "JUMP" WITH



Look for this
FUL-VUE
BIFOCAL
Shape

# FUL-VUE BIFOCALS

It's hard enough to hit a golf ball without having it seem to move as you look at it through old-style bifocals. How annoying it is to grope for the first step when you start up or down stairs or have things seem to jump as you glance at them.

The new Ful-Vue Bifocals are a great improvement in correcting this annoyance. Things don't jump when you look at them through Ful-Vue Bifocals. You don't have to get used to them.

Check up on your eyesight today. You may be straining your eyes as you read this message. HAVE YOUR EYES EXAMINED. Go to an expert whose professional training, skill and experience will assure you of the thorough examination your eyes deserve.

Careful fitting of your glasses, too, is vitally important to your comfort and appearance. Glasses, particularly bifocals, should be literally custom-fitted to your facial contours.

Don't skimp on eyes and glasses. The best is none too good when it comes to eyesight.

We should like to send, without cost, an illustrated and important booklet, "What You Should Know About Your Glasses." Mail the coupon.

American Optical Co.,
Dept. NG4, Southbridge, Mass.
Without charge or obligation, please send me the booklet, "What You Should Know About Your Glasses."

Name_____

Address_____

City_____ State_____

The name of the man who fits my glasses is

_____

This marvelous little **CAMERA** fits into the **PALM** of your **HAND**

Yet it takes perfect pictures under the most adverse light conditions because of its extremely fast F2.7 Anticomar Lens!

THE NEW PLAUBEL **MAKINETTE**

**VEST POCKET CAMERA**

*is the acme of convenience and accuracy—a real vest pocket miniature camera that you can always carry with you—traveling, week-ending, or at home.*

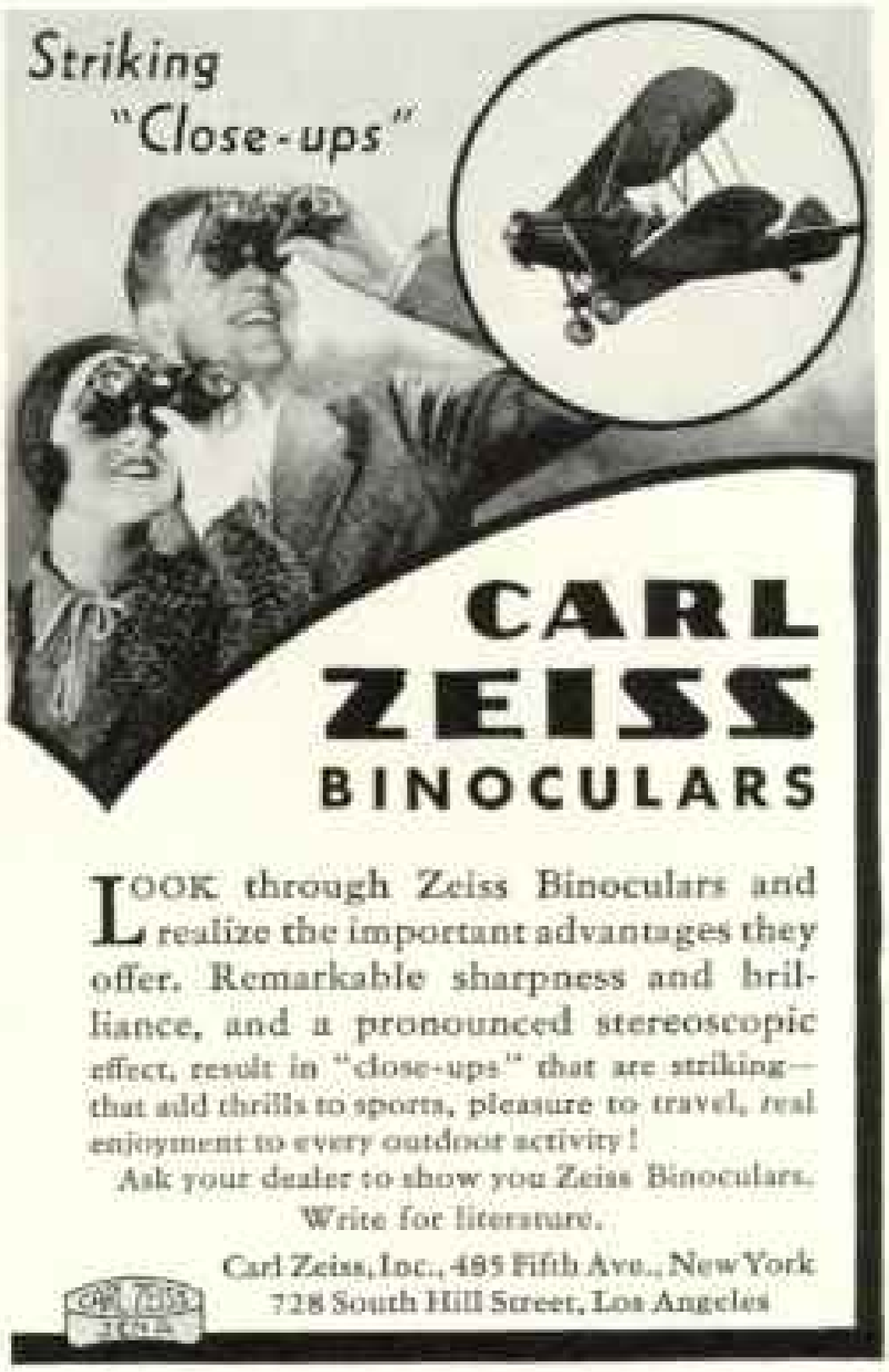
- It's easy to operate—just press a button and the front jumps out, ready for the picture.
- Always gets the picture—the high speed shutter will stop a fast moving object.
- Uses standard 8-exposure vest pocket film, obtainable anywhere and takes 16 needle-sharp pictures on each roll.
- Insures unusually large and perfect enlargements.
- It's all metal, leather covered, with special ever-ready case that permits loading without removal.

