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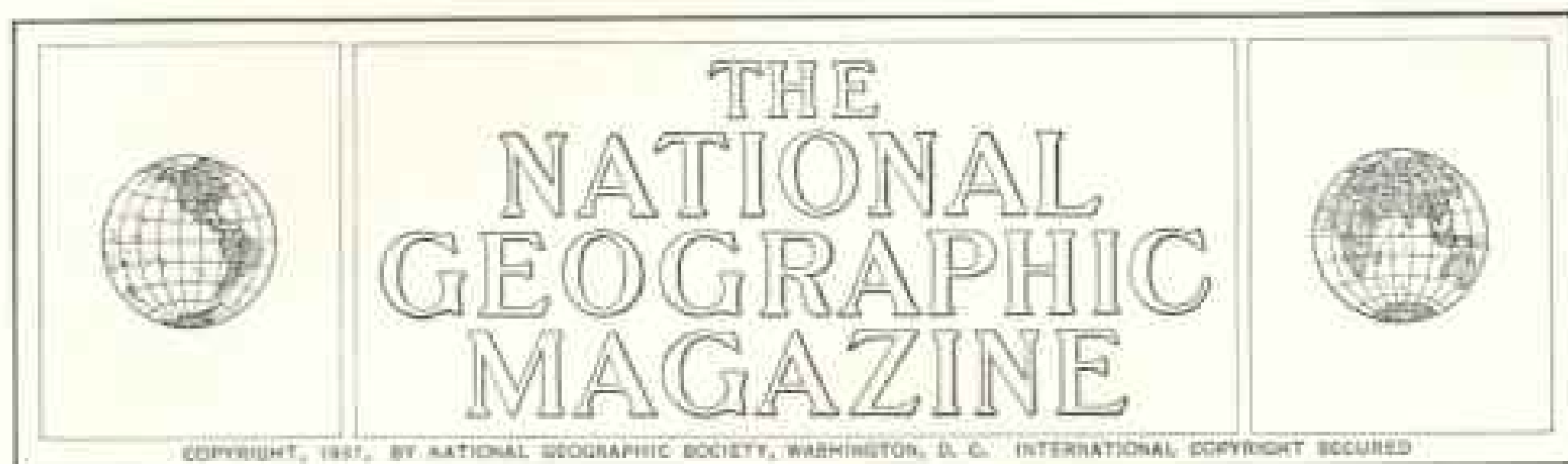
With 3 Illustrations

ANDREW H. BROWN

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WASHINGTON, HOME CITY AND SHOW PLACE To Residents and Visitors the Nation's Capital Presents Varied Sides as the City Steadily Grows in Beauty and Stature

BY LEO A. BORAH

*AUTHOR OF "UTAH, CARVED BY WINDS AND WATERS," "A PATRIOTIC PILGRIMAGE TO EASTERN NATIONAL PARKS,"
"WASHINGTON, THE EVERGREEN STATE," ETC., IN THE NATIONAL GEOGRAPHIC MAGAZINE*

TO MANY persons Washington is many things.

One friend of mine, a young printer, came here for a three-day visit and devoted the entire time to a study of the graphic arts display in the Smithsonian Institution, which covers the history of printing from the time of Gutenberg to the present.

Another had little interest in anything but the debates in Congress.

A third could not be lured away from the extraordinarily far-reaching and complete philatelic exhibit in the new Post Office Department.

Whatever the visitor's particular curiosity may be, the Nation's Capital seems to offer something to satisfy it.

Residents of Washington are amazed by the variety of sights their visitors wish to see. More news and photographs originate here than in any other city and pilgrims to the capital usually have their own ideas of where they would like to be taken. Showing the home folks the infinite variety of sights, scenes, and dignitaries is a major form of entertaining out-of-town guests.

Long propinquity has made Washington residents accustomed to the presence of the famous and near-famous. If a man prominent in public affairs grows weary of the adulation of hero-worshippers, he has only

to retreat to Washington to enjoy virtual anonymity.

A rather shy-appearing elderly gentleman used to walk past the headquarters of the National Geographic Society four times each day on his way to and from work. Among other pedestrians he passed unnoticed, though in most cities he would have attracted a queue. He was Andrew Mellon, then Secretary of the Treasury, the man who recently presented to the United States one of the finest collections of paintings and other works of art ever assembled, and added to the gift a \$10,000,000 gallery in which to display them! (Page 686.)

UNCLE SAM ANSWERS A MILLION QUESTIONS

People everywhere are familiar with the Government departments through the extension services that reach all parts of the country. For information on almost any topic within reason, one has only to call the proper office.

Thousands of students come here not only because of excellent universities and colleges but also because Government agencies and private institutions afford unparalleled opportunity for research. If it is necessary to ascertain the names, nature, or classification of rare species of flowers,

for example, they carry the question to the Department of Agriculture or to the United States National Herbarium, where an expert quickly supplies authoritative data.

If a question arises concerning trade practices in a foreign land, accurate information is available in the Department of Commerce. For human-interest material and statistics on other countries, there are the embassies and legations of those nations. The Library of Congress and the archives of the United States furnish a wealth of material on history. The National Bureau of Standards is a mine of scientific information. There is not a Government department that does not stand ready to help the serious inquirer. In this respect Washington is actually a great public research university.

My 11-year-old son, interested in collecting moths and butterflies, has been of late a frequent caller at the entomological laboratories in the National Museum. He comes home full of casual remarks about scientific classifications that are Greek to me.

It is not particularly comforting to me to know that on Plummer Island alone, a short distance up the Potomac, some 2,000 kinds of beetles have been found, but I do enjoy the flash of fireflies in the dusk of summer evenings and the bright colors of the more than 100 varieties of butterflies that flit about flower gardens.

WASHINGTON STILL HAS FRONTIERS

Almost everyone is amazed to discover how much really unspoiled natural country remains in the Nation's Capital. Near my home is a tract of perhaps a hundred acres of woodland and meadow where wild blackberries and strawberries grow, where coveys of quail scuttle to cover at anybody's approach, where youngsters of the neighborhood build concealed huts and defend them against all rivals.

The District of Columbia welcomes more than 300 species of birds each year, perhaps 150 of them casual or rare visitors, but many of them year-round residents. Since the passage of a protective law in 1932, the District has been a veritable wild-bird haven.

The bald eagle, the turkey vulture, the wood duck, the pheasant, the black-crowned night heron, the quail, the starling, several kinds of owls and hawks, and about 25 other birds are permanent residents.

Within the city it is not unusual to hear the song of a wood thrush or sight the bright flame of a cardinal.

Theodore Roosevelt listed more than 90 kinds of birds seen in the White House grounds or near by, and 17 of them nested there. Wrens, chickadees, finches, orioles, swallows, and sparrows are perhaps the most numerous, but bluebirds, cedar waxwings, juncos, golden-crowned kinglets, and even cuckoos are not uncommon.

A nighthawk recently passed a day on a limb near my office window in the NATIONAL GEOGRAPHIC headquarters building. Unfortunately a multitude of starlings have become a nuisance in recent years, driving away from favorite haunts many of the most popular native birds.

SOME FOUR-FOOTED RESIDENTS

There are five kinds of wild squirrels here, the gray fox squirrel and the red most numerous; also cottontail rabbits, woodchucks, muskrats, and chipmunks. Beavers and pine martens, which used to inhabit forested districts, are virtually gone, but occasionally a red or gray fox, a raccoon, or an opossum may be seen in woodland areas.

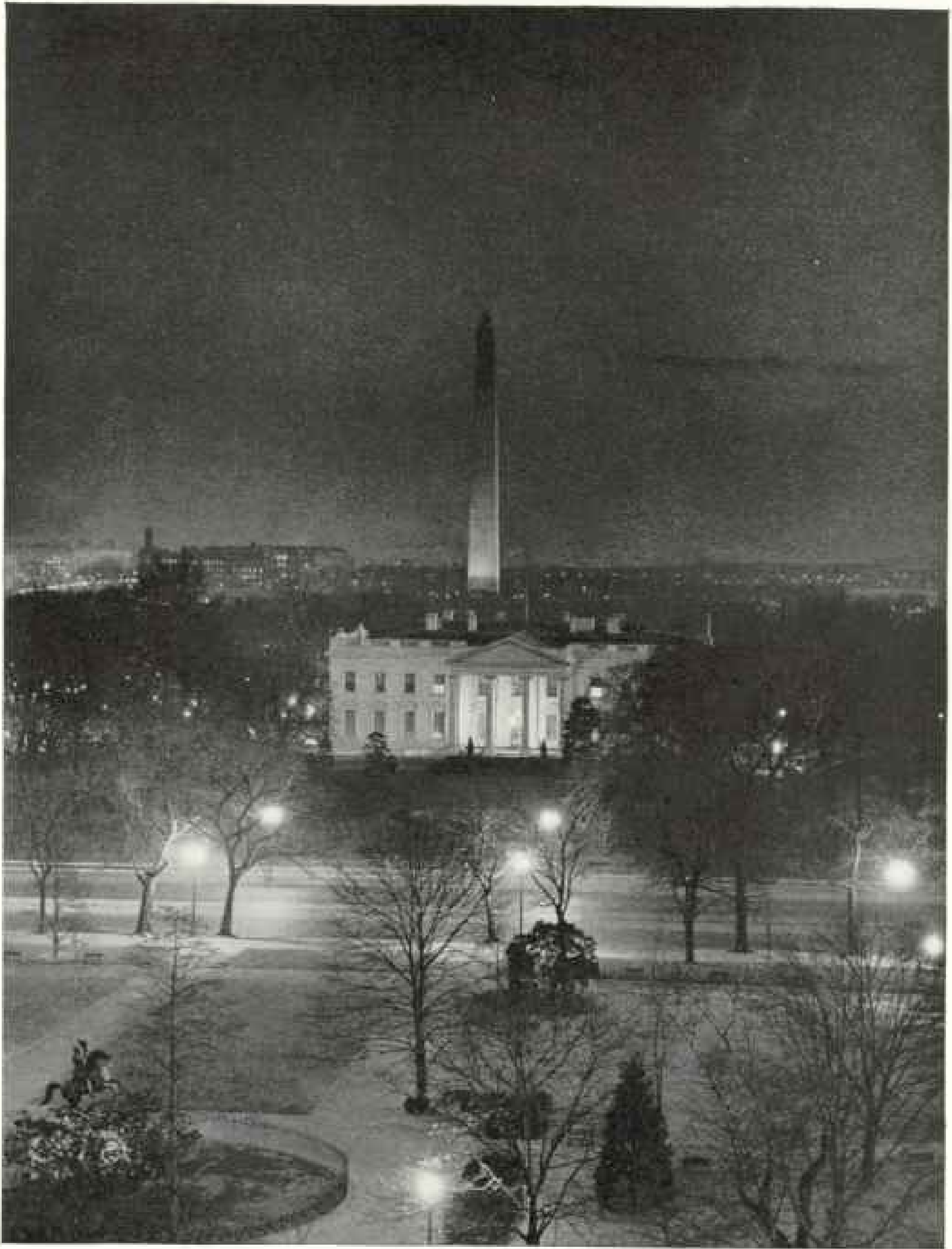
Of snakes the District has 23 kinds, only one, the copperhead, poisonous. It is a comparatively short time, however, since rattlers lurked in some of the wild blackberry patches. Children make pets of tortoises of several sorts which they find in the woods and parks.

Rock Creek Park is a constant source of delight, with its more than 1,800 acres of natural woodland and its pretty stream breaking into foam over scattered boulders. Here children go fishing for small fry for all the world as I used to do in the brook near my home in a small midwestern town.

I stood one afternoon on a rustic bridge that spans the creek and watched a half dozen boys pole a Tom Sawyer raft along the shallow stream, where legend reports Robert Fulton once tested a model of his *Clermont*, the boat that revolutionized navigation.

There are more than 30 miles of bridle paths in the park, and hiking trails climb cliffs and hills steep enough to give the enthusiast a taste of mountaineering. When motoring through this recreation area, one has choice of many winding roads totaling more than 25 miles.

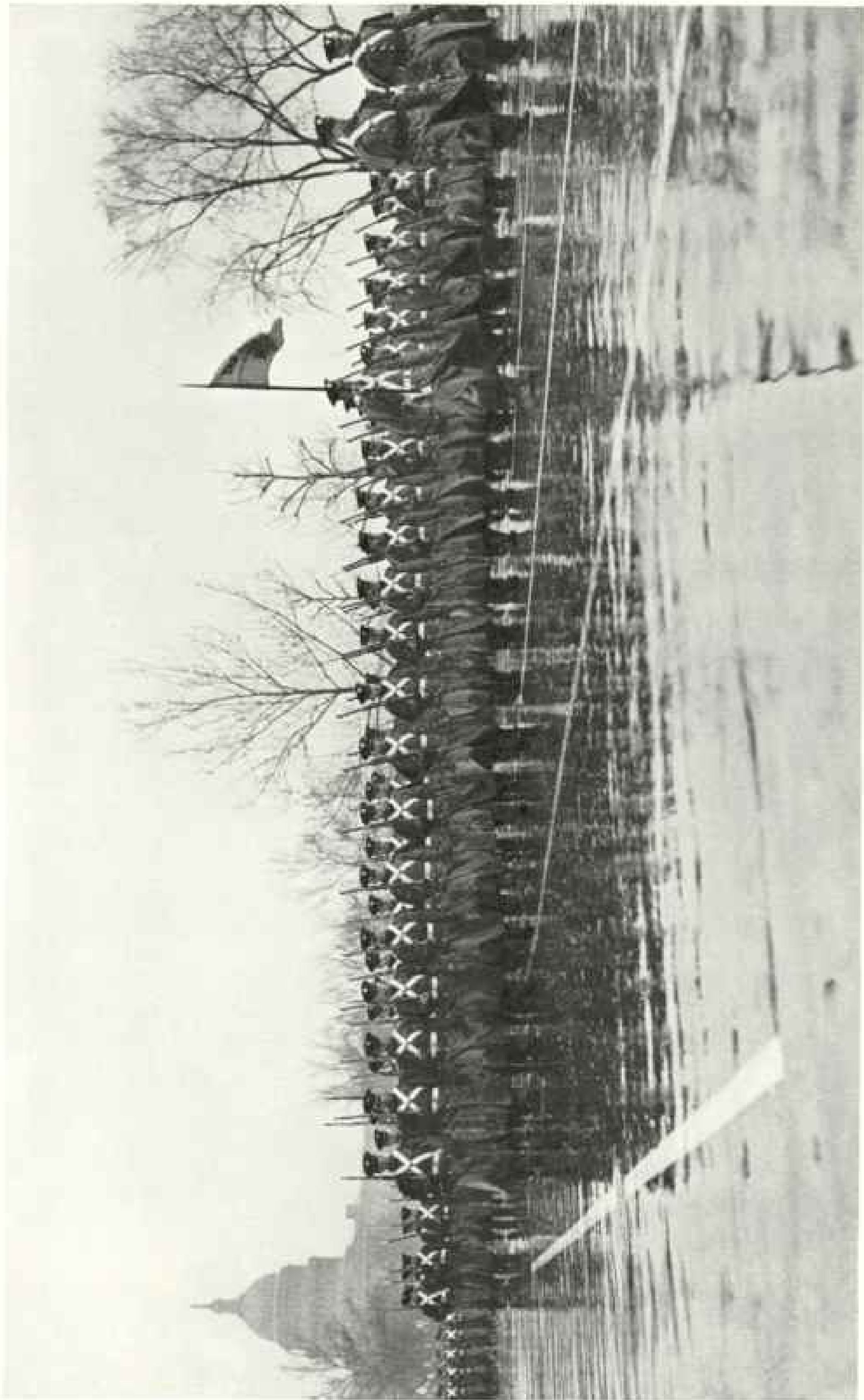
In one of the most restful spots in the park, old Pierce Mill has been restored



Photograph by J. Baylor Roberts

NIGHT SOFTENS THE OUTLINES OF THE WASHINGTON SCENE

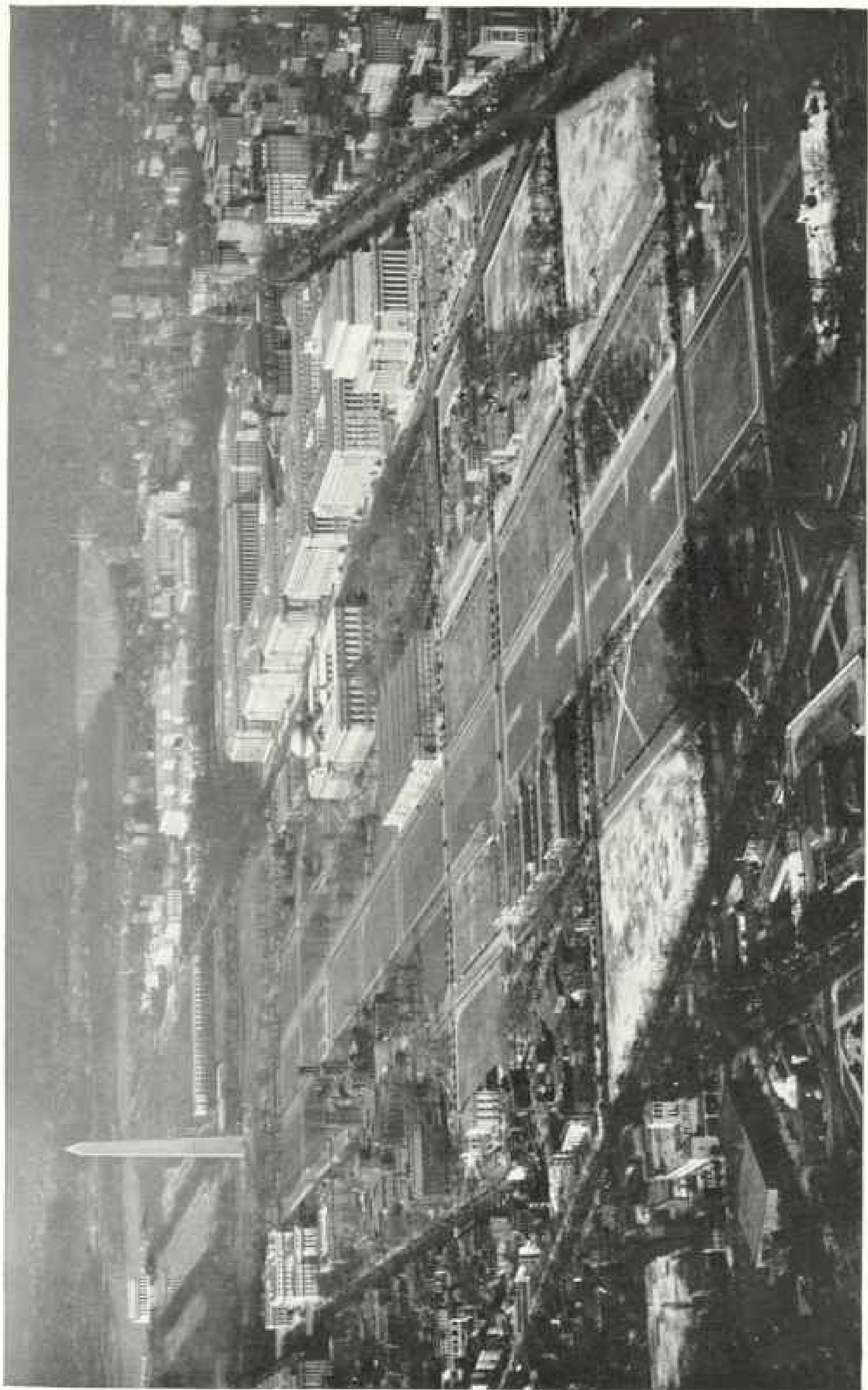
Expressive of the hospitality of the old South is the White House, glowing warmly in its setting of darkness and distant lights. The Washington Monument, beyond, seems a sentinel at attention. At the lower left "Old Hickory"—Andrew Jackson—doffs his campaign hat at the grandeur of the city he once called "a mudhole on the Potomac." This view across Lafayette Park shows the north portico of the Executive Mansion and the part of Pennsylvania Avenue where Presidents review inaugural parades.



Photograph by J. Bicylist Roberts

UNMINDFUL OF A DOWNPOUR, WEST POINT CADETS MARCHED IN THE INAUGURAL PARADE, JANUARY 20, 1937

Anticipating heavy weather, they brought along extra uniforms to don after the procession. Not so fortunate were the Midshipmen from the Naval Academy at Annapolis. They had to enjoy evening leave as best they could in wet garments. In ironic contrast to this first January Inauguration, the abandoned March 4 the same year turned out to be a perfect day!



Photograph by B. Anthony Stewart from Goodyear Almblyg Rehnstraf

FINEST OF "MAGNIFICENT DISTANCES" IN WASHINGTON IS THE MALL.

From Capitol to Lincoln Memorial and Arlington Memorial Bridge stretches a green expanse of park, about two miles long. The Apex Building of the Federal Triangle, the huge wedge of masonry at the right between Constitution and Pennsylvania Avenues, is now under construction (page 679). The Mellon collection of priceless works of art, presented to the Nation, will be housed in a magnificent new building to be erected on the spacious site just to the left of the Triangle's apex, on the same side of Constitution Avenue as the National Museum (with the dome). Low, temporary wooden buildings near by on both sides of the Mall will be eliminated.



Photograph by J. Bayler Roberts

THEIR FATHER IS A POLAR BEAR, THEIR MOTHER A KODIAK

So far as is known, the three hybrid cubs in the National Zoological Park are the only specimens of their kind ever born in captivity. Two of the healthy, mischievous little chaps here pose for a boxing match. The trio are great favorites with Washington children, who have named them Taku, Pokodiak, and Fridgee.

exactly as it was in the half century before 1897, when it closed down because a shaft was broken. A white-haired miller proudly superintends the grinding of corn and wheat, and the visitor may purchase water-ground cornmeal, or graham, whole-wheat, or white flour. The surplus is sold to the cafeterias in Government buildings.

ROCK CREEK TURNS AN OLD MILL
WHEEL

A little millrace diverted from Rock Creek rushes around a dam at the mill, turning an "undershot" wheel which operates by means of wooden cogwheels the time-worn buhrstones that grind the grain. Pierce Mill is the only survivor of eight operated by the stream in early days.

I had heard stories from my parents and grandparents about flour and meal they obtained by taking their grain to the mill and waiting while it was ground. Though I had no corn or wheat of my own to entrust to the miller, I watched him run some through the machinery and when he had finished it I bought a bag each of graham and cornmeal. The batter bread made from that

meal and the hot rolls from the graham convinced me that my pioneer ancestors did not suffer for want of good things to eat.

The National Zoological Park has been greatly enlarged and developed since 1925 by Dr. William M. Mann, who now is in Sumatra at the head of the National Geographic Society-Smithsonian Institution East Indies Expedition, obtaining new specimens. It ranks as one of the most extensive and interesting in the world.