Complete with case and two color filters. Write for descriptive booklet N. G. M.

**$70** **WILLOUGHBYS**

110 West 32nd Street, New York City

ESTABLISHED 1909

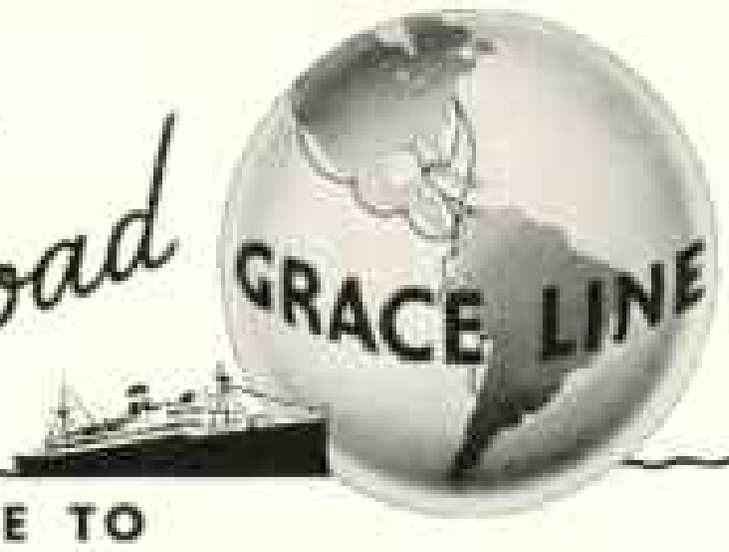



**CARL ZEISS BINOCULARS**

LOOK through Zeiss Binoculars and realize the important advantages they offer. Remarkable sharpness and brilliance, and a pronounced stereoscopic effect, result in "close-ups" that are striking—that add thrills to sports, pleasure to travel, real enjoyment to every outdoor activity!

Ask your dealer to show you Zeiss Binoculars. Write for literature.

Carl Zeiss, Inc., 485 Fifth Ave., New York
728 South Hill Street, Los Angeles

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# CALIFORNIA or NEW YORK

**WESTBOUND, $175 up**
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FIRST CLASS

*Lowest cost per day* of any coast-to-coast water route—and *only* line offering visits in Cuba*, Colombia*, Panama, Costa Rica, Nicaragua, El Salvador, Guatemala and Mexico (*Eastbound). Inland excursions at small expense. 21 days Westbound; 24 days Eastbound. No passports. Sailings every other week from New York, San Francisco, Los Angeles. Consult your travel agent or

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New York: 10 Hanover Square; Boston: Little Building; Chicago: 230 N. Michigan Avenue; New Orleans: Queen and Crescent Building; San Francisco: 2 Pine Street; Los Angeles: 548 South Spring Street; Seattle: Hoge Building.

# That's an idea!

Every time I give a party, I always call up Helen. She's a dietetics teacher and has the cleverest ideas for making everything you serve look and taste different. "What shall we have to drink?" I asked her. And she said "Kellogg's Kaffee Hag Coffee. There's nothing like a good cup of coffee at night—*if* you make sure it won't keep you awake."

• • •

You have no idea how many people will compliment your thoughtfulness as a hostess if you serve "the coffee that lets you sleep."

Kaffee Hag Coffee is guaranteed pure coffee with 97% of the caffeine and the indigestible wax removed. No fear that caffeine will keep you awake—affect your nerves—or digestion. Yet experts say Kaffee Hag has as fine a flavor as any other coffee.

At all grocers in super-vacuum tins. At a reduced price. Roasted by Kellogg in Battle Creek. Quality guaranteed. Money refunded if you're not entirely satisfied.

●

# A Lesson in Life Saving

© 1932 M.L.I. Co.

*"Let us show you one of the best ways to carry a man who needs help. You can learn how on the pier or the beach and then practice in the water. You'll find this and other 'carries' in the Metropolitan's booklet 'Swimming and Life Saving'."*

OUT beyond the paddlers and bathers who cannot swim a stroke, you will find the strong swimmers who get the most joy out of clean, sparkling water. But swimming is more than a keen pleasure. It offers more opportunity for wholesome exercise for more people than any other sport.

Almost everybody who has correct instruction can learn to swim. When you swim you exercise practically every muscle in your body. You take deep breaths, expand your lungs and send your blood tingling from head to foot. And afterward, when you are resting in the warm, golden sunshine you soak up health-giving rays from the sun.

You may regard yourself as a fairly good swimmer because so far you have been able to take care of yourself. But if you have not learned to swim correctly you may be unjustified in your confidence. It is not difficult to correct swimming faults or to learn the proper arm and leg action and the breath control necessary in good swimming. Foolhardiness and panic cause more drownings along the seashore and in lakes, rivers and ponds than physical exhaustion or cramps.