Among the major attractions is the section devoted to bears; and in one of the cages, fighting and frolicking, are three of the most remarkable cubs that ever boxed each other's ears. Hybrids, they are believed to be the only ones of their kind yet born in captivity. The father is a polar bear, their mother a Kodiak brown bear.

In the up-to-date birdhouse and the flight cages near it live Andean condors and flightless cormorants from the Galápagos, besides hundreds of more familiar species. About 100 wild black-crowned night herons have made their permanent home near the largest flight cage, apparently to keep their captive relatives company.



Photograph by Harrison Howell Walker

A WARLIKE ADORNMENT OF THE OLD STATE DEPARTMENT BUILDING POINTS AT THE
WHITE HOUSE

The only menace, however, is in appearance; the cannon's fighting days are long since over. A brass 6-calibre smoothbore, it was made in Seville in 1777 and captured at Manila Bay. The anchor, by comparison, is new, dating only from 1885. The relics recall that this was long the State, War, and Navy Building; the State and War Departments still have their headquarters here. Across the street, uniformed policemen stand at the west steps of the White House, leading to the Executive Mansion and offices (right).

Separated from the public by glass screens in the reptile house—the last word in comfortable quarters for serpents—are cobras (six varieties), rattlesnakes, water moccasins, African puff adders, coral snakes, and other poisonous kinds. Boa constrictors, pythons, and anacondas live in compartments which resemble their habitats.

Several years ago when Dr. Mann and his colleagues were trying to obtain funds from Congress to develop the National Zoological Park, one of the keepers in the birdhouse trained a handsome myna bird from India to say, "How about the appropriation?" The bird was an apt pupil, and when the Congressional Committee arrived, it spoke its piece.

Someone laughingly replied, "So's your old man!" Since that time it has been possible to induce the bird to repeat the conversation: "How about the appropriation? So's your old man!" The efficacy of the myna's effort to obtain help for the zoo is attested in many handsome new buildings.

So far as possible the zoo displays other specimens in their natural surroundings. Flight cages contain miniature mountains and craggy heights; tropical animals are housed in realistic jungle scenes. It would take several days of wandering about the 175 acres of the park merely to see all the interesting creatures it contains.

MANY VISIT THE SOCIETY

Every year, thousands of the more than a million members of the National Geographic Society are shown through The Society's headquarters on 16th Street. They and a multitude of others come to see such varied exhibits as these:

A scale model of the gondola and the instruments used by Captains (now Majors) A. W. Stevens and Orvil A. Anderson in the stratosphere expedition conducted by The Society and the United States Army Air Corps in 1935.

Some of the bathysphere equipment with which William Beebe explored ocean depths a half mile down.

The flags flown by Admiral Byrd at both the North and South Poles.

The chronometer Sir Ernest Shackleton carried on his expedition of 1908-09.

Temple banners, and the robes, saddle, and trappings of a Muli king, brought from Chinese fastnesses by Joseph Rock.

A necklace of 2,500 hand-drilled turquoise beads unearthed at Pueblo Bonito,

New Mexico, by Neil M. Judd, and believed to be at least 1,000 years old.

Explorers' Hall, where outstanding pictures made by The Society's photographers in widely separated parts of the earth are on display.

Many are eager to learn about the processes employed in The Society's well-equipped laboratories which make possible the remarkable natural-color photographs used to illustrate *The Magazine*.

THE WHOLE CITY LOVES TO PLAY

Washington loves outdoor sports, and the city provides full opportunity for their enjoyment. In the public parks alone there are 89 tennis courts, 32 baseball diamonds, 10 golf courses, 35 horseshoe courts, 26 picnic groves, 23 playgrounds.

Among the recreational highlights are polo, the equestrian drills at Fort Myer, and the Army, Navy, and Marine band concerts held in Washington parks in summer.

A few weeks ago the National Botanic Garden displayed 1,700 azalea plants in full bloom. This show was followed by one of rhododendrons, together with Easter lilies, hyacinths, and other flowers. Under the direction of the Congressional Library and the office of the Architect of the Capitol, the Botanic Garden has gained recognition as among the finest in the world.

In one part of the new million-dollar building the visitor finds himself literally transported to the Tropics. Exotic plants from mysterious jungles thrive amazingly under scientific care. Here are the finest artificially grown specimens of the long-stemmed Peruvian plant from the fibers of which Panama hats are made, and dozens of rare anthuriums with leaflike flowers so weird as to seem figments of a dream.

Another room contains a bewildering collection of cacti, ranging in shape from the spherical bisnaga to the wandlike ocotillo, and in size from tiny spikes half an inch tall to 20-foot giants from the Southwest.

To the newcomer by train Washington is a delight, particularly if he has come from a crowded city of skyscrapers and industry. He steps out of the Union Station to look across a charming plaza to the Capitol. An elaborate fountain plays above a large reflecting pool, and he little suspects that beneath it lie a vehicular tunnel and a subterranean garage for 270 congressional automobiles (Color Plate VI).

Here is real spaciousness, room to

THE WASHINGTON OF TRADITION BUILDS FOR THE FUTURE



© National Geographic Society

Dufaycolor Photograph by J. Baylor Roberts

OPPOSITE THE TRIANGLE WILL RISE ANDREW MELLON'S GIFT TO THE NATION

This vista across the main entrance of the Archives Building and along Constitution Avenue toward the Capitol is soon to be enhanced by the National Gallery of Art, which, together with his priceless collection, the former Secretary of the Treasury has presented to his country. The new edifice will replace the frame structure of the city woodyard now occupying the site of the abandoned George Washington Memorial Auditorium (right).



© National Geographic Society

DuRaycolor Photograph by J. Baylor Roberts

THE PRESIDENT LEADS THE NATION IN HOMAGE TO THE HERO "KNOWN BUT TO GOD"

On every Armistice Day an impressive ceremony at the Tomb of the Unknown Soldier in Arlington National Cemetery recalls that historic November 11, 1921, when was buried here the body symbolizing to Americans the spirit of unselfish devotion. The narrow beat behind the bugler blowing taps is paced by a guard of honor from sunrise to sunset daily throughout the year.



© National Geographic Society

Dufaycolor Photograph by J. Bayler Roberts

PRESIDENT ROOSEVELT READS HIS ANNUAL MESSAGE BEFORE THE FIRST JANUARY OPENING OF A NEW CONGRESS—1937

Never before has the color camera recorded a joint session of Senate and House in the Hall of Representatives. Speaker William B. Bankhead and Vice President John N. Garner stand at the marble Speaker's desk behind the Chief Executive. Between the flag and the painting of Washington is the Speaker's mace, a silver-bound bundle of ebony rods surmounted by a silver globe on which perches a silver eagle. The portrait on the right is of Lafayette.



Dufaycolor Photograph by Willard R. Culver.

TO YOUNGSTERS THE REFLECTING POOL IS A "SEA" OF DELIGHT

Their toy yachts dot it in summer, and sometimes in winter their skates ring upon its frozen surface. More than a third of a mile long, and 160 feet wide, it mirrors at this end the classic Lincoln Memorial, at the other the Washington Monument.



© National Geographic Society

Dufaycolor Photograph by J. Baylor Roberts

THE COLOR CAMERA REVEALS HIGHLIGHTS OF MONEY MAKING

Of all Government buildings, the Bureau of Engraving and Printing, a room of which is here photographed for the first time in its natural lines, is one of the most popular with visitors. Currency printing is as fascinating as the dreams inspired by the untold wealth.

THE WASHINGTON OF TRADITION BUILDS FOR THE FUTURE



WASHINGTON AIRPORT RANKS FOURTH BUSIEST IN THE UNITED STATES

Though it is unpretentious, 64 planes arrive and depart from its runways daily. The large ship at the left is a 21-passenger unit of the Eastern Airways' "Great Silver Fleet," flying between New York and Miami. Overhead sails the Goodyear blimp *Enterprise*.



© National Geographic Society

Dufaycolor Photographs by J. Baylor Roberts

GEORGE WASHINGTON UNIVERSITY GIRLS PLAY HOCKEY ON THE ELLIPSE

One of the most popular recreation grounds of the city park system is this area in the south part of the President's Park. Public baseball diamonds and playing fields for other sports invite the athletic-minded out of doors.



© National Geographic Society

BENEATH THIS ELABORATE FOUNTAIN 270 CONGRESSIONAL CARS ARE PARKED

Color Photograph by Willard R. Colver

Visitors from other countries had often complained that automobiles along the curbs in the most interesting parts of Washington detracted from the beauty of the city. In Capital Park, between Union Station and the Capitol, the Government abated the nuisance somewhat by taking underground the streetcar track that formerly encircled the Senate Office Building and providing a sub-street-level garage for the use of those "on the hill."



© National Geographic Society

UNION STATION AT ITS PLAZA OFFERS GRACIOUS WELCOME TO VISITORS

Dufaycolor Photograph by Willard R. Calver

Washington presents to the traveler arriving by rail a delightful first appearance. From the main entrance there is an unobstructed view of the Capitol across the green vista of Capital Park, with its handsome fountain, pool, and shrubbery (see opposite page). The monument near the flagpoles is the Christopher Columbus memorial.



© National Geographic Society

Truycolor Photograph by J. Taylor Roberts

"WHEN WE ASSUMED THE SOLDIER, WE DID NOT LAY ASIDE THE CITIZEN"

No speaker on this Armistice Day program in the Memorial Amphitheater in Arlington National Cemetery voiced a truer interpretation of American idealism than these words carved above the stage. Built through efforts of the Grand Army of the Republic to establish a fitting memorial to the country's soldier dead and to provide an appropriate assembly place for Memorial Day services, the white marble structure typifies the sentiment of patriotism. There are seats for 5,000 persons on the stone benches set on the circular floor and standing room for 2,000 more in the colonnades.

breathe. The sky is clean. There are no skyscrapers thrusting spear heads at it. The jesting description of early-day Washington as "a city of magnificent distances" can now be considered only a deserved compliment.

True, the curbs in many parts of the city are lined with homeless automobiles, for the parking problem in Washington is acute. There is one automobile here to every three inhabitants (Detroit has one to five; New York one to eight) and 75,000 cars are regularly parked in the streets all night.

Government offices, open from 9 to 4:30, spill forth such numbers of employees that even Washington's wide streets are taxed; the city has no subways—except the tiny "Senate subway" for taking Senators from office to Capitol.

Some measure of relief has resulted from the staggering of working hours for different groups of employees. Yet every work-day afternoon, as early as 4 o'clock, Constitution Avenue, widest and most open street in the Government office district, is clogged with cars from Pennsylvania Avenue to the Potomac; and one can imagine the multitude that jams the streets when the thousands of workers pour out of the great buildings of the Triangle (page 667).

Streetcars and buses are packed, and throngs block the sidewalks where they await some means of transportation to their homes. I have seen a United States Senator hanging to a bus strap, glad to be moving and not sitting in his automobile behind a traffic jam.

RAPID CHANGES IN THE LAST DECADE

Washington has changed so rapidly in the last decade, through a \$200,000,000 Government building program, that even those of us who have lived here continuously have had difficulty keeping track of the shifting scenes.*

The problem faced by the Commission of Fine Arts and the builders of the new Washington is twofold. In carrying out the plan of 1901, worked out to incorporate virtually all that was feasible in Major L'Enfant's original plan, they are striving to produce the most beautiful capital in the world and at the same time to provide suitable quarters for the ever-increasing bureaus of the Federal Government.

* See "Wonders of the New Washington," by Frederick G. Vosburgh, in *THE NATIONAL GEOGRAPHIC MAGAZINE* for April, 1935.

To erect a truly graceful building large enough to house the thousands of employees of one of the major departments, such as Commerce, Interior, or Agriculture, is a task so difficult as to challenge the most skilled architects. There must be hundreds of offices, all with outside windows; no gloomy medieval castles will prove satisfactory. Hugeness is a physical necessity, grace an artistic obligation.

TRIANGLE COVERS TWENTY BLOCKS

To their everlasting credit, the architects who have designed the new edifices have mastered seemingly impossible difficulties. The Federal Triangle, where are concentrated more official activities than in any other capital, covers an area of about twenty city blocks from its 15th Street base, the enormous Department of Commerce Building, to its Sixth Street tip, the Apex Building, which is to be occupied by the Federal Trade Commission.

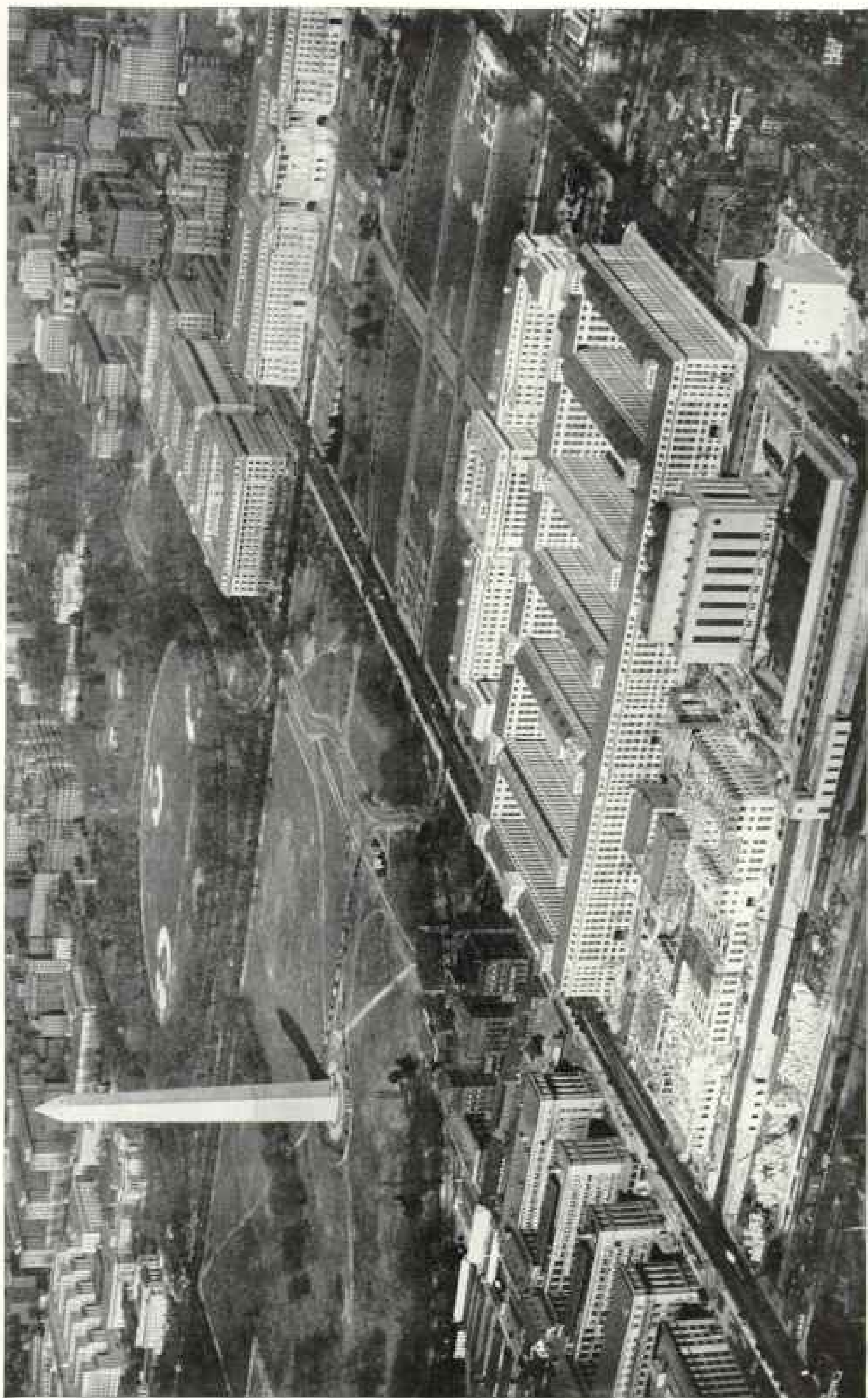
Within the nine buildings of this group are offices for more than 25,000 Government employees; yet, despite the vastness of the structures, the development has genuine architectural attractiveness and dignity.

Fortunately L'Enfant planned a Federal City with room to expand. Even the largest edifices can be made to look graceful if surrounded by grounds sufficiently spacious, and the new buildings are so framed by pleasant parks and plazas that they escape the charge of crowded awkwardness.

With its new south extensible section, the Department of Agriculture Building has become the largest government office structure in the world, housing in its 4,292 office quarters 6,450 employees; yet even in such a commodious building only about a third of the Department's Washington personnel can be brought together.

Constant expansion of activities requires an increase in Government office forces too rapid to be taken care of in any single structure, even though it be extensible by merely adding wings and be placed, as is this, in a 35-acre park (page 680).

Latest of the new structures to be occupied is the new Interior Department Building, into which some 3,000 workers recently moved. Designed by Waddy B. Wood, in consultation with Secretary Harold L. Ickes, this building departs somewhat from the classical style of its neighbors. No pillars adorn it, but setbacks providing outside walls for its many wings



Photograph by B. Anthony Stewart from *Goodyear Airship Reliance*

IMAGINE THIS SCENE AT OFFICE CLOSING TIME!

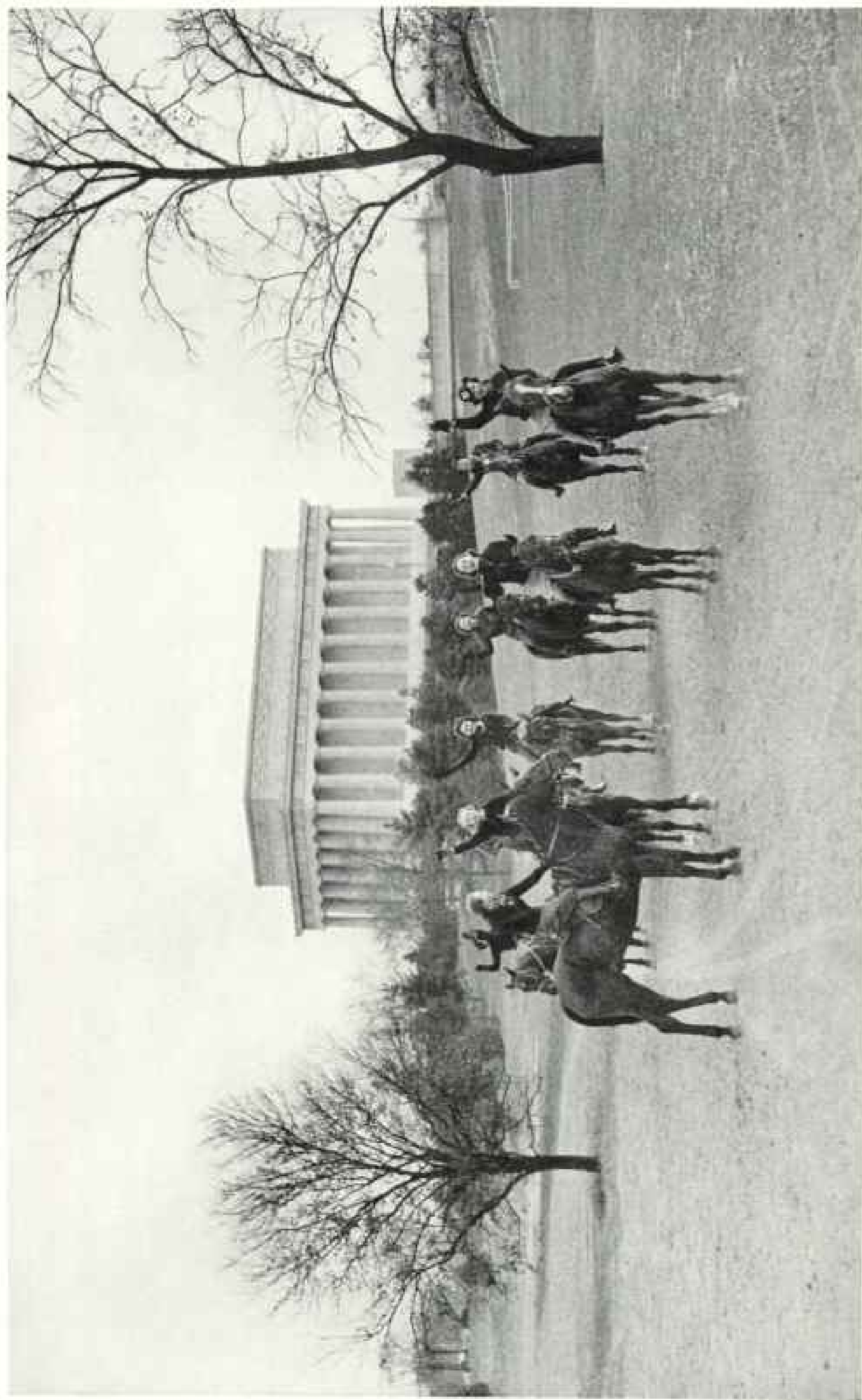
Largest government office building in the world, the Department of Agriculture (center) shelters 6,450 employees. Beyond the Mall to the right of the Ellipse is the Commerce Department, with the Labor Department-Interstate Commerce Commission just across the street from it. In the extreme upper center appears the White House. In the upper left corner are the new offices of the Interior Department. The new Central Heating Plant, with long strip-like windows, rises in the foreground. Smoke from its three stacks is electrically dry-cleaned. At the lower left is the Bureau of Engraving and Printing, with its new annex under construction.



Photograph by J. Taylor Roberts

SOME 2,000 CARS AWAIT THEIR OWNERS, AT WORK IN THE NEW GOVERNMENT BUILDINGS OF THE "TRIANGLE"

Bordered in the background by the Department of Commerce Building and on the left by the home of the Labor Department, this open area on 14th Street helps to solve the parking problem. It forms a hollow in the base of the giant wedge of new Federal structures and later will become a landscaped park.