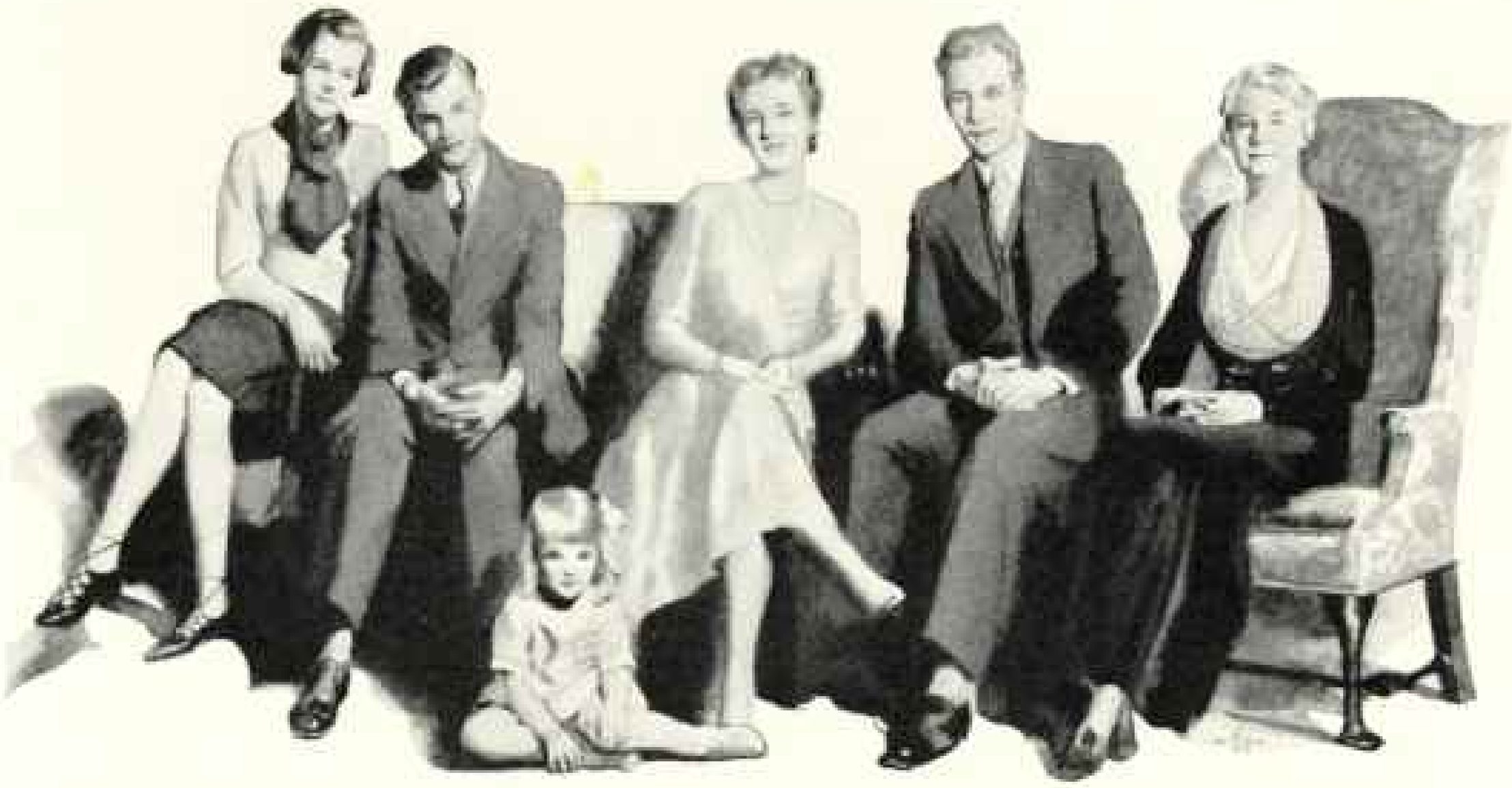
You may be perfectly willing to risk your own life to save that of another. But if you do not know how to go about it there is great danger that both lives will be lost. To save a life requires real skill. Prove whether or not you are competent by carrying ashore a friend who is not helping himself. If you find that you cannot do it, learn the proper life saving methods so that, if ever needed, you will be ready.

The Metropolitan Life Insurance Company, in cooperation with the American Red Cross Life Saving Service, has prepared a booklet which will help you to learn to swim, if you cannot swim now. It shows the American Crawl used by champion swimmers and the proper Side Stroke to use in life saving. Send for your free copy of "Swimming and Life Saving." Address Booklet Dept. 732-N.

**METROPOLITAN LIFE INSURANCE COMPANY**

FREDERICK H. ECKER, PRESIDENT — ONE MADISON AVE., NEW YORK, N. Y.

# *Bringing back the* GOOD OLD FAMILY CIRCLE



PHILCO, the first radio scientifically designed as a musical instrument, is bringing back the good old Family Circle! It is doing this with fine home entertainment.