Photograph by J. Baylor Roberts

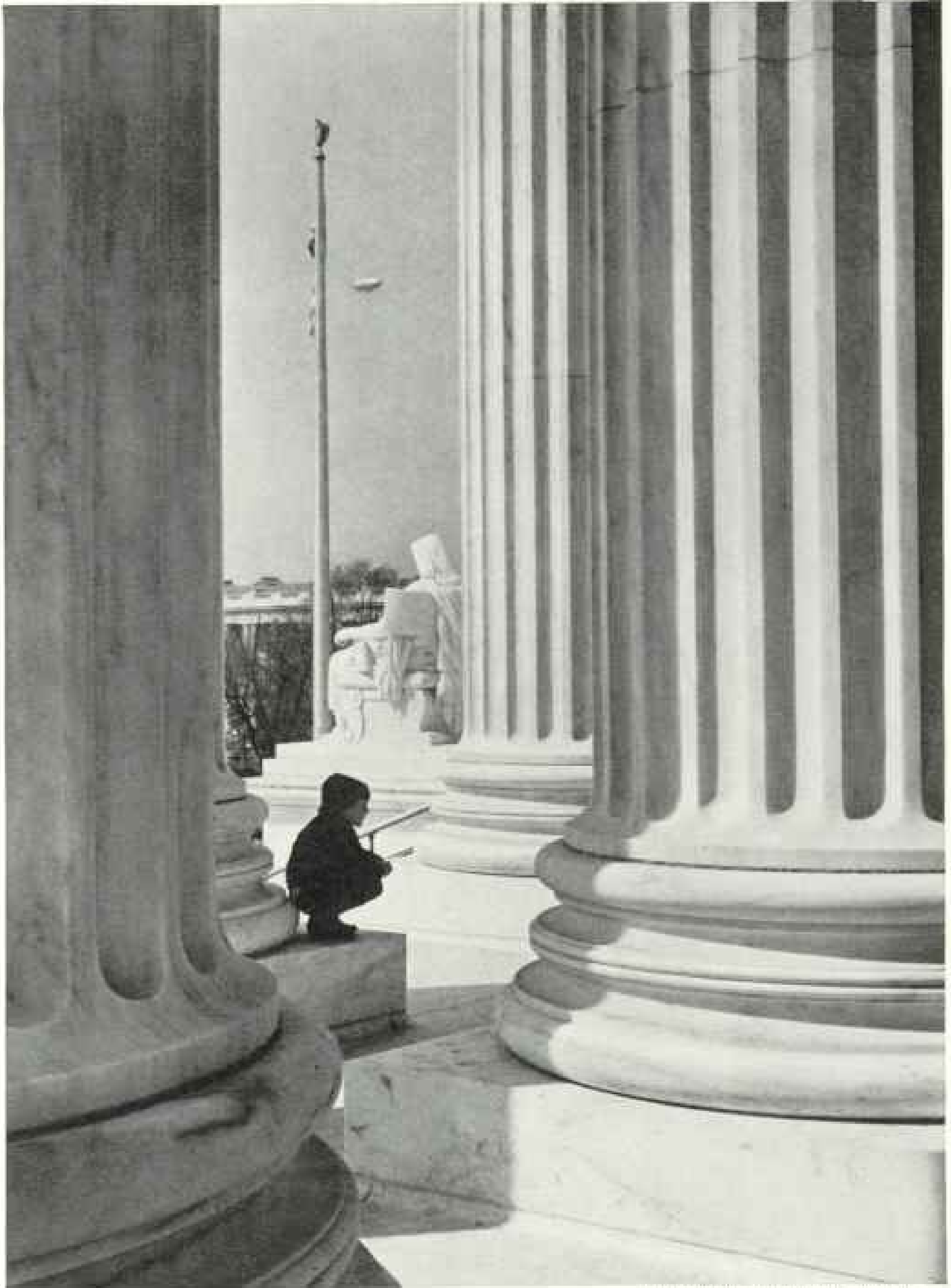
LIGHT-HEARTED YOUTH GOES FOR A CANTER IN POTOMAC PARK

Near the river and the Lincoln Memorial a gay party of equestriennes enjoys a ride on a frosty morning. There are 52 miles of bridle paths in the public recreation areas of Washington, and horseback riding is highly popular. Across the Potomac, in Virginia, fox-hunt parties attract Columbia enthusiasts for the sport.



Photograph by Walter M. Edwards

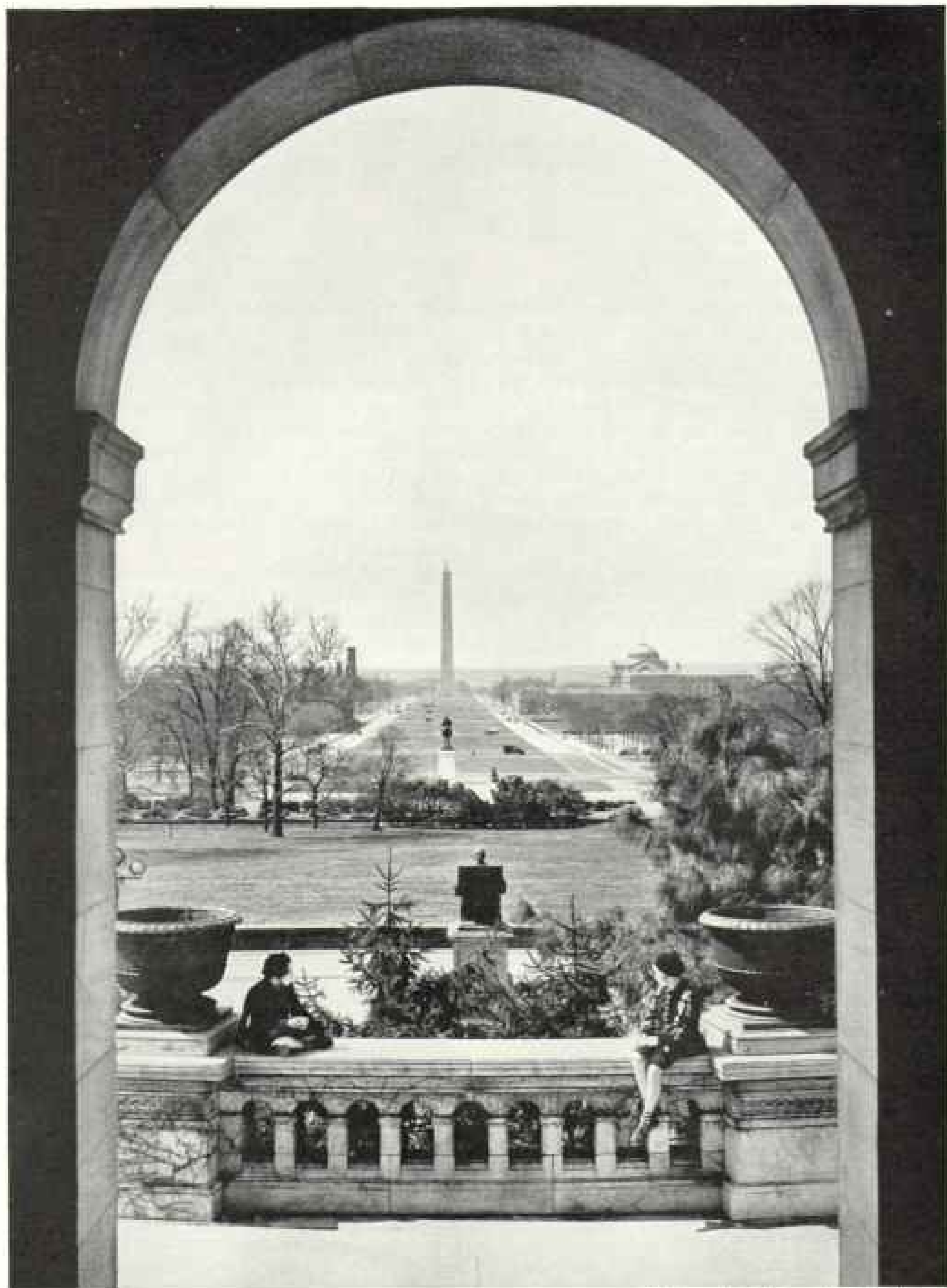
JAPANESE CHERRY BLOSSOMS FLING AN APRIL GARLAND OF LOVELINESS AROUND THE TIDAL BASIN



Photograph by Harlan Howell Walker

A NEW GENERATION CONTEMPLATES THE SUPREME COURT'S PARTHENONESQUE COLUMNS

This entrance, which faces the Capitol, is flanked by allegorical statues by James E. Fraser; the one glimpsed in the background portrays a woman meditating upon the problems of justice; the other, not shown here, depicts a male figure girl to execute laws. Above drifts the blimp from which some of the accompanying photographs were made (pages 687 and 680).



Photograph by Harrison Howell Walker

A GENERAL AND A JURIST GAZE DOWN THE VERDANT MALL.

Near the center of the picture framed by an archway of the Capitol stands an equestrian statue of General Grant. On the pedestal in front of the balustrade the seated figure of Chief Justice Marshall appears. Much of the area beyond and to the right of the Grant statue recently has been cleared of unsightly buildings and transformed into park, making possible this striking vista.

give the appearance, at a distance, of Doric columns. Between it and the old Interior Building is Rawlins Park, now being developed as an elaborate plaza. The two structures are connected by a lighted tunnel.

It is the pride of the planners that every clerk in the new Interior Department Building will have light from an outside window, a rather remarkable feature in view of the fact that the structure covers more than five acres of ground.

This gray stone giant, just north of the marble edifices that form the frame for the Lincoln Memorial, is the first Government office building to be equipped with electric stairways. Two of these have been installed to carry passengers between the C Street and E Street levels and to relieve congestion during the rush hour when lunch is being served in the big cafeteria in the basement. Besides the moving stairs there are 20 high-speed elevators and 11 complete stairways. Like others recently constructed, the building has a completely automatic air-conditioning system. Eventually it will contain 3,500 people.

With such a corps of workers the structure becomes virtually a city within a city. It has a telephone system now handling 2,200 main lines and 1,100 extensions. At a peak, 2,600 main lines can be served. The system is equivalent to one serving a city of 30,000.

Along the north side of broad Constitution Avenue, across from the Munitions Building, stand the white marble edifices described by the Commission of Fine Arts as the frame for the Lincoln Memorial. Erection of a home for the Federal Reserve Board between 20th and 21st Streets completes this composition, and when eventually the temporary buildings, result of war-time haste, are removed, one of the major dreams of L'Enfant will be realized.

GUARDIANS OF A NATION'S HEALTH

Other splendid buildings in this "frame" are those occupied by the National Academy of Sciences, the Public Health Service, and the Pharmaceutical Association. Plans for an annex to the Pan American Union have been prepared.

Although a short sight-seeing tour seldom includes a trip through the Public Health Service, that bureau is one that will richly repay a special visit. Within its laboratories men are constantly at work, seeking out causes of diseases that menace life.

Here Dr. Edward Francis discovered the

nature and origin of tularemia, or "rabbit fever." Here he is now conducting a study of intermittent fevers. He has exposed himself to the bacteria of so many diseases that it seems a miracle that he still lives. Other earnest scientists are his colleagues. They work tirelessly, risking their own lives for the safety of others.

MASTERPIECES COME TO WASHINGTON

Andrew Mellon, former Secretary of the Treasury, in presenting to the Nation his collection of art, together with a \$10,000,000 building to house it, made a gift valued by experts at probably \$50,000,000. For a site, the location across Constitution Avenue from the Apex Building has been chosen (Plate I and p. 667). Mr. Mellon's magnificent gift is not to bear his name, for he has asked that it be called the National Gallery of Art, administered by a board of trustees with the title vested in the Smithsonian Institution.

Through a lifetime of study, Mr. Mellon, who celebrated in March of this year his 82d birthday anniversary, has acquired a deep and thorough knowledge of art. His selection of pictures reveals a most discriminating taste, and his gift's esthetic value to the Nation is hardly to be estimated.

Among the outstanding masterpieces are two unchallenged Raphaels, the *Alba Madonna* and the *Niccolini Madonna*; the exquisite *Toilet of Venus* by Titian; Botticelli's *Adoration of the Magi*; the *Old Lady Seated in an Armchair* by Rembrandt; Van Eyck's *Annunciation*; Velásquez' *Woman Serving*; and magnificent sculptures by Donatello and Pisanello. Some forty of the greatest artists in history are represented.

The *Alba Madonna*, painted in Rome in 1510, hung for many years in a convent in Naples, whence it passed successively to a Spanish viceroy, the ducal house of Alba, a London banker, and the Hermitage collection at St. Petersburg (Leningrad). Procuring what critics pronounce a bargain, Mr. Mellon bought it for \$1,166,400. It depicts the Virgin, the Infant Christ, and Saint John in an open field, the baby saint offering the Sacred Child a toy cross.

For the *Niccolini Madonna* the price Mr. Mellon offered Lady Desborough of Hertfordshire was \$875,000. This conception of the Holy Mother and Child is tenderly human, the Virgin wearing a rose-red robe with yellow-green undersleeves and over it a blue mantle (in the hem of which is embroidered the artist's signature), and a

THE WASHINGTON OF TRADITION BUILDS FOR THE FUTURE



SPEEDBOATS ROAR ON THE POTOMAC IN THE 1936 PRESIDENT'S CUP REGATTA.

Off Hains Point the historic river affords an excellent course for these annual races. September sunlight gleams on the rippling water and intensifies the flashing colors of the flag-decorated shores, where thousands of spectators gather to watch the thrilling spectacle.

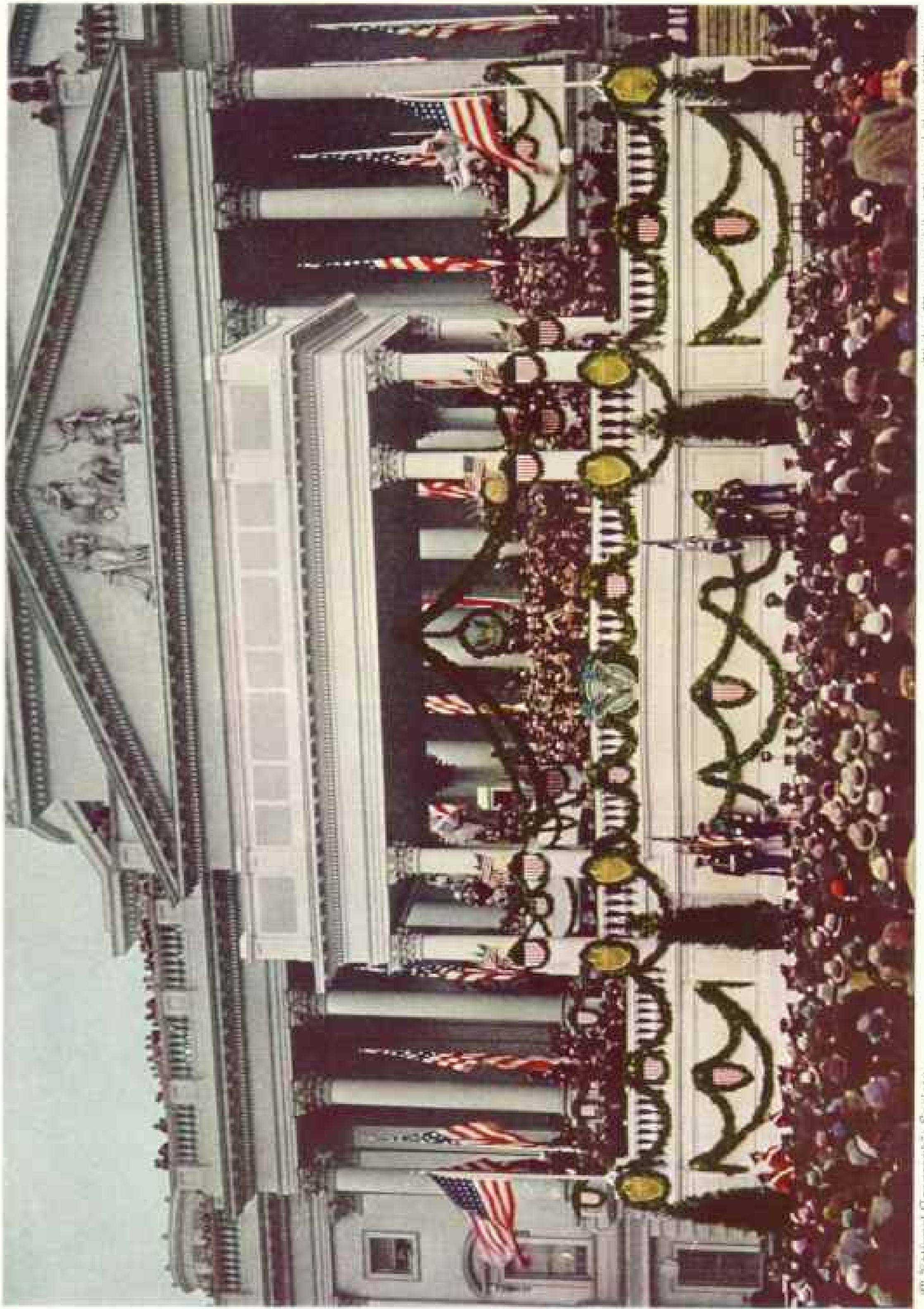


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Dufaycolor Photograph by J. Haylor Roberts.

GIRL CONTESTANTS BRAVE THE POTOMAC IN COCKLESHELL BOATS

If the outboard motors do not become temperamental, the tiny craft dart around the course like water bugs. There are no special events for women on the Regatta program, but in 1936 one feminine competitor, Miss Molly Tyson, won a handicap race.



© National Geographic Society

Vicinity Photograph by Marjard Owen Williams

NATURE SMILED ON PRESIDENT ROOSEVELT'S FIRST INAUGURATION, MARCH 4, 1933, THE LAST TO BE HELD IN MARCH. The vast throng that stood this year before the temporary rostrum in front of the Capitol to hear his second inaugural address was drenched.



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ARMED WITH EGGS, CHILDREN STORM THE WHITE HOUSE LAWN EVERY EASTER MONDAY

Usually the First Lady makes a little speech of welcome from the balcony, and sometimes the President comes out for a word of greeting. The living quarters of the Chief Executive and his family are on the second floor. State functions are conducted in the famous rooms below.



© National Geographic Society

JEFFERSON HANDS THE DECLARATION OF INDEPENDENCE TO JOHN HANCOCK IN THIS PAINTER MURAL ARCHIVES BUILDING

Dufaycolor Photograph by J. Dwyer Roberts

The famous personages represented are: left to right, front row, Robert Morris, Samuel Chaut, Charles Carroll, Stephen Hopkins, Samuel Adams, Thomas McKean, John Dickinson, Abram Clark, William Ellery, John Witherspoon, John Hancock, Benjamin Harrison, Samuel Huntington, Thomas Jefferson, Roger Sherman, John Adams, Robert R. Livingston, Benjamin Franklin, Richard Henry Lee, Thomas Nelson, Jr.; back row, Joseph Hewes, Edward Rutledge, Lyman Hall, Josiah Bartlett, Thomas Stone, Francis Hopkinson, George Wythe, and William Floyd.



© National Geographic Society

PAULKNER PRESENTS A LESSON IN HISTORY AND PATRIOTISM IN THE ARCHIVES MURAL, "THE CONSTITUTION OF THE UNITED STATES."

Makers of the Nation represented are: left to right, front row, Edmund Randolph, Nathaniel Gorham, John Dickinson, John Rutledge, James Wilson, Oliver Ellsworth, Charles Pinckney, James Madison, Elbridge Gerry, William Samuel Johnson, George Mason, George Washington, Benjamin Franklin, Rufus King, William Paterson, Charles Cotesworth Pinckney, Gouverneur Morris, Alexander Hamilton, George Read; back row, William R. Davie, John Langdon, Luther Martin, Roger Sherman, Gunning Bedford, Jr., and Abraham Baldwin.

Daylighter Photograph by J. Dwyler Roberts



© National Geographic Society

Defaycolor Photograph by Lutz Marden

AFTER THREE QUARTERS OF A CENTURY THE SPIRIT OF '61 STILL LIVES

When the thinning ranks of the Grand Army of the Republic marched in Washington in September, 1936, many spectators predicted sadly that the "Boys in Blue" would never parade again; but the veterans went ahead with plans and voted to meet in Madison, Wisconsin, in 1957. The drummer "lad" is R. D. Parker, Downers Grove, Illinois; the flagbearers from Ohio are, left to right, Henry F. Russell, Alliance; Frank S. Morris, Chardon; and W. H. Little, Canton.



Defaycolor Photograph by J. Taylor Roberts



Friday Photograph by Linn Marden

ALL WASHINGTON LOVES A PARADE—HAIL TO THE SHRINERS IN 1935!

As the brilliant units of the procession march along Pennsylvania Avenue past the new Archives (left background), Department of Justice, and Internal Revenue Buildings, throngs almost as great as an inaugural crowd greet them. Elaborate grandstands, covered and uncovered, offer seats at prices that would give pause to a theater "first-nighter."

© National Geographic Society



Photographer Photograph by J. Taylor Roberts

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CHILDREN OF 23 FOREIGN EMBASSIES AND LEGATIONS, SOME IN NATIVE COSTUMES, WISH MERRY YULETIDE TO THE WORLD. They are broadcasting the Fifth International Children's Good-will program in their own languages December 21, 1936. Sakiko, daughter of the Ambassador of Japan, Hiroshi Saito, standing at the microphone, was Queen of the Blossoms in the cherry-blossom festival in April, 1937.

playful child symbolizing the Infant Jesus.

Besides the *Old Lady Seated in an Armchair*, the list includes several other Rembrandts, among them the *Death of Lucretia*, often described as the canvas "painted in gold"; a splendid *Self Portrait*, depicting the Dutch master in 1659 when trouble had put its lines upon his face; and a *Portrait of a Young Man*, dated 1662.

Frans Hals is represented by a number of pictures, of which probably the best known is the *Portrait of an Old Lady with a Prayer Book*. This sympathetic interpretation of serene old age is signed under date of 1633.

Mr. Mellon has expressed the wish to have his art treasures displayed in a building so comfortably arranged and fitted that visitors will not suffer "museum fatigue," and with this idea in mind the architect, John Russell Pope, has designed a perfectly lighted edifice of spacious halls, with numerous seats where guests may rest while looking at the displays.

Any discussion of Washington art treasures must include at least mention of the Corcoran Gallery of Art, the Phillips Memorial Gallery, the Freer Gallery of Art, and the National Collection of Fine Arts, formerly the National Gallery of Art. All are distinctive. In the Phillips Gallery the pictures are hung as they would be in a home.

THE CITY OUTGROWS ITSELF

Washington circles, parks, and plazas are adorned with many memorials, some of outstanding artistic merit. For those interested in sculpture and other decorative arts, the city offers a field for months of study.

Washington finds itself changed since the World War from a rather sleepy southern town to a bustling metropolis. When bureaus grow, as the Internal Revenue has, from 2,000 people to 10,000 in ten years, it becomes necessary to provide homes and office space for them.

For nearly a century and a half the dream of L'Enfant of a perfectly planned Federal City has been progressing toward fulfillment. It is still far from complete, may never reach accomplishment in this generation; but as interpreted by the plan of 1901 it assures a Washington growing in beauty as well as stature.

Aside from the official part of Washington, which belongs of a right to the Nation, there is a familiar part which endears the city to its inhabitants. They are not pro-

vincial folk so far as their present place of residence is concerned. Perhaps the majority of them are "exiles in a foreign land," reserving their provincialisms for "back home."