Music! The masters of all times, interpreted by the masters of our own time. All classes and kinds of music, vocal and instrumental, in full register and exact tone. PHILCO brings it to you with dependability and fidelity—as if the performers were present in person, playing just for you. Turn your back, close your eyes—your ear cannot distinguish between the voice of PHILCO and the original. Not only music, but the spoken word—the world's great personalities—religious services—the whole gamut of sports and up-to-the-minute news—all yours to command on your PHILCO, with clarity and purity which make you really "at home with the celebrities."

Put a PHILCO in your home today. What single object can so greatly affect the happiness and entertainment of your entire family? PHILCO dealers everywhere are happy to show and demonstrate it. See it. Hear it. Buy it. Enjoy it.

PHILCO - PHILADELPHIA - TORONTO - LONDON

# PHILCO

*A musical instrument of quality*

Patented


$36.50 to $295.

All prices tax extra

PHILCO MODEL 15X, $150, shown above, is scientifically designed as a musical instrument because:

1. The PHILCO Inclined Sounding Board throws all sound up into field of listener, making all high notes heard for the first time. 2. Large area of sounding board insures full reproduction of low notes. 3. Echo Absorbing Screen at the back prevents echo and blur, the first radio to deliver sound only from front of speaker. 4. Open sounding board instead of sound chamber affords clear unbound tone.

# SOUP ADDS SO MUCH MORE RELISH AND FLAVOR TO THE COLD MEAL!

The cooling foods charm and refresh at this time of the year—there is no doubt about that. We suggest nothing to discourage your indulgence in them, but rather a way which actually increases your enjoyment and benefit from them. Soup—bracing, invigorating soup!