The population includes 112,000 Government employees, many of whom are more or less transients here, though thousands devote their lives to the Government service. Only about 8,000 persons are employed in industry. In view of these facts, it is easy to understand why there is so little of vaunting local pride, so much of nostalgia for the Pacific coast, the Middle West, the South, the Northern and Eastern States.

Virtually every Commonwealth of the Nation is represented by a State society in Washington. These organizations conduct social affairs at which opportunity is afforded for back-home folk to get together. As the city is a show place of national activities, its population is a cross section of the people of the United States. Practically every civilized nation is represented by a diplomatic delegation.

For those of us who claim Washington as our home, the city has a definite appeal not in any way connected with the political generations that come and go.

Since we cannot vote, we have no active part in political affairs. Administrations change, but the changes affect us little save by taking away friends and bringing in strangers with whom we soon become acquainted.

WHAT A WASHINGTONIAN REMEMBERS

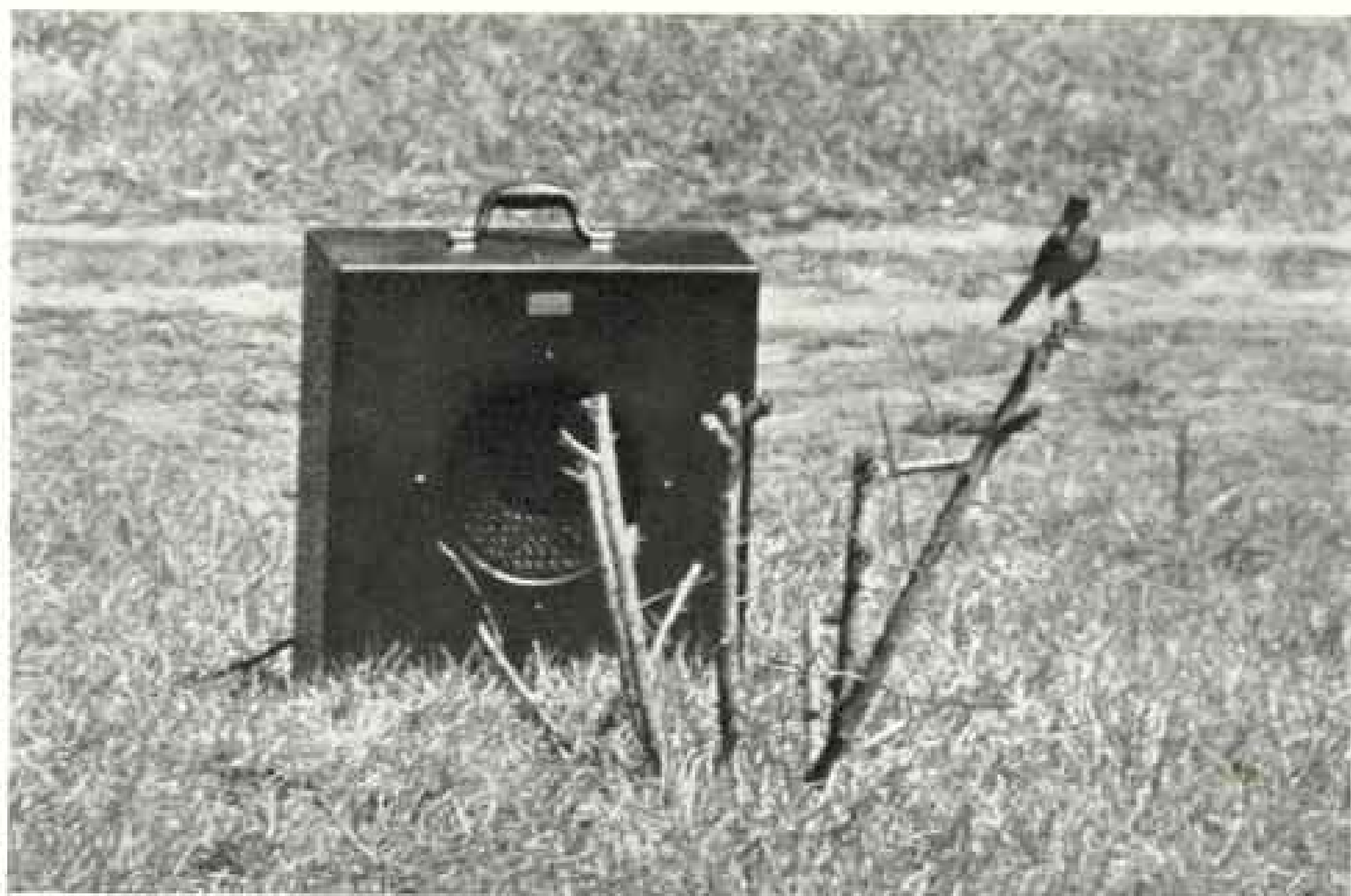
If I should leave Washington, I suspect that some of the less important bits of experience here would linger in my memory longer than important public events.

These things should I remember always: negroes dancing in the street on Halloween; the glow of flowers on green lawns; the easy drawl of a speech neither truly southern nor yet of the north; the flash of a cardinal in the trees of a park; the song of a warbler beneath my office window; the lights of the city as I approached it from Arlington over the Memorial Bridge; fireworks in the Washington Monument grounds; the worn old leather chairs brought by Supreme Court Justices to their new marble temple; the mauve of fading light on the Japanese cherry blossoms, and, most precious of all, the somber glory of the Lincoln Memorial darkling above its image in the reflecting pool.



A GOLDEN EAGLE SCREAMS AT THE MICROPHONE

Contrary to popular belief, these eagles are shy birds and only because of their extreme wariness have they been able to persist in most parts of the Rocky Mountain region. Usually they nest on inaccessible ledges, but occasionally in the tops of tall trees. Their outcry is rather disappointing. This youngster has only recently left the nest (page 712).



A PUZZLED MOCKINGBIRD SEEKS A RIVAL IN A LOUD-SPEAKER

The bird heard his own voice, which had been previously recorded, coming out of the instrument, and, thinking it an interloper in his territory, darted at the offending case to drive it away. Round and round he fluttered, hunting for the other bird, until finally, completely flabbergasted, he stood thus—with his bill open, yet not daring to sing (page 699).

HUNTING WITH A MICROPHONE THE VOICES OF VANISHING BIRDS

BY ARTHUR A. ALLEN

Professor of Ornithology, Cornell University

With Illustrations from Photographs by the Author

ALMOST within the memory of men still living, four species of North American birds have become extinct. In our museums will be found the dried skins or mounted specimens of the great auk, the Labrador duck, the passenger pigeon, and the heath hen. The Carolina parakeet seems about to follow them.*

Until only a few years ago, the tooting of the heath hen could be heard each spring on the island of Martha's Vineyard, but the thought of preserving its voice, in addition to its photographic image and stuffed effigy, never entered anyone's mind.

Yet there are many Nature lovers, interested in the living bird as well as in its plumage and classification, who would like to know what sounds it made when it inflated the tiny balloons on the sides of its neck and stamped its feet and flirled its tail.

They would like to know what sounds were made by the millions of passenger pigeons described by Audubon and Wilson as darkening the sky for hours at a time. They would like to listen to the call of the Labrador duck and the other species that are gone forever.

And today there are other birds, still living, which seem unable to compete with the march of civilization and which our children may know only as museum specimens. Should not their voices be preserved before it is too late?

As we were talking this over one winter evening when I was beginning to plan a sabbatical leave from the University, my good friend Albert R. Brand suggested that

*These ill-fated species have been described in detail in previous issues of THE NATIONAL GEOGRAPHIC MAGAZINE. The Passenger Pigeon and the Heath Hen (under Prairie Chicken) were included in "Game Birds of Prairie, Forest, and Tundra," by Alexander Wetmore, in The Magazine for October, 1936; the Carolina Parakeet in "Parrots, Kingfishers, and Flycatchers," by Dr. Wetmore, June, 1936; the Great Auk in "Birds of the Northern Seas," by Dr. Wetmore, January, 1936; and the Labrador Duck in "Far-Flying Wild Fowl and Their Foes," by Maj. Allan Brooks, October, 1934.

a worthwhile undertaking would be the all-time preservation of the voices of vanishing birds.

The idea grew, and soon we had a hunting expedition well in mind—an expedition which would leave guns at home and would "shoot" the birds with cameras, microphones, and binoculars; its object: specimens of bird voices preserved on film, with such photographs, motion pictures, and field observations as would elucidate the habits and appearance of the living birds and determine better methods for their conservation.

The American Museum of Natural History, of which Mr. Brand is an Associate in Ornithology, approved of the project; the National Association of Audubon Societies gave us its blessing; Mr. Duncan Read loaned us additional motion-picture cameras; and the Brand-Cornell University-American Museum of Natural History Ornithological Expedition was born.

BIRD VOCALISTS PROVE TEMPERAMENTAL

We had already had opportunity to learn something of the work we were undertaking. Not long after the first sound pictures appeared on the screen about ten years ago, an attempt was made by a well-known motion picture company to obtain a film release of singing birds as a demonstration of the quality of its sound-recording cameras.

It is one thing, however, to invite an opera singer to step before the microphone and quite another to order a wild bird to do the same thing. For nearly two weeks two of their best operators, equipped with a sound truck, struggled with the problem, but just as they got their cameras and microphones into action the singing birds flew away.

Finally, patience exhausted, they came to our Laboratory of Ornithology at Cornell for help, thinking that our knowledge of birds might supplement their knowledge of sound recording with desirable results. To make a long story short, we were able to



THE CORNELL UNIVERSITY-AMERICAN MUSEUM OF NATURAL HISTORY ORNITHOLOGICAL EXPEDITION MAKES A ROADSIDE STOP

With the object of securing permanent records of the voices of vanishing species of birds and filming their habits, the Cornell ornithologists left Ithaca, New York, the middle of February, 1935, and traveled 15,000 miles, circling much of the United States in their quest. The truck at the left, equipped for camping and photography, had a collapsible tower on its roof to bring the photographer on a level with the tree tops; the truck at the right was equipped for sound recording. The microphone was supplemented by a large parabolic reflector shown between the trucks.

help, and became so interested in the problem that we conceived the idea of making a permanent record of the songs of all North American birds.

This was not the province of the movie men, however, we were quickly assured. They now had enough film of singing birds for one release and that was as far as they desired to go. We could buy the truck for \$30,000 and do it ourselves if we wished. But we didn't have the funds.

And so the problem rested until Albert Brand entered the picture with a love of birds in his heart and a desire to learn their songs. He studied with us at Cornell for a couple of years, saw the writing on the wall, and decided his would be the problem of filming the songs of North American birds. Furthermore, he would record the songs from the films on phonograph disks so that they would be available to anyone who wanted them.

We little realized all the intricacies of the problem when we first started assembling the instruments necessary for this delicate kind of recording. But our colleagues at Cornell in the College of Engineering, Professors W. C. Ballard and True McLean, and Mr. Arthur Stallman, were very helpful.

Soon, with their aid, we were embarked on a project that was to prove as fascinating as it was difficult, and as time-consuming as it was productive, and that finally took us 15,000 miles with our sound truck and cameras in 1935 in an effort to record the voices of certain birds that are threatened with extinction.

SEEKING THE RARE IVORY-BILLED WOODPECKER

By the middle of February we were fully equipped and had started work in central Florida. Mr. Paul Kellogg, instructor in ornithology at Cornell and an expert in

sound recording, had been assigned to the expedition by the Dean of the College as the sound technician. Dr. George Sutton, Curator of Birds at Cornell, was to accompany the expedition as bird artist until we should find the ivory-billed woodpecker—a rather indefinite commission. James Tanner, a graduate student in ornithology at Cornell, was to accompany the expedition as general handy man to assist in both the sound recording and the photography. Mr. Brand and the author were to plan the itinerary and take charge of the photography and the ornithological observations.

One of the first objects of the expedition was the rediscovery of the ivory-billed woodpecker, perhaps the rarest of the North American birds and at one time thought to be extinct.*

In central Florida in 1924 the author and Mrs. Allen had discovered a pair that were later collected by local taxidermists, and the expedition planned to spend March in the same general region of Florida searching for another survivor. Whenever conditions were suitable, of course, we would catch the songs of other birds as well.

LEAVES NO LONGER WHISPER, THEY SHOUT

It must be realized that when the song of a bird is amplified enough to cause a recording lamp to flicker sufficiently to make a record on the film, every other sound is amplified too. Many a time records of beautifully clear songs are rendered worthless by the passing of an automobile a block away or even by the rustling of a slight breeze among the leaves. The whispering leaves of the poets are shouting leaves to the sound recorder; the babbling brooks no longer babble; they roar.

So each morning we arose at daybreak before the milk trucks, the tractors, the roosters, the hounds, and the innumerable other sounds of civilization became too frequent, and recorded the voices of such familiar Florida birds as the mockingbird, the cardinal, the Florida wren, and the ground dove.

When conditions were inauspicious for recording, we spent long hours and covered many miles hunting for ivorybills. On some of these trips we obtained records or films of such unusual species as the sand-

hill crane, the southern bald eagle, the American egret, the wood ibis, and the Audubon's caracara, which is near the northern limit of its range on the Kissimmee Prairie.

Nor were our labors ended with the setting sun, for we were always looking for ideal conditions to record the evening concerts of the barred owls, the limpkins, and the chuck-will's-widows.

One of the unusual places we visited in Florida was "Manywings," the home of Mr. W. E. Browne near Grandin. Here the familiar garden birds have grown so tame that they come to his call, and nine or ten species have learned to catch from the air fragments of peanuts which he tosses to them (page 702).

The blue jays, which are particularly wary in most places, are especially adept at darting from the trees like flycatchers to snatch the titbits in mid-air. Most remarkable of all is the tameness of a Florida crane which comes to the back door for cornbread.

While we were recording the voices of some of Mr. Browne's birds and the truck door stood open, an inquisitive Florida wren so quickly accepted us into the family that she carried nesting material into the truck. Before Mr. Kellogg realized it, she had made a good start on her nest at his elbow, as if she would induce him to remain and make his home with her. What greater show of hospitality has Florida to offer?

CHALLENGING AN UNSEEN RIVAL

Quite different was our experience in Winter Park when we were testing some of the film we had exposed. We had our projector set up inside the house with the window partly open. One after another the songs of different Florida birds poured from the loud-speaker with nothing to disturb our critical ears until the song of a mockingbird came on.

Then, as the liquid notes began to vibrate across the room, we became aware of a tapping at the window and there, fluttering against the pane, was our favorite garden mocker bristling with resentment. This house and garden were his, and he obviously objected to any other mockingbird singing in his territory.

When we placed the loud-speaker in the garden and played the mockingbird's song again, it was almost pathetic to watch the

* See "Woodpeckers, Friends of Our Forests," by T. Gilbert Pearson, NATIONAL GEOGRAPHIC MAGAZINE, April, 1933.



JOE HOWELL LOOKS IN ON A CARACARA'S NEST

It is a difficult climb to the top of a cabbage palm, but the investigator negotiated the smooth bark, the rough crown, and the sharp fans to get a glimpse of the young birds about ready to leave home (pp. 702-3). He discovered that they had been banded, each bearing a number recorded by the Bureau of Biological Survey at Washington, D. C. A vulturlike bird of prey, Audubon's caracara captures snakes, lizards, and other animals, or joins buzzards feeding on carrion.

bird's amazement when he flew at the song but could find no bird on which to vent his wrath (page 696).

In Florida we were unsuccessful in our search for the ivory-billed woodpecker. If it still occurs in this part of its former range, it will take keener ears or luckier observers than we to find it.

So the last of March we started for Louisiana, where Dr. T. Gilbert Pearson had reported the finding of an ivorybill by Mason D. Spencer near the Tensas River in 1932.

On our way we stopped at Beachton, Georgia, at the charming home of Herbert

Stoddard, the great authority on the bobwhite. He had arranged with Col. L. S. Thompson to bait up a flock of wild turkeys on a chufa patch in a clearing on his plantation so that we could secure motion pictures and voice recordings of these shy, absolutely feral birds, uncontaminated by any domestic blood.*

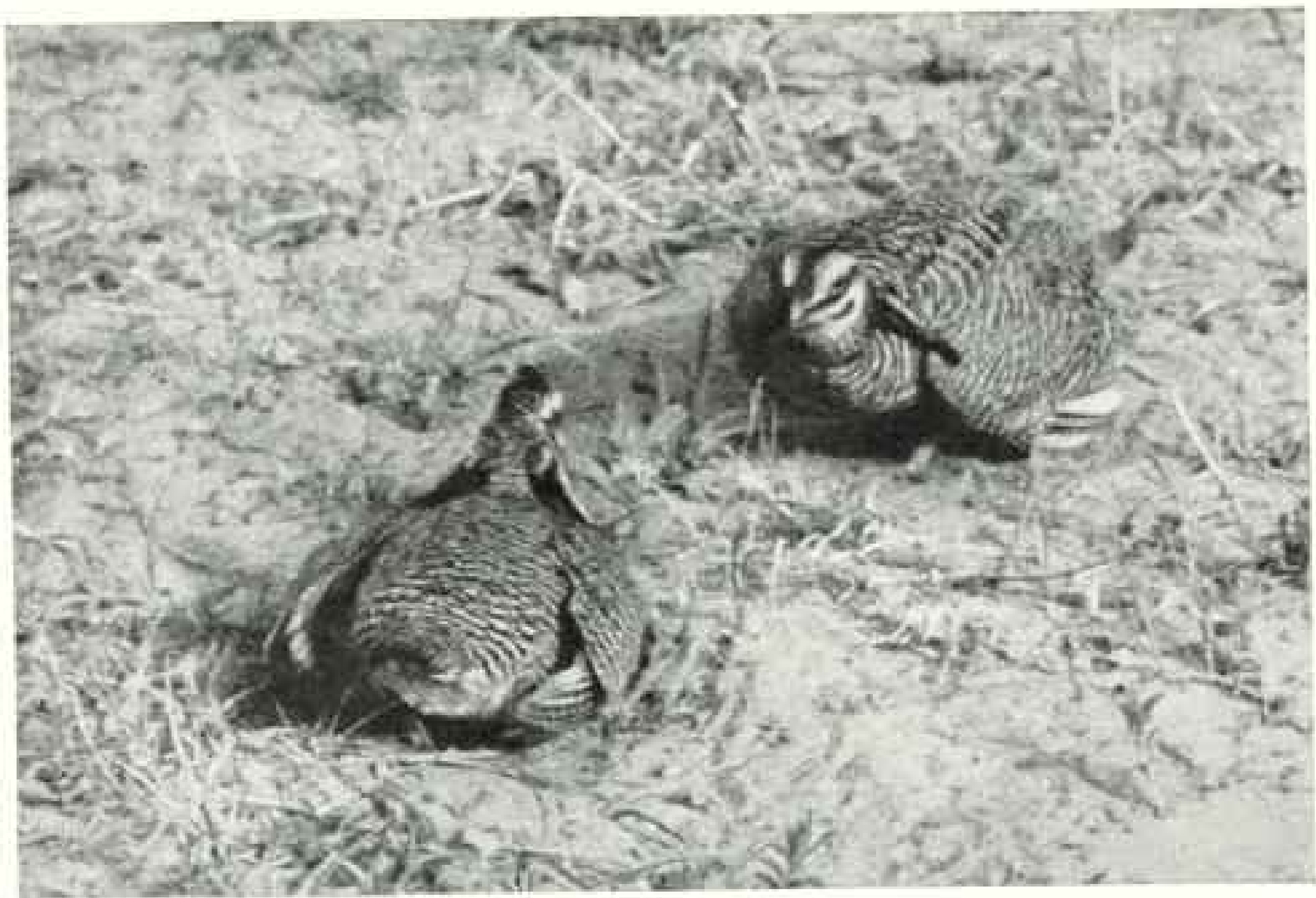
One familiar only with domestic turkeys little realizes the wariness of these grand old birds, or the stealth necessary to get within camera distance.

* See "Game Birds of Prairie, Forest, and Tundra," by Alexander Wetmore, NATIONAL GEOGRAPHIC MAGAZINE, October, 1936.



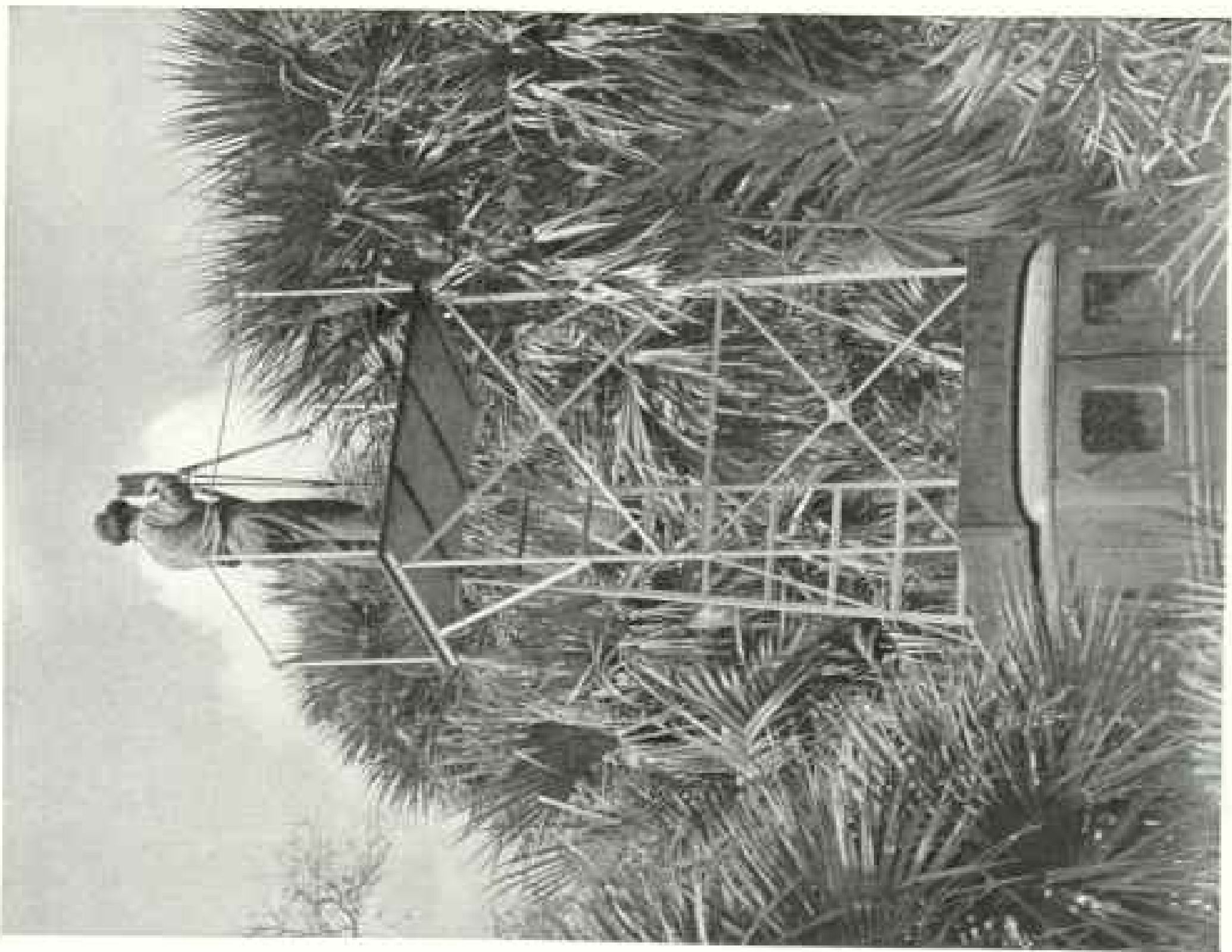
WILD TURKEY GOBBLERS STRUTTED UNCONCERNEDLY BEFORE THE MICROPHONE

With corn and peanuts the birds were baited to this clearing in the forest on the Colonel Thompson estate at Thomasville, Georgia, by Herbert Stoddard and Albert Stringer. The sound truck and cameras were concealed in blinds built two weeks before.



LESSER PRAIRIE CHICKENS CROUCH FOR ATTACK WITH WARLIKE GOBBLERS

In spring the males repair to flat-topped knolls in groups of from four to as many as 40. Each bird sets up a little domain some 75 feet square and proceeds to fight with all his neighbors. Thus the boundaries become fixed, and each learns to respect the rights of others, so that when the females arrive after six weeks of battle, there is no grand rush (page 711).



Photograph by Arthur A. Allen.

PAUL KELLOGG HANGS DROPS ON A CARACARA NEST

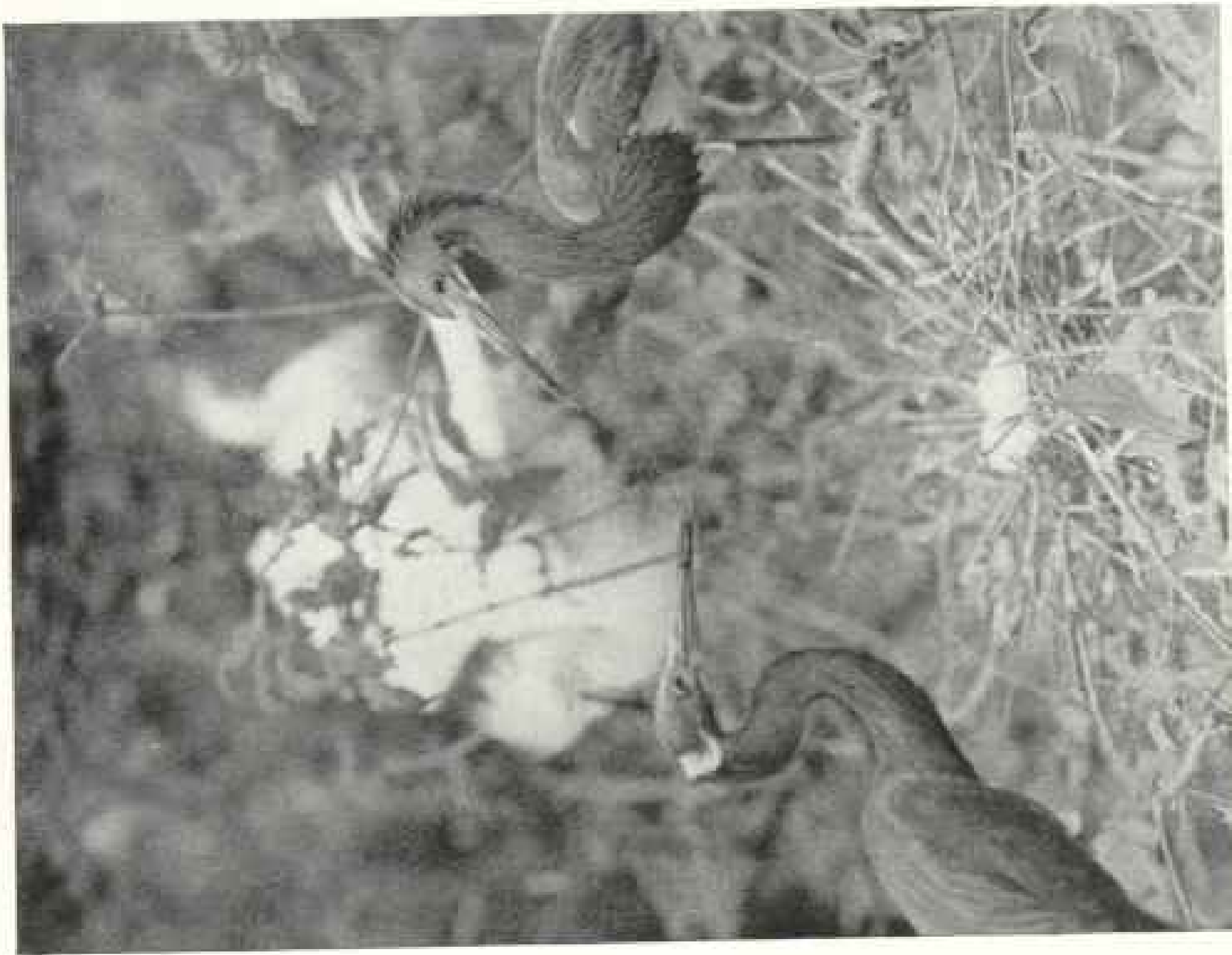
This tower, which folded up into the box on top of the truck, could be erected in ten minutes and raise the photographer 20 feet into the air, thus saving the laborious toil of climbing. The caracara's name comes from its raucous cry, which to Dr. Allen sounded more like "blah-blah."



Photograph from W. E. Browne

BLUE JAYS CAPTURE TITBITS ON THE WING

W. E. Browne of Grandin, Florida, has trained many of his birds to catch fragments of peanuts tossed into the air. While the expedition was recording the voices of some of Mr. Browne's feathered friends, a Florida wren became intrigued with the sound truck and started a nest in it (page 699).



A LOUISIANA HERON PRESENTS A TWIG TO HIS LADY

Nesting material is scarce in the 40-acre rookery which E. A. McIlhenny maintains for herons and egrets at Avery Island. Nicknamed "Lady of the Waters," the graceful Louisiana heron has a slaty-purple plumage that contrasts with its snowy head plumes and white underfeathering.



IT FLED FROM THE MOTION-PICTURE CAMERA

This young caracara, which A. R. Brand, sponsor of the expedition, is holding, had the party a merry chase through the saw palmettos when they tried to catch it to return it to the nest from which it had been frightened. When uttering its hoarse, rasping call, the bird throws its head back like an opera singer.



"AOW-AOW" THE LIMPIN CRIES, LIKE SOMEONE HAVING A TOOTH PULLED

The weird sound may be the origin of many a superstition connected with Florida's swamps and savannas, where this noisy "crying bird" lives. When flying, the limpkin's wings flap jerkily up and down like those of a mechanical toy. The long-legged wader's favorite food is a large fresh-water snail, which it extracts without breaking the shell.

Fortunately for us, Colonel Thompson had directed his superintendent, Albert Stringer, to build a blind of pine boughs two weeks before our arrival, so that the turkeys would have time to get accustomed to it.

Corn and peanuts were scattered some 20 yards in front of the blind each day, and when we arrived we found many signs of turkeys, deer, quail, squirrels, and mourning doves that had been frequenting the spot.

NOT A GOOD GOBBLING MORNING

The day before we planned to make our record the sound truck was driven into the blind and completely concealed; the cable was stretched 250 feet to another blind where I could sit with Mr. Stoddard and aim the sound reflector at the gobblers when they should come off their roosts and advance toward the field. In the hope of attracting a gobbler within recording range,

Stoddard armed himself with his turkey call and imitated the sound of a hen turkey.

But turkeys are capricious birds. Turkey hunters will tell you that certain days are "good gobbling mornings," and on other days not a gobble will be heard. Not one of the three days at our disposal proved to be a good gobbling morning and we had to content ourselves with mediocre sound, though we obtained some good film of a flock of hen turkeys and two magnificent old gobblers (page 701).

It was interesting to watch from ambush their varying responses to the different morning sounds. To most they paid slight attention, but at anything suggestive of human presence they were extremely wary. Instantaneously they would change from full display, when they were the most conspicuous objects on the landscape, to sleek, trim creatures that miraculously disappeared into their environment, as if they had been swallowed by the earth.



TO "SHOOT" THESE WOOD IBISES, THE AUTHOR STOOD WAIST-DEEP IN A SWAMP.

Flocks of the flinthead, silent ghost of Florida marshlands, are often seen in the skies, soaring in great circles like buzzards. It was difficult to get the sound truck near the birds, but this made little difference because they are virtually voiceless when fully grown. Breeding in colonies sometimes numbering several thousand pairs, they nest year after year on the same platforms of sticks, built high in trees. When fishing in a pond, the wood ibis often muddles the water with its feet to force fish to the surface. It is the only stork found nesting in the United States.

Their eyes, which are extremely quick to notice any motion, are apparently not very keen at seeing objects at rest. On one occasion two old gobblers approached within thirty yards of Stoddard and me as we crouched immovable behind the sound mirror in full view.

RECORDING THE LIMP-KIN'S KERIC CRY

From Beachton, at Stoddard's suggestion, we went south to the Wakulla River, Florida, where we hoped to get within recording distance of the limpkin, or crying bird, another of the main objectives of our trip.

Here a magnificent underground stream, crystal clear, comes to the surface as a spring 185 feet deep and flows gently to the Gulf. Its waters teem with fish which can be observed easily even at considerable depth. The banks of the river are clothed with beautiful moss-covered cypress where hundreds of anhingas, or snakebirds, nest,

as well as many herons, ospreys, and other fish-eating birds.

Most interesting of all, however, are the limpkins. About the size of bitterns but related to the cranes, they are dark brown spangled with white. They have been attracted to this beautiful stream by the abundance of a large, aquatic snail (*Ampullaria*, now called *Pomacea*), which is their principal food (opposite page).

The snails are largely nocturnal, and so are the limpkins. At night the loud, wailing cries of the birds reverberate up and down the river, sending shivers down one's back. It would not be difficult even for the most prosaic person to imagine that some lost soul had come back to earth, or at least that some luckless black brother was losing his leg to an alligator.

Here, enthralled by the magical scenery which was rendered even more eerie by the hooting and laughing of the barred owls, we

spent several days. We had little difficulty in recording the weird cries of the limpkin and filming its habits, as well as those of the snakebirds, ospreys, and Ward's herons.

From the Wakulla River our expedition proceeded to northern Louisiana, which we found largely under water, with all but the improved roads impassable to our trucks. The stickiness of this Louisiana mud, or "gumbo" as it is called, is exceeded only by its hardness when it is thoroughly dried out. Then it is as hard as stone, and in a dry season one can drive anywhere; but let a little water fall upon it and one sinks in it almost literally up to the knees.

So here our search for the ivorybill was greatly retarded, and had it not been for the kind offices of our friend Mason Spencer, the local representative in the State Legislature, and J. J. Kuhn, a member of the State Conservation Department, our hunt would probably have been in vain.

FOUND: THE ELUSIVE IVORYBILL

As it happened, however, we spent but three days tramping through the jungle before we not only located a pair of ivorybills but actually found the nesting cavity 43 feet from the ground in a dead swamp maple. Furthermore, the nest was only seven miles from an improved road, which, in an unbroken forest 18 miles wide and 30 miles long, was indeed fortunate.

It was obviously impossible to consider taking the sound truck, with its 1500 pounds of equipment, into the swamp, but it was not beyond possibility to consider getting in with a wagon and a few mules.

The mayor and sheriff of the nearest town where electricity was available entered into the project with enthusiasm. They offered us the jail and its courtyard in which to dismantle the truck, unsolder all the connections, and set up the equipment in a wagon.

We furnished much amusement to the inmates of the jail as we worked, and when word of our objective got around, several of them volunteered confidentially the information that they could show us more of these "peckerwoods" if we could arrange a leave of absence for them with the jailer.

It required a day to eviscerate the truck and another day with four stalwart mules to haul the wagon into the swamp and set up our unique sound laboratory within 300 feet of the ivorybills' nest.

Here we camped for eight days, piling up palmetto fans on the roots of a giant oak to keep our blankets out of the water. Twenty-four-power binoculars, mounted on a tripod and focused on the nest tree, kept us informed of all the happenings, while the sound mirror brought us the calls. We christened our location "Camp Ephelus" in honor of the scientific name of this rarest North American bird—*Campephilus principalis* (page 711).

Gradually the birds became somewhat accustomed to our presence and we dared build a blind in the top of a rock elm on a level with the nest and only twenty feet away. It was a thrilling experience to sit and listen to the conversations and watch at such close range the exchange of courtesies as these strikingly beautiful birds changed places on the eggs (pages 712, 713).

The brilliant scarlet crest of the male, the gleaming yellow eye, the enormous ivory-white bill, the glossy black plumage with the snowy-white lines from the head meeting in the glistening white of the wings, are as vividly pictured in my mind as if I were still sitting on that narrow board in the tree-top, not daring to shift my weight and feeling it gradually bifurcating me with wedgelike efficiency.

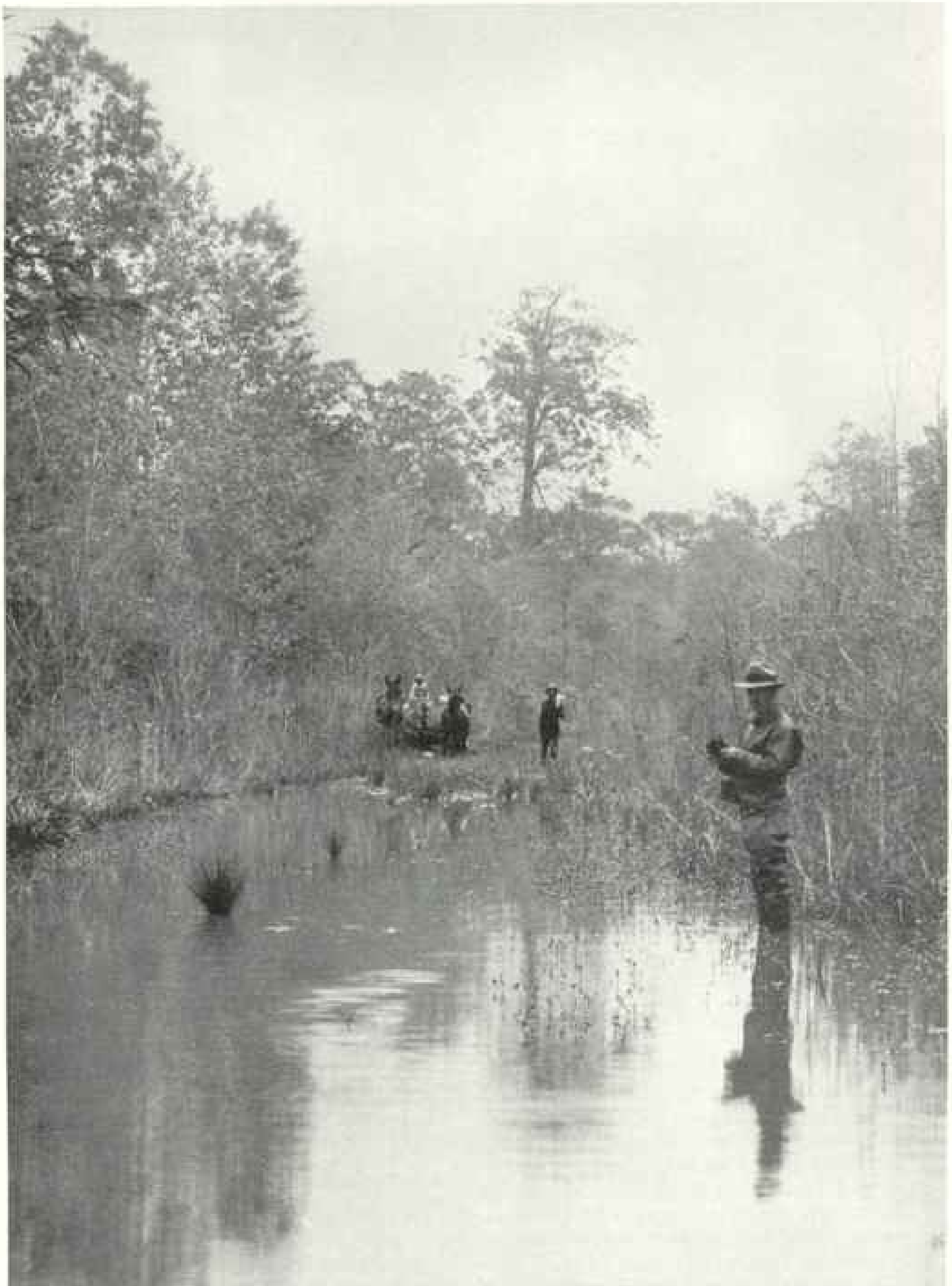
For five days we recorded all the happenings at the nest, taking turns with the glasses so that not a moment's observations would be missed, hoping we might discover some clue as to why the birds are apparently unsuccessful in rearing young.

But all the events were rather commonplace. Each morning at 6:30 the male bird tapped on the inside of the nest hole; as he grew more impatient he stuck his head out and gave a few "yaps" or "kents" in no uncertain tone, but he never left his post until the female arrived.

A little intimate conversation then ensued, and she entered, but before he took off through the forest he often spent 15 or 20 minutes arranging his plumage and scratching as if he were infested with mites. This, we later discovered, must have been the case.

MRS. IVORYBILL OUT ALL NIGHT

During the day the two birds took turns incubating in about two-hour shifts, but the female always arranged it so that she could leave for the night at 4:30 p. m. and not return until the following morning at 6:30.



PART OF THE "ROAD" TO THE IVORYBILLS' NEST WAS UNDER WATER

One of the expedition's chief objects was to record the voice of the rare ivory-billed woodpecker. The almost total disappearance of this magnificent bird baffles ornithologists. Once locally abundant, it is now found in a few isolated swamps. To locate a nest, Dr. Allen searched for the large chunks of bark which the bird strips from trees. A mule team dragged the expedition's equipment through sticky mud to the nest.



READY TO RECORD A RARE VOICE

James Tanner points the apparatus at the ivory-billed woodpeckers' nest so that all of their vocabulary can be recorded when they change places on the eggs. The microphone is hung at the focal point of the parabolic reflector, and the mirror is sighted at the birds through the telescope on one side.

At least, this was the schedule every day during the time that we observed them.

We wanted to remain with the ivorybills until their eggs hatched and the young were reared. But we heard from our friend Verne Davison that if we wished to study and record the lesser prairie chickens in western Oklahoma we must hasten on so as to get there before the first of May.

So, torn between two desires and anxious to make the most of all opportunities, we sent for the mules and broke camp, planning to return in three weeks when the young should be nearly fledged. In two

days we had our sound truck reassembled in preparation for the work in Oklahoma.

At this time, however, dust storms were raging on the prairie, and we delayed our journey to accept the kind invitation of E. A. McIlhenny to visit his beautiful estate and bird sanctuary at Avery Island, Louisiana. Here we spent three enchanting days recording the daily life in his "Bird City."

This is an amazing object lesson in bird protection, showing what man can accomplish through thoughtfulness and kindness toward bird life. Beginning 35 years ago when the snowy heron had become quite rare, Mr. McIlhenny has gradually built up a large colony on an artificial pond of his own cre-

ation. At the time of our visit in late April it certainly numbered 10,000 birds, and as many again, we were told, were yet to come (pages 703, 710).

A BULL ALLIGATOR'S FEARSOME BELLOW

Here we recorded the curious froglike croakings of the snowy egrets, and, by unusual good-fortune, captured the bellow of a huge bull alligator. It is a thrilling sound—like the roar of a lion, but rendered more terrifying by the sight of the churning water, and it certainly must be effective in intimidating lesser male alligators and



"CAMP EPHILUS" WAS NAMED IN HONOR OF THE IVORYBILL.

To get to the nest, which was seven miles from an improved road in a forest 30 miles long and 18 miles wide, the party had to transfer all equipment to a farm wagon hauled by four mules. The wagon became the sound laboratory and the camp was christened with the generic name of the bird sought (page 706).

keeping them from the chosen territory.

The bull alligator lies at the surface of the water, inflating the large air sacs on the sides of his neck. He then submerges his ponderous body, while the armored head and tail protrude menacingly. Thereupon he emits his thunder while the heavy plates on his back seem to vibrate and cause the water above to dance and shoot spray into the air (page 710).

It was now the last of April and another message from Davison started us westward, though we were loath to leave our genial host and his marvelous bird sanctuary.

When we reached western Oklahoma a dull fog gradually obscured the landscape, and as the wind whipped over the barren fields and swirled across the road, we realized that we were in the midst of a real "Panhandle" dust storm.

Furthermore, the storm continued without much abatement for seven of the eight days that we spent on the Davison Ranch

near Arnett. It had scarcely rained for three years and from fields that had once been plowed the surface soil and the very seed was blown into neighboring counties.