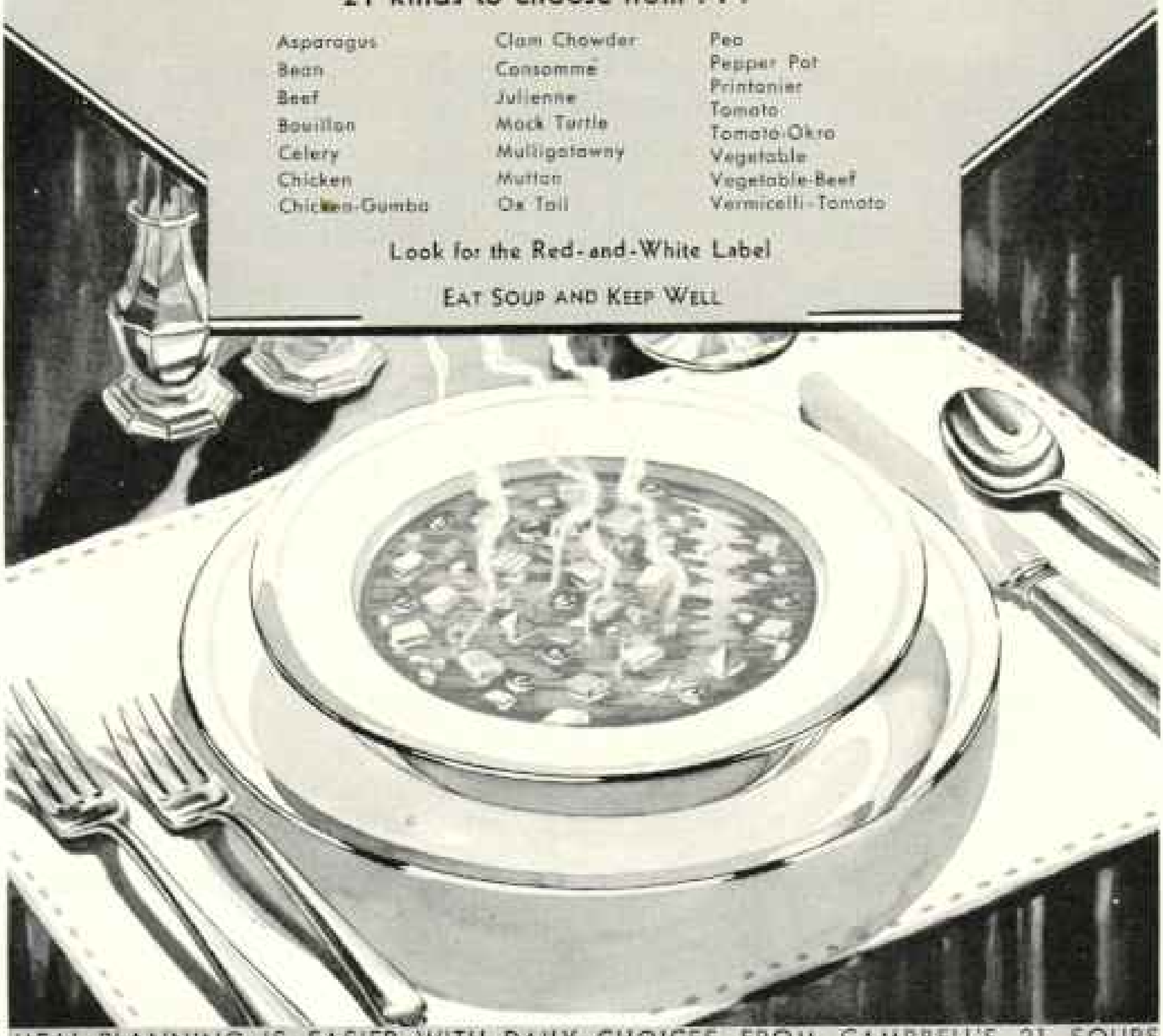

The hot soup among so many cold foods and icy beverages, acts as a wholesome, healthful tonic both to your appetite and digestion. The whole meal sparkles with a new appeal. Serve Campbell's Vegetable Soup on many a summer's day—hearty, delicious, sustaining!

**21 kinds to choose from . . .**

| | | |
|---|---|---|
| Asparagus | Clam Chowder | Pea |
| Bean | Consomme | Pepper Pot |
| Beef | Julienne | Printanier |
| Bouillon | Mock Turtle | Tomato |
| Celery | Mulligatawny | Tomato-Okra |
| Chicken | Mutton | Vegetable |
| Chicken-Gumbo | Ox Tail | Vegetable-Beef |
| | | Vermicelli-Tomato |

**Look for the Red-and-White Label**

EAT SOUP AND KEEP WELL



MEAL-PLANNING IS EASIER WITH DAILY CHOICES FROM CAMPBELL'S 21 SOUPS

## A Message to the Membership of the National Geographic Society about the Advertising in Their Magazine

THOSE directing the editorial and advertising policy of the Magazine wish to remind the members of the unusual care and scrutiny given the advertising messages appearing in the columns of The Geographic.

In these times, when every publication is eager for advertising revenue, the advertising standards of your Magazine have not been and will not be lowered nor modified. The pages of The Geographic always have been closed to many advertisers because their products, policies or methods did not conform with our requirements.

This censorship has been uncompromising, possibly uniquely so. We believe it well justified, because the interests and the established faith of our more than a million members, the owners of the Magazine, are paramount.

In giving your patronage and encouragement to advertisers using The Geographic, you are not only observing sound business practice, but at the same time are supporting your own Magazine and assuring its continued growth.

You may feel certain only dependable products and services are accepted and will appear in the pages of The Geographic.

Faithfully yours,

John O. La Gorce

Vice-President

# *IF THERE WERE ONLY TWO TELEPHONES IN YOUR TOWN*

If there were only two telephones in your town the fortunate possessors would probably put them on pedestals in the most prominent places in their homes. Neighbors would flock to see them. Children would clamor to touch them. Bolder ones would lift the receiver to hear the magic voice—then hang up suddenly in bewilderment.

Because the telephone is in millions of homes and offices and is so much a part of our daily lives, it is not regarded with this strange awe. Yet the miracle of it is no less real. The magic of it no less powerful. At any hour of the day or night you can talk to almost anybody, anywhere—to far countries and to ships at sea.

The first wonder is that you can talk to folks around the corner. The second wonder is that the service is so organized that you can talk to people in far away lands. The third wonder—perhaps the greatest of all—is that telephone service is so inexpensive.