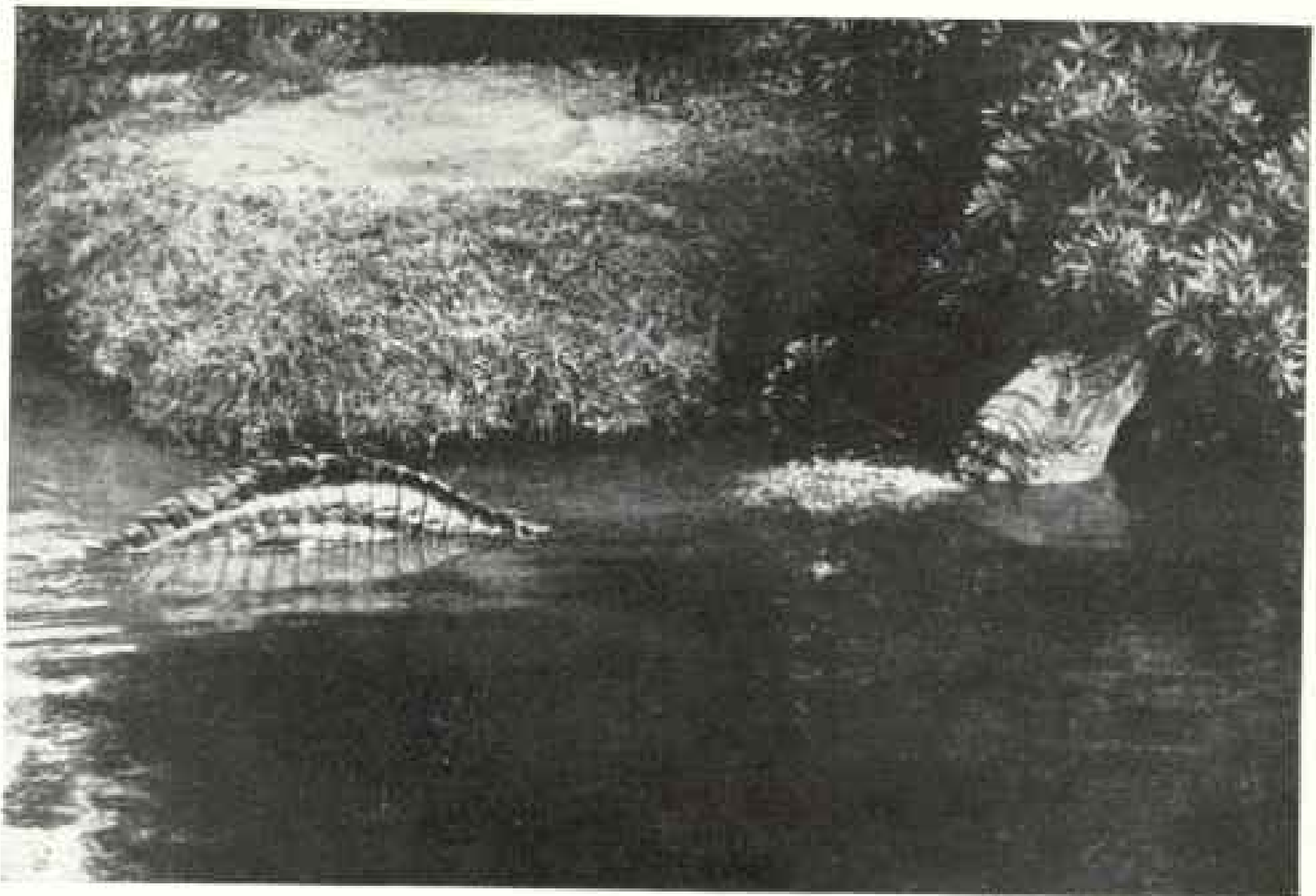
The Davison Ranch itself, however, is largely covered with tiny oaks which the natives call "shinnery." Here in the dust-covered shinnery we were to study the lesser prairie chickens, photograph their curious courtship antics, and record their gobbling calls.

The cattle eyed us curiously when we first erected one of our observation blinds near the home of a burrowing owl. This blind was made of artificial grass mats, greener than anything in that whole country, greener than anything the heifers had ever seen. Instinctively they came lumbering in from all quarters to get a luscious meal.

The effect of habit on these same heifers was even more amusing after their first severe rain storm. The downpour not only



SOME 20,000 SNOWY HERONS SEEK THE PROTECTION OF MC ILLHENNY'S "BIRD CITY" In this celebrated rookery at Avery Island, Louisiana, the microphone was set up near several of the nests to record the neighborhood gossip. The talk was far from musical.



Photograph by James Tanner

THE BELLOW OF THE ALLIGATOR WAS SUCCESSFULLY RECORDED

When the reptile bellows, the horny plates on its back vibrate, causing the water to dance and shoot spray two feet above the surface. Air sacs resembling those of a huge leopard frog can be seen at the sides of the neck. Through the courtesy of E. A. McIlhenny, the fearsome performance, which serves the same function as a bird's song, was caught by camera and microphone (page 708).



Photograph by P. P. Kellogg

DR. ALLEN SPIES ON IVORYBILLS AND RECORDS THEIR ANTICS

For five days the members of the expedition made continuous observations, through a pair of powerful binoculars (pages 712 and 713). The camp at the base of this large oak was surrounded by water, and palmetto fans kept the blankets out of the mud (page 706).

laid the dust, but filled every depression in the ground with water, including those trodden by the cattle themselves around the drinking vats that were normally kept filled by windmills. Never before had they seen standing water except in these vats and never had they drunk out of anything else. So now, with the vats in the center of large ponds, they could be seen wading out to them to get a drink.

Each morning and again at evening during the spring on the Davison Ranch, the lesser prairie chicken cocks assemble in groups of from four to forty on certain flat-topped knolls in the shinnery to compete with one another in a show of prowess, both of voice and of bodily vigor (page 701).

For six weeks the males engage in these matches before the females intentionally visit their gobbling grounds. Each male comes back to exactly the same spot each morning and gradually forces upon his neighbors a respect for his territory, some 25 or 30 feet square.

Many of the combats are mere gestures or feints of anger, but others are sufficiently severe to scatter feathers over the shinnery.

Sometimes when the males jump at one another and strike with their wings, a hapless bird is flipped clear over onto his back by a stronger rival.

Each morning from April 25 to May 2 found us at the gobbling grounds of a group of 26 males with the microphone staked out in the territory of some aggressive cock. Seven of the eight mornings the wind howled in the microphone and the dust blew, but at last it was quiet and we secured a nearly perfect recording of the birds' sounds, from the pattering of their feet and the silken twitching of their tail feathers to the loud gobbling that follows.

COCKS ARE HEARD TWO MILES AWAY

This gobbling is accompanied by the swelling of the little balloons on the sides of their necks, which serve as resonators. These air sacs, really dilations of the esophagus, swell up to the size of hens' eggs when the mouth and nostrils are closed and air is forced into them from the lungs.

The sound itself is produced by the vibration of tiny membranes in the syrinx, or voice box, at the lower end of the wind-



AN IVORY-BILLED WOODPECKER LEAVES HOME: AND HIS MATE TAKES HER TURN ON THE EGGS

The birds work in two-hour shifts during the day, but the female leaves her partner on duty all night—so that she always knows where he is, says the author! The nest hole was 43 feet up in a dead swamp maple and measured $4\frac{1}{2}$ inches in diameter. The great amount of white in the wings distinguishes this bird from the commoner pileated woodpecker.

pipe. Such resonance is given to the sound by the neck sacs that the birds can be heard for two miles on a quiet morning.

The strong winds made sound recording very difficult in western Oklahoma, though such clarion calls as those of the western meadowlark and the "whip-whirr" of the burrowing owls at dusk came through very distinctly. We failed to record, however, the white-necked ravens and Mississippi kites which, while rare in many parts of their range, are fairly common on the Davison Ranch.

From Oklahoma our expedition moved north and west through the barren, wind-swept prairies of western Kansas into the verdant irrigated stretches of eastern Colorado, and thence to Colorado Springs and Denver.

Here we were met and generously assisted by Mr. Robert Niedrach, Curator of Birds at the Colorado Museum of Natural History. Director J. D. Figgins kindly relieved him of other duties so he could help us in our efforts to record and film the golden eagles and prairie falcons which are still not uncommon in the vicinity of Denver.

Never shall I forget the experience of lying prone for four hours on a flat rock at the edge of Box Elder Canyon, a few miles north of Fort Collins,

watching and waiting for a golden eagle to return to its eyrie.

Directly below me the cliff fell away 750 feet, while the nesting ledge was only 60 feet down. I was covered with one of our grass blinds so that the eagle would not see me and, unknown to me until I tried to shift my position, the boys had piled so many rocks on the edge of the blind to keep me from falling off the cliff that I could not even roll over.

At last the majestic bird sailed in with a jack rabbit in his talons and the young

eagles screamed with anticipation at his approach. The picture impressed upon my mind was well worth all the fatigue of the journey up the mountain and the long wait on the hard rock at the edge of the canyon.

EAVESDROPPING
AT AN EAGLE'S
NEST

A few days later Bob Niedrach led us to another eagle's nest, in Willow Tree Canyon near Denver, where we could actually drive the sound truck almost to the cliff's edge.

We padded the microphone, lest it strike a rock, and let it down about 60 feet on its cable to the nesting ledge. Then, concealing the trucks in a grove of pines near by, we spent the night on the bunks within them.

The next morning at daybreak we clamped on the earphones to learn what was happening at the nest, which, of course, we could not see. It was interesting to hear the many species of birds in the canyon below greet the new day with their various twitterings, screechings, or carols.

There was a canyon wren, too far away to record, whose song, a series of rich, descending whistles, came through beautifully. A red-shafted flicker called close at hand. A black-headed grosbeak and a western tanager, with songs almost exactly like our eastern rose-breasts and scarlet tana-



IVORYBILLS CHANGE PLACES—THE FIRST PHOTOGRAPH EVER TAKEN OF A NESTING PAIR

The ivory-billed woodpecker is now perhaps the rarest North American bird and from time to time has been thought extinct, though it formerly was found locally throughout the Gulf States and as far north in the Mississippi Valley as southern Indiana. The species is about the size of a crow, and the male has a flaming red crest, that of the female being black.

gers, could be heard faintly up the canyon. A long-crested jay screeched and a flock of violet-green swallows and white-throated swifts came forth from the crannies in the rocks and twittered past the microphone.

About 7:30 a loud crackling in the "mike" told us that the eaglets had arisen and were doing their daily dozen—jumping up and down on the nest and fanning their wings.

About 8 o'clock they began to scream, and looking out of the truck window we could see one of the parent birds coming



FRANKLIN'S GULLS AND WHITE-FACED GLOSSY IBISES NEST TOGETHER

These two species join forces in large colonies in the tules of the Bear River Marshes, Utah. Apparently they do so from force of circumstances rather than sociability, for the expedition learned, by watching from blinds, that they pass most of their time fighting. An excellent flyer, the white-faced glossy ibis (right) travels miles for a meal of crustaceans, earthworms, water insects, or frogs. Franklin's gull nests in marshes and is seen on United States coasts only in winter.

out of the east. In majestic circles it sailed over the canyon, looking the ground over to make sure that all was safe. From its talons dangled a large jack rabbit.

Now the screams of the hungry eaglets became more and more excited as, in narrowing circles, the old bird dropped lower and lower. Finally, in one long graceful sweep, it disappeared below the rim of the canyon and a moment later we heard the crash of twigs as it landed on the nest. There were no cries from the old bird; silently she came and silently she left. Only the calls of the young were recorded.

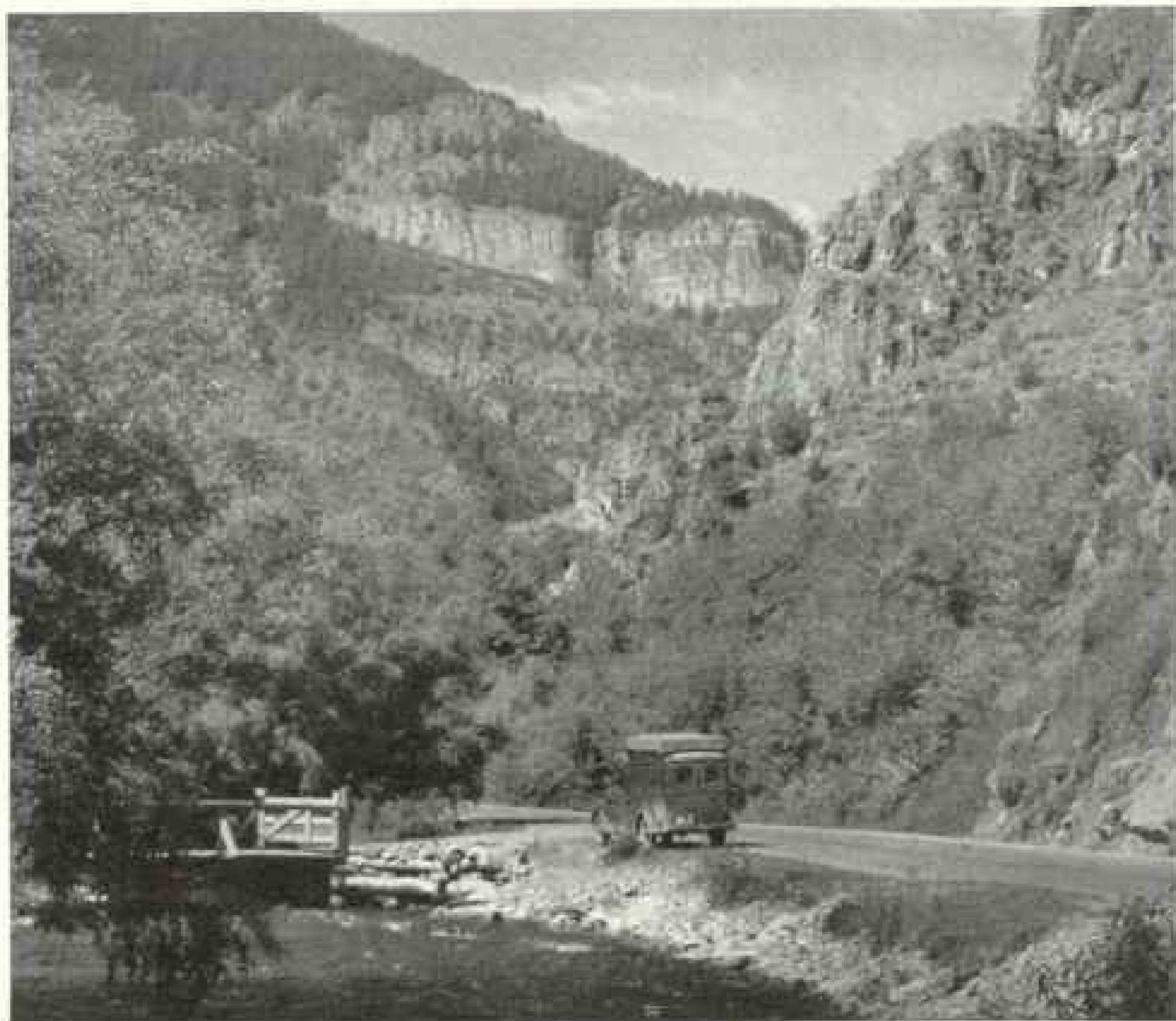
A more obliging creature was the dashing prairie falcon that had its eyrie on a similar vertical cliff at the mouth of a canyon near Denver. Its wild screams, whenever we approached the cliff, made it easy to re-

cord and the photographing was not difficult.*

At the bottom of the same precipice under an overhanging cliff, long ages ago the home of cliff dwellers, a little canyon wren had built its nest, and the resounding whistles of the male were clearly recorded when once we discovered his favorite song perch on a near-by rock.

One of the most appealing experiences of the trip was at the home of a mountain plover in the arid prairie country east of Denver. It was one of those uncertain days when one can count a half-dozen rainstorms in different directions while the sun shines brightly overhead. Eventually one

* See "Week-ends with the Prairie Falcon," by Frederick Hall Fowler, NATIONAL GEOGRAPHIC MAGAZINE, May, 1935.



LOVELY LOGAN CANYON IS A HAPPY HOME FOR THE WATER GUZEL.

There were plenty of these birds along this mountain torrent and they were not difficult to photograph, but the rush of the turbulent current over the rocks made so much noise that ordinary methods of recording their song were impossible. The microphone was therefore removed from its parabolic reflector and fastened to a rock at the edge of the stream where one little musician sang at daybreak for posterity (page 716).

of the storms headed directly for us, and soon we were being pelted with hailstones larger than marbles.

There was no shelter anywhere on the prairie and as we hastened into the truck we noticed the alarm of the birds about us when the hailstones struck around them. We drove the truck to within eight inches of the plover's nest to protect the eggs, and immediately the bird returned to the nest (page 720).

HOW A MEADOWLARK GAVE THANKS

Then birds started flying to us from all directions, especially the showy lark buntings, and soon there were some twenty of them sitting beneath the truck.

Then came a western meadowlark, pitifully frightened. He longed for the shelter

of the truck, but he was a timid bird and each time he approached within ten feet of the car, and could see us inside, his courage deserted him and he ran back. Three or four times he advanced as hailstones hit around him, but just as often he retreated.

At last, summoning all his courage, he made a rush for the car and slipped safely beneath with the other birds. And when he found himself secure at last, he loosed his feelings in one of those clear, beautiful songs that endear this bird to all westerners.

From just a few inches under our feet his carol of thanks burst through the car and for a moment turned our thoughts to those countless natural dangers which constantly beset all wild creatures and to which we so seldom give heed.

Northward and then westward through



IN DASHING ROCKY MOUNTAIN STREAMS THE WATER OUZEL IS AT HOME

It gets a large part of its food from aquatic insects, which it captures by diving into the turbulent water and walking along the bottom.



A SPIRIT-OF-THE-SPRAY MADE MELODY IN LOGAN CANYON

With the microphone on the rock from which the water ouzel, or dipper, sang at daybreak, the bird's voice was caught in spite of the rushing water; for the singer's bill was often less than two inches from the diaphragm. Sometimes the performer mounted to the instrument itself, but then its little claws made scratching sounds that ruined the recording.

arid Wyoming the expedition wound over the mountains to Logan, Utah, where I was scheduled to give a course of lectures in ornithology at the Utah State Agricultural College.

We traveled through the beautiful Logan Canyon where we had our first opportunity to get really acquainted with the dippers, or water ousel, which live along most of the dashing Rocky Mountain streams. Famed for its mockingbirdlike song, which is often heard in midwinter, the dipper presents a difficult problem for the microphone because, with normal amplification, the noise of the stream drowns out all other sounds.

Hence, we studied intently a pair that had built their mossy nest on the side of a huge boulder, to determine some method of capturing the song amid the rushing water. We often saw the little bird plunge headfirst into the whirling stream, using its wings as flippers and running along on the bottom in search of May-fly and stone-fly larvae. The mountain torrent held no terrors and the bird's dense plumage shed water like a duck's.

NO "MIKE FRIGHT" HERE

The song season was nearly over, but we soon discovered that this little dipper had a favorite rock from which, early in the morning, it sang before going in search of food for its young.

It was a simple matter the next morning to fasten the microphone to the rock and have the bird's bill within two inches of the diaphragm while it was singing. Indeed, at times it mounted to the microphone itself to sing, but then the scratching of its tiny claws ruined the recording (opposite page).

In the beautiful Cache Valley of Utah, into which Logan Canyon empties, we found many fascinating birds, and during our two weeks' stay added 15 species to our already long list of records. Birds like the long-billed curlew, the black-necked stilt, the western willet, and the avocet, which we think of as very rare in the East, are truly common there (pages 718, 719).

Even on the campus of Utah State Agricultural College the lovely lazuli buntings, lark sparrows, Cassin's purple finches, and black-headed grosbeaks made bird observing a real pleasure.

Our normal method of recording at day-break, however, was completely upset, for,

with the setting of the sun, there poured down the canyons from the snow peaks above a strong, cooling breeze that continued until 6 o'clock the next morning. This was, no doubt, as delightful to the sleepers as it was annoying and frustrating to our recordings. It proved a blessing in disguise, however, to some of the party, for Kellogg and Tanner could sleep that much longer while I continued to arise at 4:30 to lead my class of students afield to observe the birds.

Many afternoons we drove to the Bear River Marshes, about 22 miles southwest of Logan, and enjoyed the innumerable waterfowl that had congregated there: ducks by the thousand, Franklin's gulls, Brewster's egrets, white-faced glossy ibises, western and eared grebes, and others too numerous to mention, and certainly too numerous to photograph satisfactorily in the short time at our disposal (page 714).

Several pairs of snowy plovers had laid their eggs in the middle of a gravel road leading into the marsh from Brigham and would dash off their nests just long enough to let each car pass over and roll by. There were literally scores of these interruptions daily, but the birds continued to live in the middle of the road (page 720).

The last week of June found us headed northward toward eastern Idaho to look for trumpeter swans. It is thought that only about 75 individuals of this species remain alive in all the United States, though at one time it was not an uncommon bird throughout the West.

Arriving at Henrys Lake, we scanned its surface with our binoculars and discovered a pair of these birds swimming near a submerged island in the middle of the lake. Finding very comfortable quarters at the Bar L Ranch close by, we decided to stop for a few days.

TRUMPETER SWANS REFUSE TO TRUMPET

Next morning we surveyed the lake more closely and found that there were 19 swans staying there, one of which had already molted its wing feathers and was unable to fly. None of the birds was nesting, however, even the mated pair in the center of the lake having been discouraged by the changing water level, for the lake was being used for water storage by a power company.

We were hopeful that some of the flock might fly around and do some trumpeting



AMERICAN AVOCETS TAKE TURNS SITTING ON THE NEST

In this case the female was more timid than the male, and after the observation blind was installed near by she always waited for the male to take his position over the eggs before offering to do her share of the home duties.



MRS. AVOCET BUNTS HER MATE FROM THE NEST

When the female finally made up her mind all was safe, she had difficulty dislodging her mate from the eggs. Once in possession, she did not settle immediately but fidgeted for several minutes, disturbed by the sound of the motion-picture camera.



AN AMERICAN AVOCET MAKES CAREFUL PREPARATIONS BEFORE COVERING ITS EGGS

They are so large compared to the size of the brooder's body that it is difficult to cover all four of them. Before settling upon the eggs the bird usually turns them with its bill and adjusts them so that the small ends are toward the center like wedges of a cut pie.



IN INCUBATING, THE AMERICAN AVOCET MUST BE A CONTORTIONIST

The long legs are folded and straddle the nest. When feeding, avocets use the curious upturned bill like a scythe. Flat at the tip and as thin as a knife blade, it is swung from side to side to gather marsh flies and their larvae from soft mud or from the surface film of shallow water.



A STONY HIGHWAY OFFERS A NESTING PLACE FOR THIS SNOWY PLOVER

The little bird laid its protectively colored eggs in the middle of a gravel road leading out to the Bear River Marshes. It soon became accustomed to passing cars and would dart from its eggs just in time not to be run over, then would scamper back as soon as the car raced by (page 717).



NOT EVEN AN AUTOMOBILE COULD FRIGHTEN THIS MOUNTAIN PLOVER

The species was formerly fairly common along the eastern edge of the Rocky Mountains, but has become rare because of excessive shooting. Shortly after this photograph was taken near Denver, a sudden hailstorm threatened to kill the bird or break the eggs, and to protect it the party drove the truck within eight inches of it. Dozens of other birds then got beneath the shelter (page 715).

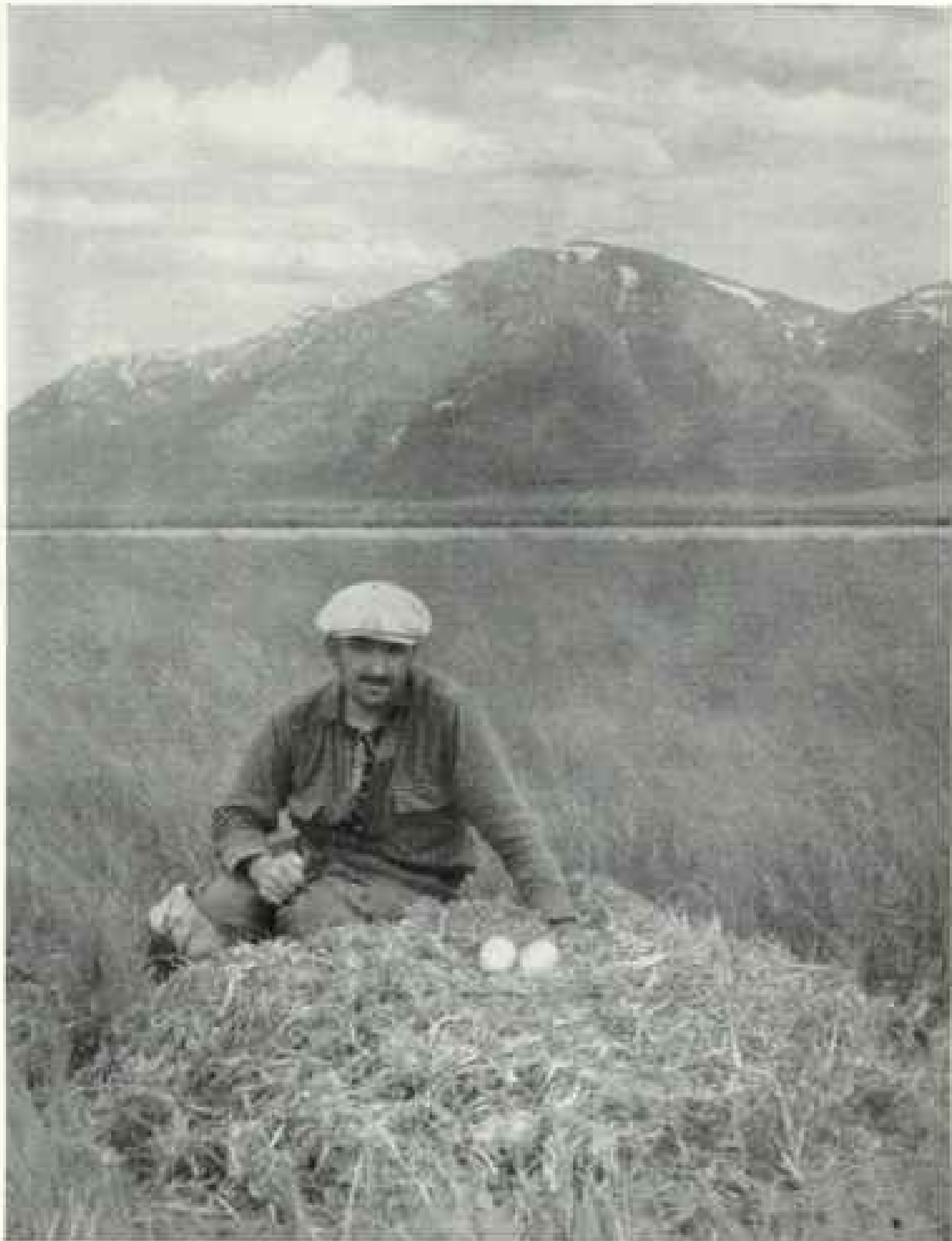
which we might record, so we stayed for three days and kept our microphone and sound mirror ever ready. But it was not to be so simple and we were doomed to disappointment.

Thereupon we moved on to Lower Red Rock Lake, Montana, a few miles to the westward, where, we were informed, a pair of swans had reared young the year before. This lake is about four miles long and three miles wide and is dotted with innumerable marshy islands.

At first we could see no signs of swans. But, climbing to the roof of the Montana Gun Club, with our powerful binoculars we soon located seven birds, two pairs of which seemed to be nesting.

A cruise around the lake in a duckboat showed that both had nests, though one was empty; the other contained two infertile eggs and the broken shells of two others from which the cygnets had hatched and been led away by their parents.

We were now quite hopeful of being able to secure a record of the voice of the trumpeter swan, though we could not get the sound truck within a half mile of the nearest pair. For four days we remained at the Montana Gun Club with the microphone ready, but, except for one trumpet call during the night, we heard nothing from the



Photograph by P. P. Kellogg

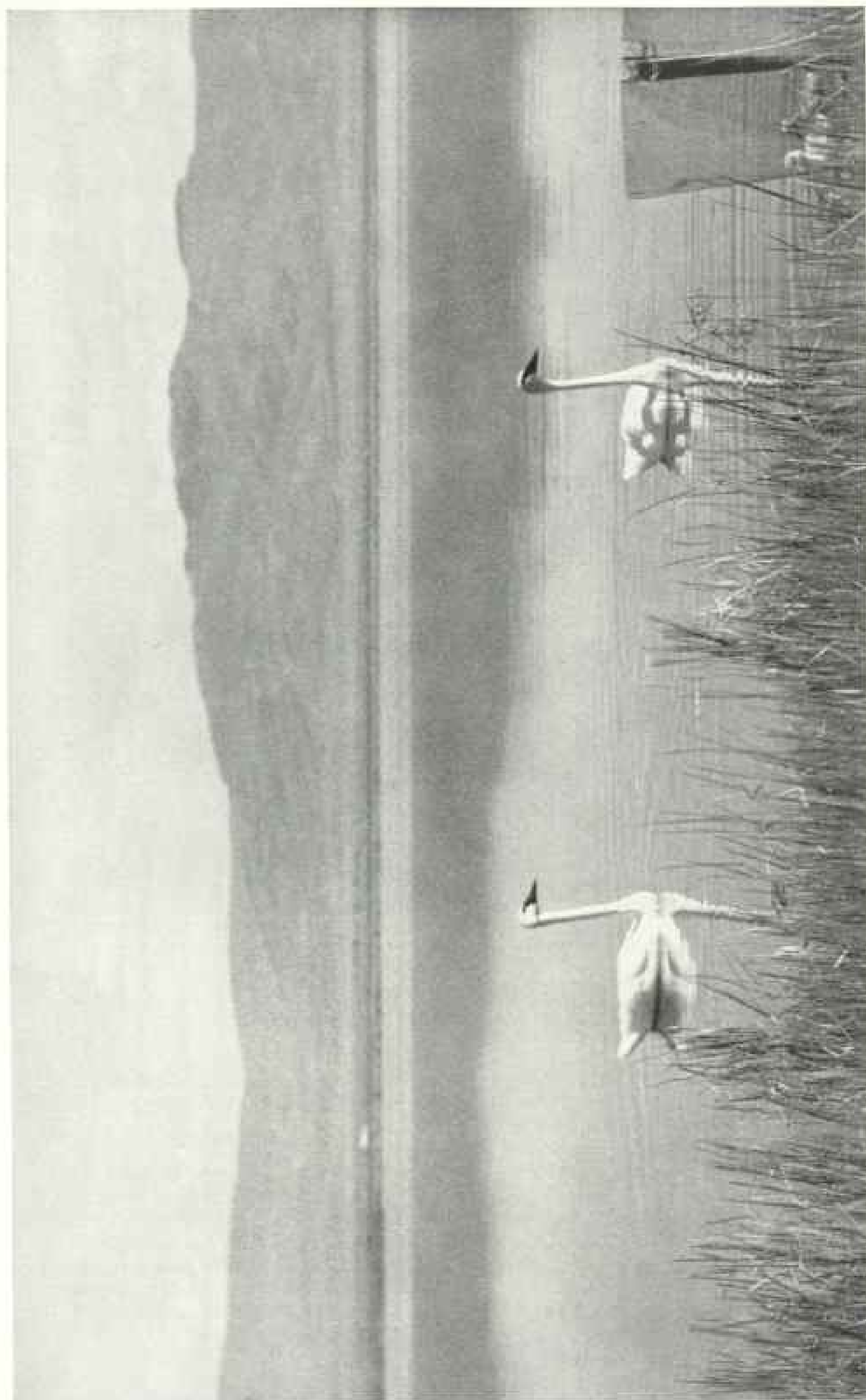
HERE IS THE HOME OF ONE OF AMERICA'S RAREST BIRDS—THE TRUMPETER SWAN

Dr. Allen discovered it about 15 feet from the open water of Lower Red Rock Lake, Montana, on one of the marshy islands which dot its surface. The nest was about six feet across and two feet high.

swans. Our time was almost exhausted and still we had failed to catch the voice.

TRUMPETERS TRICKED

When the last morning was at hand we staked our all on one last scheme. We concealed the sound truck behind one of the buildings and ran the cable to the edge of the lake, where we set up the sound reflector and the blind with the Akeley camera inside. Then we made a little cylinder of fly-screening and set it among the rushes, fastening a string to the top of it and running it over to the blind.



KIDNAPING THEIR YOUNG, THE AUTHOR TRICKED WARY TRUMPETER SWANS INTO TALKING FOR THE "MIKE."

For five days the birds were patiently stalked without a close-up or a sound record of their voices. But ten minutes after the little cygnets were imprisoned in the screen cylinder, the two old birds glided up close to the expedition's blind and began talking to their children. When Dr. Allen released the young swans, there was a grand family reunion, and the microphone recorded the hisping calls of the cygnets as well as the hoarse trumpeting of the parents. Thought once to be almost extinct, these largest of North American wild fowl are now increasing in numbers under protection. There are at least 75 in the Yellowstone region, and more in British Columbia.

Leaving Kellogg ready in the sound truck, Tanner and I then rowed two duck-boats to the opposite end of the lake. We followed devious channels so as to avoid the swans until we could start drifting slowly toward them from the opposite side.

Swans are wary creatures and these kept moving away from us, with the cygnets between them. But so slowly did we approach that they had time to feed as they went, and little did they realize that we had cut off their avenues of escape, except the one that lay past the blind. Never realizing, they fell into this simple trap and within two hours had moved to the far side of the blind.

Now we increased our speed and rowed in more quickly than the cygnets could swim, cutting them off from their parents and edging them over to the blind. With the two boats this was easily done, and in a few moments we had picked them up and placed them inside the cylinder of screening.

We now rowed quickly back into the lake, and while Tanner diverted the attention of the old birds, I went ashore and sneaked into the blind. Jim then disappeared up the lake.

Within ten minutes the swans had found their youngsters and were talking to them—into the waiting microphone. In a few minutes we had the sounds of both young and old safely recorded. I then pulled gently on the string, capsizing the cylinder and releasing the young without their knowing just what had happened and without their realizing that we were anywhere around (opposite page).

The little cygnets swam from one parent

to the other, talking back and forth and gradually moving up the lake again. They were none the worse for having been our prisoners for a few minutes so that we could make a permanent record of their voices that will go down through the years, even though all their kind should vanish from the earth.

EXPEDITION'S SWAN SONG

This was in very truth our swan song, though a happy one, and the end of our expedition. We had exposed ten miles of film, we had recorded the songs and calls of 100 species of birds, including the rarest in North America. We had filmed the home life of nearly as many and had filled our journals with observations that may help in the preservation of vanishing species.

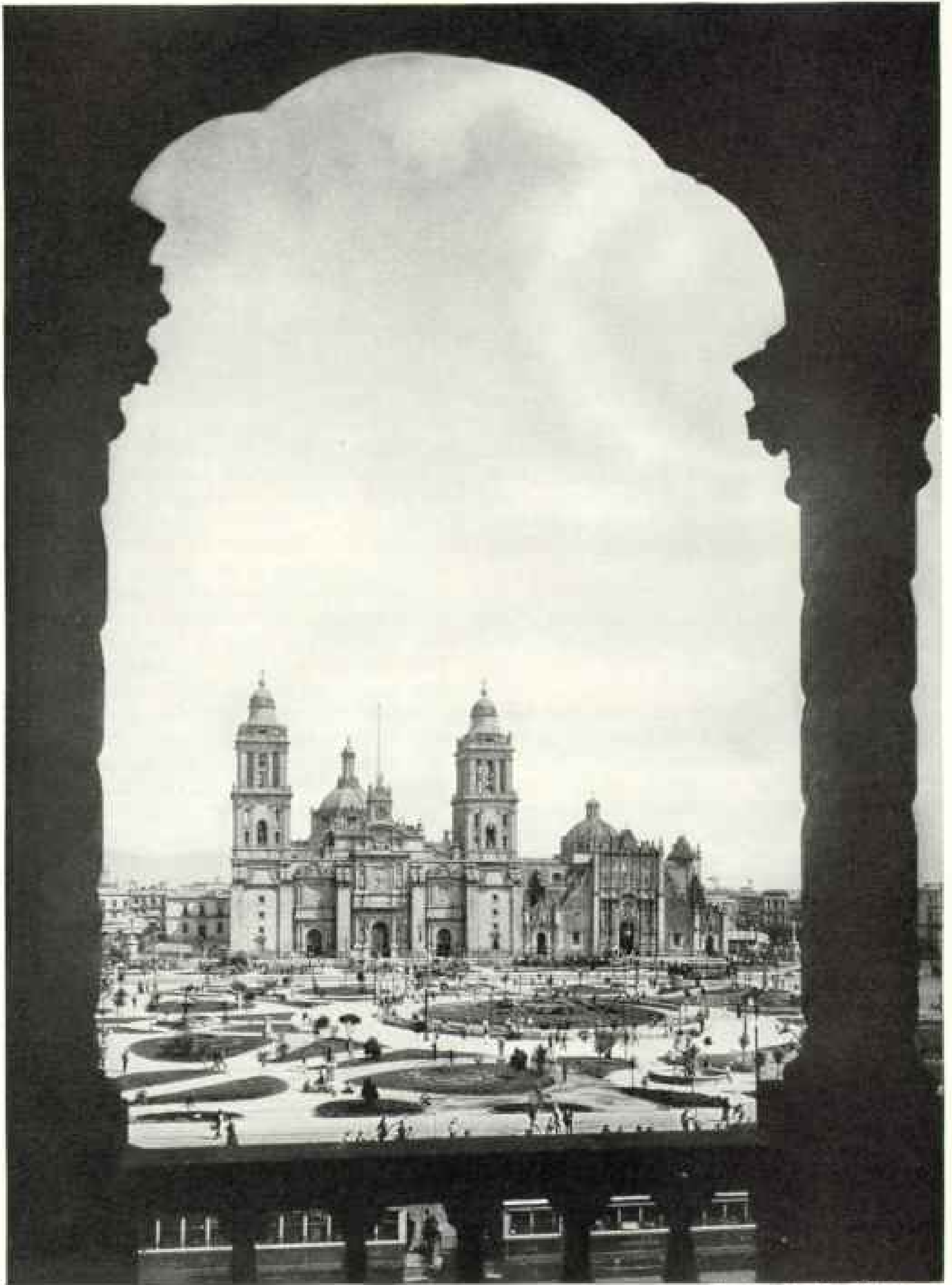
We now had six days for the return journey; two of these we spent in Yellowstone National Park where we filmed Townsend's solitaire and Williamson's sapsucker, and secured recordings of the Lincoln's sparrow, Audubon's warbler, and Clark's nutcracker. Unfortunately, the solitaire, though nesting, had stopped singing, and our failure to record this beautiful song was one of the disappointments of the trip.

By driving night and day and resting only while a broken axle was repaired, we arrived safely at Ithaca just ahead of the greatest flood in the history of central New York. Two hours after we pulled in, the deluge broke and ten inches of rain fell in the next few hours. The hillside road leading to my home was entirely washed out, so that after a successful journey of 15,000 miles, our trucks finally became marooned in my own backyard.

THE SOCIETY'S NEW "BOOK OF BIRDS" IS READY

The National Geographic Society invites attention of members to its new "Book of Birds," in two volumes, edited by Gilbert Grosvenor and Alexander Wetmore—the first work ever published portraying with comprehensive detail, and with full-color illustrations, all major species of birds on the North American Continent north of Mexico. Full-color portraits of 1,000 birds by Major Allan Brooks, more than 230 monochrome photographs and bird migration maps, 633 "bird biographies," and many fascinating articles by outstanding authorities—T. Gilbert Pearson, Arthur A. Allen, Robert Cushman Murphy, Frederick C. Lincoln, Francis H. Herrick, Alexander Wetmore, etc.—are contained in this 704-page work.

Because these volumes are published by The Society as a contribution to the increase and diffusion of geographic knowledge, and because the first cost of the engravings has been assumed by THE NATIONAL GEOGRAPHIC MAGAZINE, "The Book of Birds" may be purchased at a price of \$5.00 the set, postpaid in the United States and possessions; elsewhere 50 cents additional. It is obtainable only from The Society's headquarters, Washington, D. C.



Photograph by Hugo Brehme

THE MIGHTY CATHEDRAL OF MEXICO RISES WHERE AZTECS WORSHIPED PAGAN GODS

Carved idols and other Indian relics are reputed to form part of the foundation of this historic mother church of New Spain. The first Christian house of worship in the city was erected here about five years after the Conquest. The present Cathedral dates from 1667. Adjoining it (right) is the Sagrario, a smaller church. In front is the vast Plaza de la Constitución, or Zócalo, seen through an arch of the Municipal Palace. Though often called "Mexico City," the capital officially is "México, D. F." (Federal District).

IN THE EMPIRE OF THE AZTECS

Mexico City is Rich in Relics of a People Who Practiced Human Sacrifice, Yet Loved Flowers, Education, and Art

BY FRANK H. H. ROBERTS, JR.

Smithsonian Institution

MEXICO City's magnificent Cathedral, richly adorned Sagrario, and extensive National Palace greatly impress the present-day visitor as he stands and gazes across the Zócalo, or Great Square, for the first time.

But suppose the scene should fade away and be replaced by that which greeted Cortez and his followers in 1519. The modern traveler would be as enchanted by the barbaric splendor before his eyes as were the Spaniards, and, like Bernal Díaz del Castillo, soldier-chronicler of the Conquest, he might well be moved to ask, "Are not these things a dream?" For the civic center of Mexico City was once the Tecpan, or Temple enclosure, of Tenochtitlán, the Aztec capital.

Where the Cathedral and Sagrario now stand rose the great pyramid topped by its temples to the Gods of War (Color Plate I) and of Rain. The National Palace occupies the site of Montezuma's palace (page 728). In the plaza stood the massive circular stone used for sacrificial combat (Plate II).

SKULL-RACK HELD SACRIFICIAL HEADS

Behind the stone rose the temple to the God of the Air, and not far distant was the sinister mass of the skull-rack where were placed the heads of victims offered to the gods (Plate III). In front of this stood a devotional altar for worship, and near by was a pool of water for ceremonial observances.

Numerous other temples were scattered about the enclosure. There were houses occupied by the priests, palaces for officials, even a zoo and an aviary.

Brilliantly colored costumes of the people contrasted with the white of the pyramids and other structures, completing the picture and making an unforgettable impression upon those who beheld the scene.

Other parts of the metropolis suggest similar contrasts, for this capital city of early Aztecs and modern Mexicans is a veritable storehouse of New World history.

On all sides the eye is met by remnants of ancient glories side by side with 20th-century splendors.*

There are places where only a few short steps separate the finest of aboriginal art from the ultramodern murals of Diego Rivera. Sixteenth-century buildings adjoin apartment houses of the latest style. Smiling faces of natives thronging the streets bear the stamp of Aztec lineage.

Ancient industries are reflected in today's gold, wood, and featherwork; and architectural ornamentation on newly rising structures exhibits the influence of Aztec design and symbol. It is this pleasing blend of old and new that gives the city its unique charm and individual character.

AZTEC HISTORY TOLD IN PICTURES

The story of the Aztecs is much better known than that of many New World peoples. There are native manuscripts, called "codices," detailing in pictographic form certain phases of their history (pages 730, 731, 733, 746, and 747). Descriptions of the city and accounts of the life and customs of its inhabitants were written by some of the Conquistadores and by several of the priests who accompanied them.

Besides the pictographic stories which supplement the Spanish records, helpful narratives were penned by a few native scholars, taught to write by their conquerors.

Added to these documents is the evidence still being obtained from extensive archeological and historical researches by experts of the Mexican Government and by other investigators, from both America and Europe.

Practically every excavation for new construction work in the city yields its quota of Aztec relics and adds material to the extensive collections in Mexico's National Museum of Archeology, History, and Ethnology. An excellent example of a chance

* See "North America's Oldest Metropolis," by Frederick Simpich, in *THE NATIONAL GEOGRAPHIC MAGAZINE* for July, 1930.

find of this nature is the statue of Coatlicue, the Earth Goddess, who wears a skirt of woven snakes. This awesome figure is one of the striking exhibits now on display in the museum.

The foundation of the Aztec nation and its subsequent florescence occurred at a time when the Old World was sunk in the depths of the Middle Ages.

Entering the Valley of Mexico early in the 14th century as a crude hunting people, the Aztecs found various communities around the borders of a great lake and came into contact with a culture which was very high.

According to some accounts, they settled near Chapultepec and came under the influence of the Acolhuacans, from whom they received many cultural traits. Between about 1367 and 1376, the Acolhuacans drove them out and forced them to take refuge on two small reed-covered mud banks or islands in the center of the lake.

The settlements on the islands grew into two towns, Tenochtitlán and Tlaltelolco. They appear to have risen side by side and progressed as independent units for more than a century, although the space between them was reduced to little more than a broad canal. Late in the 15th century, Tlaltelolco was conquered by the sixth ruler of Tenochtitlán and the two were united to form one great city.

ORIGIN OF MEXICO'S COAT OF ARMS

The legendary explanation for the choice of the present site of the city is not in full agreement with the historical facts, but is more picturesque. According to tradition, the Aztecs were told that when they saw an eagle eating a serpent there they should stop and found their dynasty.

Upon reaching the borders of a large lake they saw a beautiful island, and the priest who led them beheld a huge eagle with a struggling snake in its talons. The bird came to rest on a cactus plant and proceeded to kill and devour the reptile. The Aztecs were overjoyed at this, because their prophecy was fulfilled, and they set about establishing their city.

The tradition is symbolized today by the eagle, serpent, and cactus in the Mexican coat of arms and flag.*

As long as the Aztecs were weak and hemmed in by their foes, they subsisted on

fish, birds, aquatic plants, and such vegetables as they were able to grow on floating gardens, or *chinampas*. The latter were formed by heaping up soft mud from the lake on rafts made from reeds and wattlework.

These floating islands gradually increased in size. The interlacing roots of the plants made them more compact and eventually anchored them to the bottom of the lake. More and more were built and as their number increased they became a series of rectangular plots separated by canals just wide enough for the passage of canoes.

The gardens of Xochimilco, not far from Mexico City, are a present-day illustration of this type of made land and communicating waterways (opposite page).

By the time of the Conquest Tenochtitlán was a veritable New World Venice; in fact, one of the Spaniards with Cortez, and the conqueror himself, called it that.

One of the soldiers in his journal describes it as a place of many wide and handsome streets formed half of hard earth like a brick pavement and half of canal, so that the people moved about either by land or by water (Color Plate VII).