Of all things purchased, there is none that costs so little and brings you so much convenience, security and achievement as the telephone.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

# *You've waited a year for vacation*

## Make it last for months to come . . . in Ciné-Kodak Movies

MAKE this year's vacation the most interesting and exciting you ever had. Then be able to relive it again and again as often as you please.

Making movies with Ciné-Kodak is an exciting, fascinating sport. As simple as making snapshots. You capture forever, in *living* pictures, the events, the scenes, that will mean so much in years to come.

Ciné-Kodak M, priced at only $75, is as easy as a Brownie to use. Aim . . . press a lever. And that's all there is to it. We do the rest. Kodascope projectors are now as low as $50. Eastman Kodak Co., Rochester, N. Y.

# Ciné-Kodak

***Simplest of Home Movie Cameras***

**IT'S SO EASY** to make clear, brilliant home movies with this simplest of home movie cameras. Aim . . . press the lever . . . and that's all. If you can make a snapshot, you can make a movie.

CINÉ-KODAK *Model M*

*. . . only $75 with case*

**Into this compact little camera, Eastman has concentrated all the essentials of movie making. Equipped with f.3.5 lens and a special attachment for close-ups. No focusing. Loads with full 100 feet of 16 mm. film.**

N. G. 7-32

Eastman Kodak Company, Rochester, New York.

Send me FREE illustrated booklet telling me all about making my own movies.

Name_____

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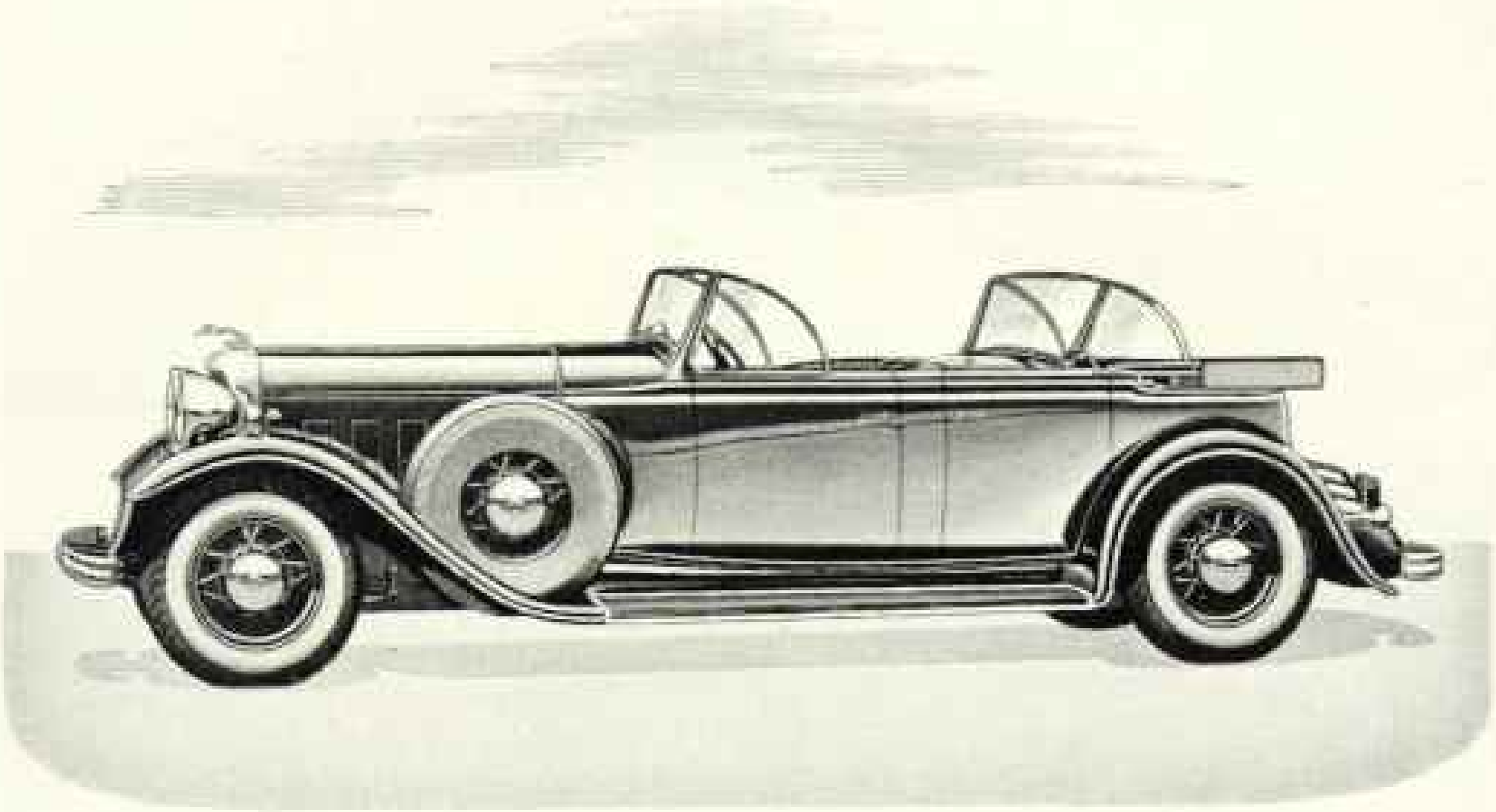
THE LINCOLN

# 12



THE LINCOLN V-12 CYLINDER . . . 4-PASSENGER SPORT PHAETON . . . $4500 AT DETROIT

*In the belief that every Lincoln owner has the unqualified right to the highest type of motoring service, every Lincoln is built to one high aim—it must be the best that can be made. Lincoln has never for any cause countenanced a sacrifice of quality. To fulfill its obligations, every Lincoln is an achievement of advanced engineering, finest tested materials, and methods of construction that are unhurried and precise. The development of this unique Lincoln background has been made possible by the support of the Ford Motor Company. Only from such a source can spring the perfectly balanced qualities found in the V-12 cylinder Lincoln—a motor car striking in beauty, brilliant in performance, strong, safe, and enduring. The V-12 cylinder Lincoln is offered in twenty-one custom-built and standard body types priced at Detroit from $4300, fully equipped.*

# *Lighter* in weight *Harder* on dirt
# *Easier* on the pocketbook

ONLY $4.50 DOWN FOR THIS NEW VALUE IN HOOVERS

Welcome the representative from the Hoover Department of your local dealer. He is bonded and trustworthy, and comes to you from one of the leading stores in your community. Ask him to show you the new Popular-Priced Hoover. See what a wonder-cleaner it is. Learn about Positive Agitation, the exclusive Hoover principle—how *easy* it is on rugs, how *hard* on dirt.

Check the new low price at which Positive Agitation is offered, the new low down payment, the greatly reduced monthly payments, the generous allowance for old electric cleaners, against any cleaner values you know. This is what you will find: that Hoover is offering you in its new Silver Jubilee models the greatest values in its history; that this is the year of years to buy the cleaner of cleaners. If you wish, the Hoover representative will be glad to leave any of the three new Silver Jubilee Hoovers with you for a Home Trial.

*The Hoover Company, North Canton, Ohio . . . The oldest and largest maker of electric cleaners . . . The Hoover is also made in Canada, at Hamilton, Ontario*

25 YEARS OF CLEANING LEADERSHIP · 1908 1933 · HOOVER SILVER JUBILEE

# *Silver Jubilee* HOOVERS

BEAT . . . AS THEY SWEEP . . . AS THEY CLEAN . . . ON A CUSHION OF AIR

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*"Somehow I like a man who smokes a pipe..."*

*Packed in a handy pocket pouch of heavy foil. Keeps the tobacco better and makes the price lower. Hence...* 10c

Others may tell you their tobacco is as good as Granger but the challenge stands:

*The best pipe tobacco in America, regardless of price*