Many of the "boulevards" were entirely of water, however, and could be traversed only by boats. The position and direction of a number of the more important streets of modern Mexico City were determined by the course of these main canals, and as one walks along them today he travels on pavement where the Aztec went in his canoe.

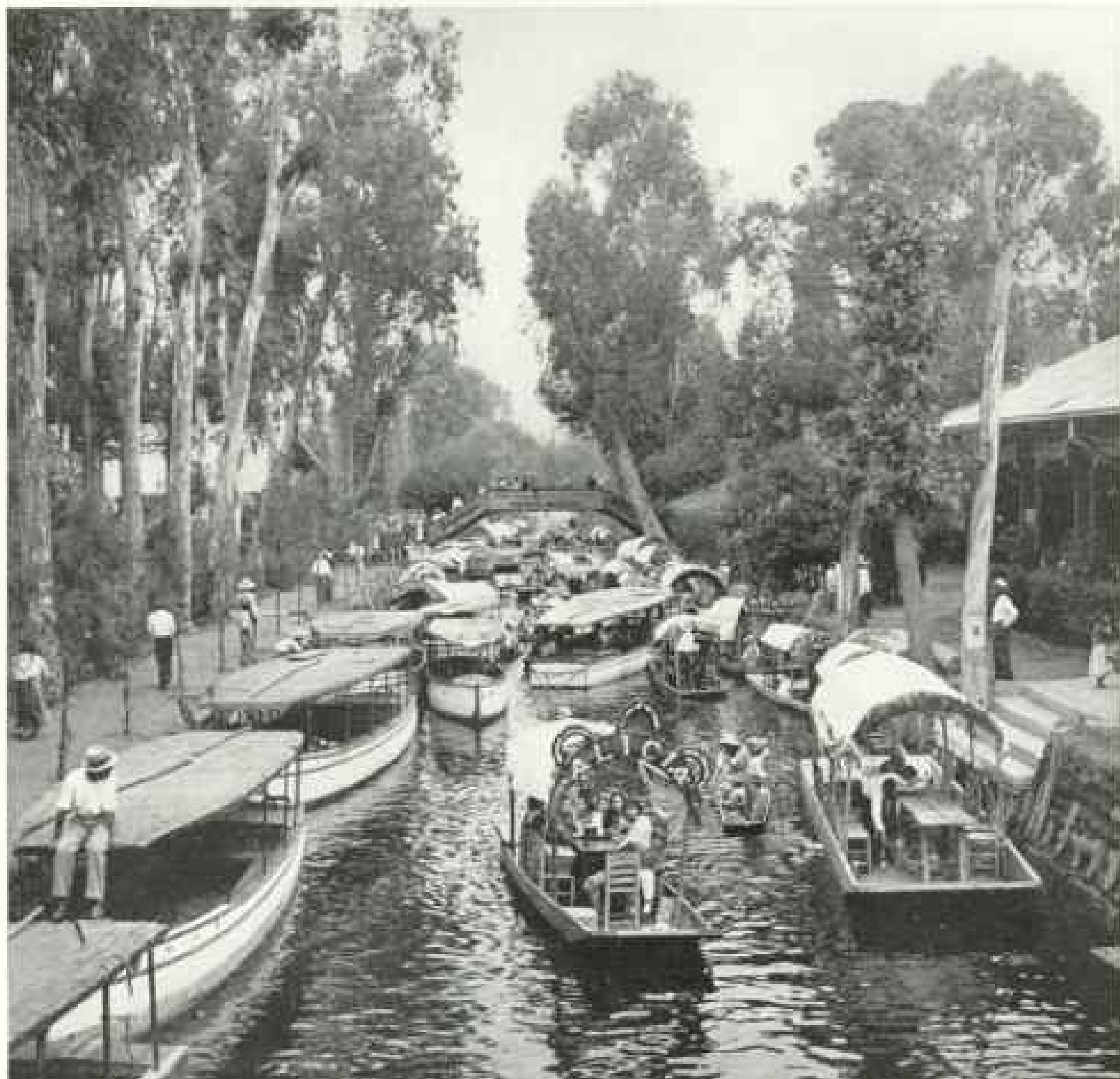
A POWERFUL EMPIRE IS BORN

The Aztecs did not become a real power in the Valley until their fourth ruler, Itzcoatl, 1427-1440, became head of the "kingdom." Itzcoatl had a famous general named Maxtli, who conquered many neighboring cities and tribes and exacted from these subject peoples tribute which enriched the Aztecs.

From this time on, under five succeeding rulers, Tenochtitlán prospered and expanded, until by the time of the Conquest tribute was pouring into the coffers of Montezuma II from all of southern Mexico, the Vera Cruz coastal plain, and even from Guatemala.

Agriculture was important, and, while many vegetables were raised in the environs of the city, most of the products came from surrounding precincts. A variety of maize, or Indian corn, was developed which ma-

* See "Flags of the World," in the NATIONAL GEOGRAPHIC MAGAZINE, September, 1934.



Photograph by E. John Long

BOATLOADS OF HOLIDAYMAKERS JAM THE CANAL LEADING TO THE "FLOATING GARDENS" OF NOCHIMILCO

Indian boys pole the flat-bottomed craft, with awnings and fancy names, through the eucalyptus-shaded Canal de la Viga. Since the days of the Aztecs, the "floating gardens" of this Mexican Venice have been a source of fresh vegetables and flowers as well as a favorite resort for throngs from the capital. The gardens were originally large rafts of interlaced twigs covered with soil. Huts were erected on them, and the gardener could row his "farm" from place to place. Later the plants took root in the lake and the gardens no longer floated freely.

tured rapidly, an essential quality for the high, arid plateau country. Other products were sweet potatoes, tomatoes, squash, beans, peppers, cacao or chocolate, tobacco, cotton, hemp, rubber, and copal.

The turkey was an important domesticated fowl and an item of barter (Color Plate IV).

The gold and silversmith's art was highly developed. There were numerous wood carvers, workers in stone, makers of elaborate turquoise mosaics, and producers of featherwork.

Other groups spun thread from cotton and wove it into cloth; the tailors fashioned it into garments. Still others made the elaborate headdresses worn by officials and warriors. There were sandal-makers, basket weavers, pottery makers, and tanners of skins. Merchants, too, constituted a busy and important group.

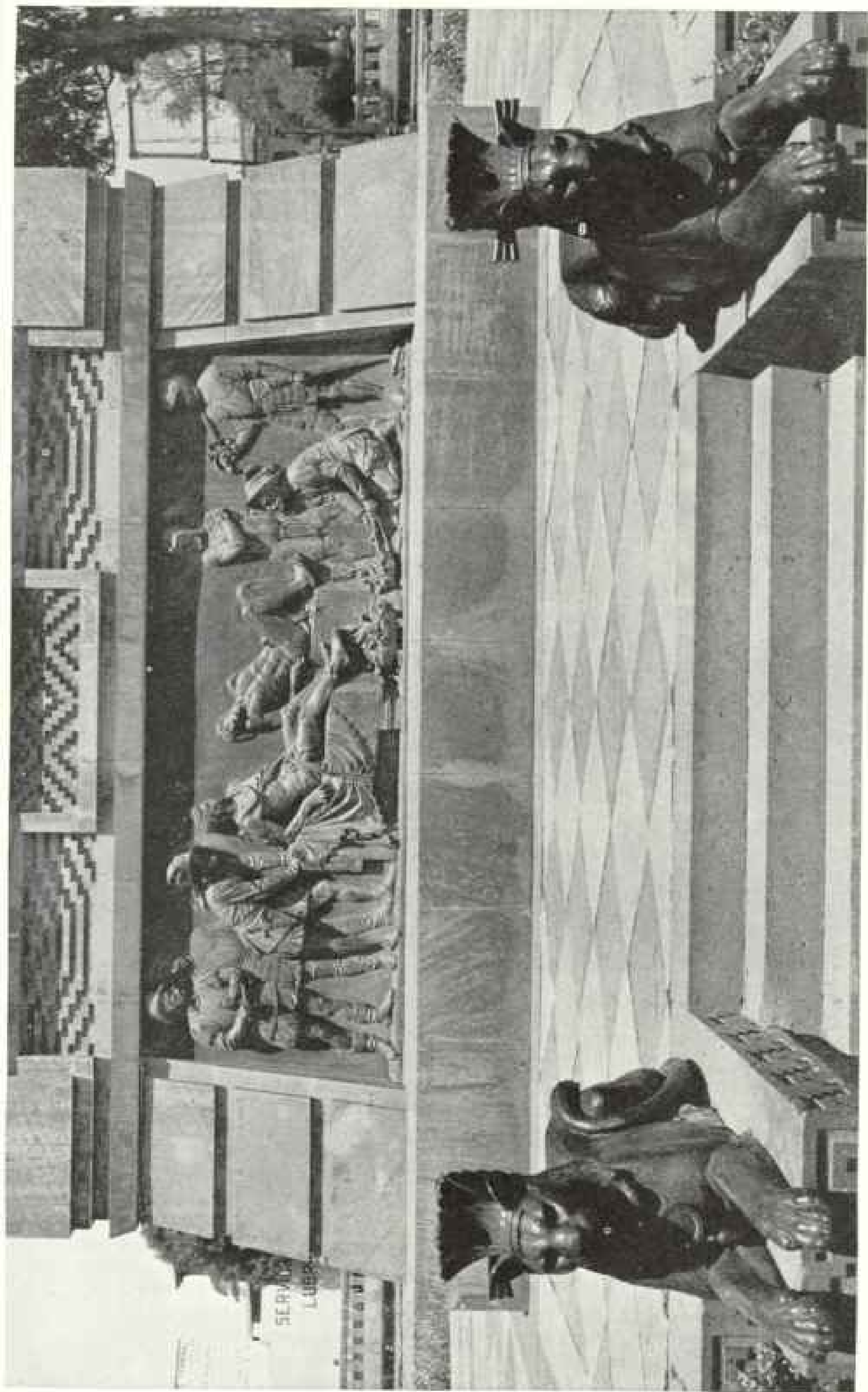
Clothing varied to conform to both the position or rank of the wearer and the occasion on which it was worn. The ordinary dress of an Aztec man consisted of a breech-cloth, a hip-cloth, a mantle or cape, and



Photograph by Hugo Birkman

SEAT OF MEXICO'S GOVERNMENT, THE NATIONAL PALACE OCCUPIES PART OF THE SITE OF MONTEZUMA'S HUGE, RAMBLING RESIDENCE

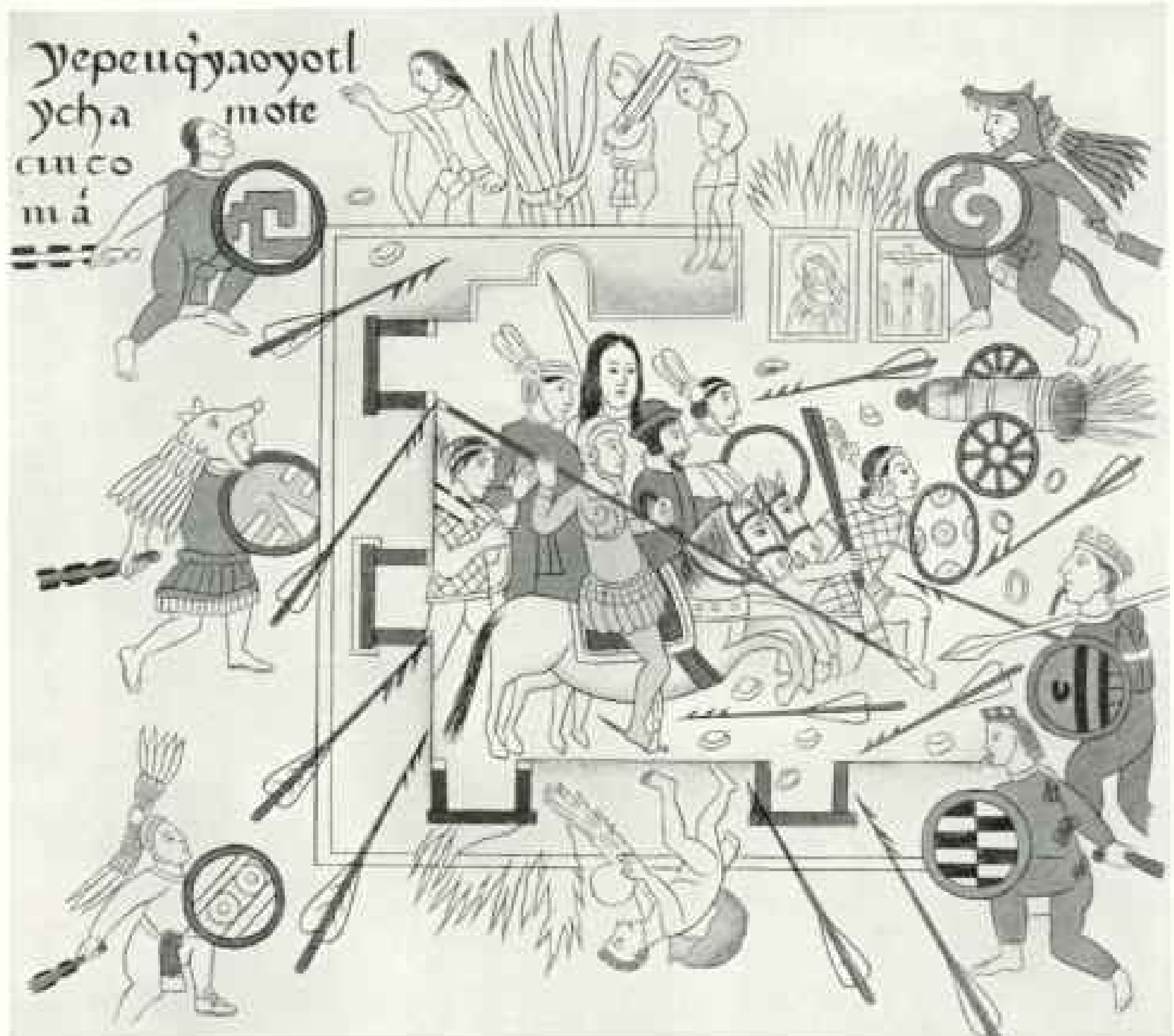
Cortez here appropriated one of the Aztec ruler's palaces and built his own headquarters, portions of which still exist. The structure has been frequently altered; its upper floor was not added until 1927. Here ruled Spain's viceroys, the spectacular native emperor Agustín de Iturbide, the ill-fated Maximilian, and successive Presidents of the Republic. Above the central doorway is the Mexican Liberty Bell, rung by the priest Hidalgo at Dolores in 1810 to summon patriots to fight for independence from Spain. Annually on September 15, in this wide square called the Zócalo (page 724), Mexico's President leads throngs who shout as Hidalgo did after he sounded the bell.



Photograph by Lou Marden

HEROIC INCIDENTS IN THE LIFE OF MEXICO'S LAST AZTEC RULER ARE DEPICTED ON THE BASE OF HIS STATUE

Cuauhtemoc's plumed figure, in bronze, stands atop this impressive monument, unveiled in the tree-lined Paseo de la Reforma, Mexico City, in 1887. Two bronze jaguars guard a flight of steps at each side of the base, which is adorned with massive tablets. The relief on this side shows Cortez's soldiers torturing the successor of the Montezumas and one of his chiefs with fire in a vain attempt to force them to tell where the Aztec gold was hidden. A warrior dressed in a jaguar skin (third figure from right) stands in tense anguish as he watches his brave master suffer. The Spanish later hanged Cuauhtemoc.



HOW AZTECS BESIEGED CORTEZ IS SHOWN BY AN INDIAN ARTIST OF THE TIME

The Spanish invaders had been permitted peaceably to enter the Aztec capital (Tenochtitlán) in 1519, and had been assigned a palace. Shortly afterward, when they kidnaped Monteruma, the ruler, and massacred unarmed citizens dancing at a festival, the Aztecs rose and attacked the garrison, as depicted here. In the courtyard, bearded Cortez and long-haired Marina, his Indian mistress and interpreter, with a mounted aide and four Indian allies, defend themselves behind a cannon. A chapel with a Virgin and Calvary (upper right) is set on fire by the attackers. On the roof (upper left) Monteruma begs his people to let the Spaniards depart in peace. Angered, they fatally wound their sovereign with a stone, shown flying toward him. These illustrations reproduce a native pictorial record intended to honor the Tlaxcalan Indians who aided Cortez (pages 731, 733, 746, and 747).

sandals. The mantles and ends of the breech-cloth were short and plain for the lower classes and long and highly embroidered for those of more important station (Color Plate V).

Women's dress consisted of a short skirt and sleeveless blouse, the elaborateness of which likewise depended on the wearer's position in the social scale.

ARMOR OF COTTON AND FEATHERS

Warriors generally wore armor made from quilted cotton, three-fourths to an inch and a half thick, soaked in brine (Plate I).

Sometimes the legs also were encased in quilted armor and the outside of the entire suit was frequently covered with feathers, plates of gold, or of silver. The feathers played an important part in that they formed an elastic layer on the outside of the quilted cotton and made it even more effective protection (Color Plate II).

The protection offered by such apparel was so effective against arrows and javelins that the Spaniards adopted and wore it.

The use of feathers also made possible a differentiation of costume that indicated various subdivisions and companies in the



WITH CRUDE "TANKS," CORTÉZ TRIES TO FIGHT HIS WAY THROUGH MEXICO CITY

In a vain effort to get control of strategic bridges so that they could retreat from the capital, the Spaniards built portable wooden shelters for protection against the stones and javelins hurled by Mexicans from the housetops. A Spanish soldier with sword and shield fires a cannon beside a Tlaxcalan ally in the tank at the left. On the right, one of Cortez's men discharges a harquebus through a loophole, while another tries to rescue his horse from the conventionalized canal (left center) into which it has fallen. The ladder represents an attempt to bridge the canal, which has stopped the advance of the tanks. Native artists who survived the Conquest painted these pictures. The original record, called the "Lienzo de Tlaxcala," was long kept in the city hall at Tlaxcala, but disappeared during Maximilian's reign; the reproductions are made from an exact copy, published by the Mexican Government in 1892.

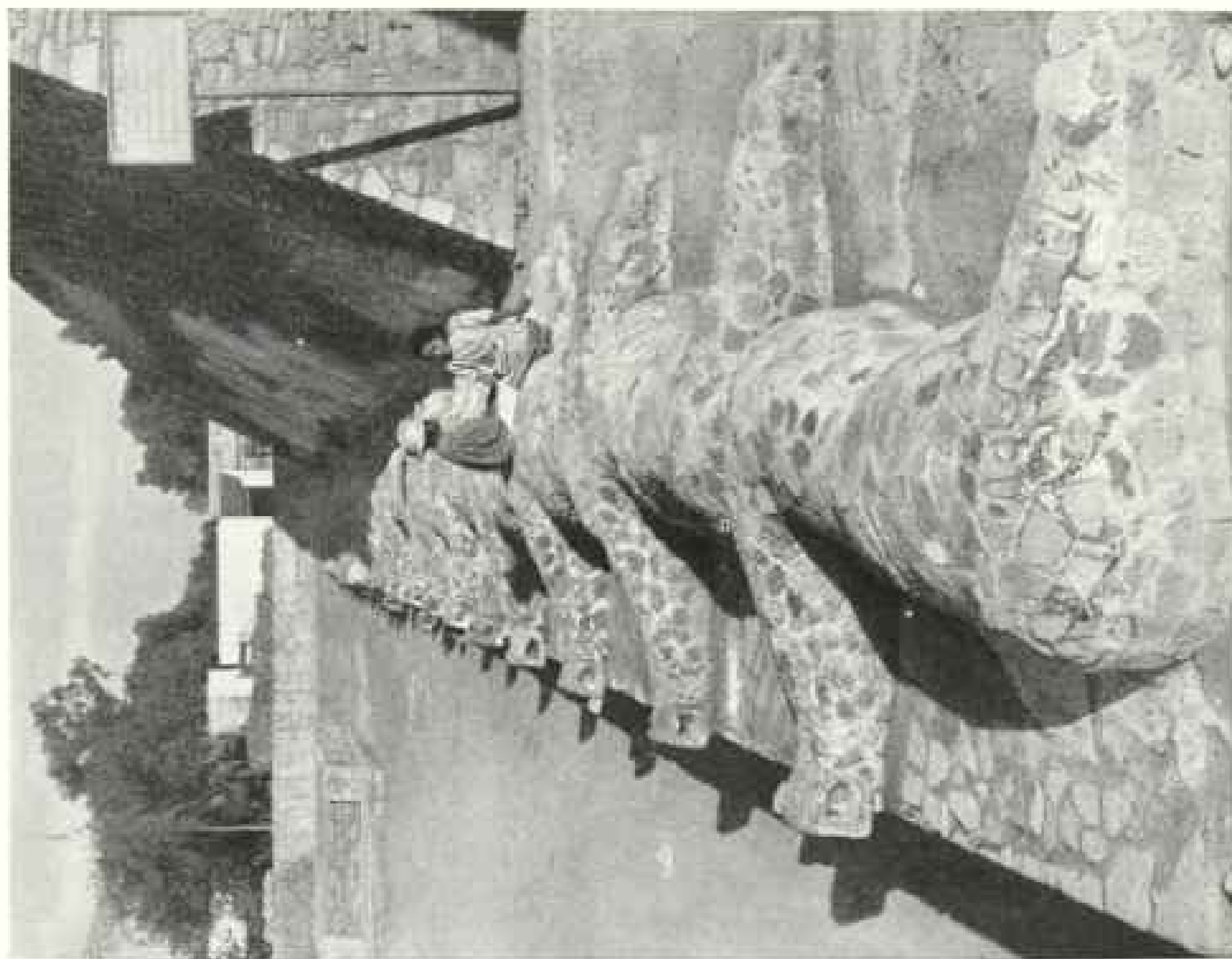
military forces. Some uniforms had white and red leathers, others blue and yellow; some were green, and others simulated actual birds.

Some groups wore animal skins over their armor or painted it to resemble animals. Warriors of merit wore headdresses, half mask, half helmet, many of which imitated the heads of jaguars, mountain lions, wolves, snakes, birds, and other creatures. The warriors in the sacrificial combat scene (Plate II) are wearing headdresses symbolic of the Eagle and Jaguar. The priest in charge is dressed as a bear with a casque

representing the head of that animal.

The principal leaders and war chiefs were distinguished by the cut of their hair, by lip and nose plugs, by their wide and flowing mantles, and by towering plumes of green feathers (Plate VII). Shields were ornamented with designs which indicated war honors, the number of persons captured, or exploits of extreme bravery. The village chiefs wore a white mantle and ambassadors (Plate VII) carried a fan.

The ordinary dress of the priests was black; even their bodies were stained black. But the color of the sacrificial priest was



YOUNG MEXICANS PLAY ON ONCE-SACRED STONE SERPENTS

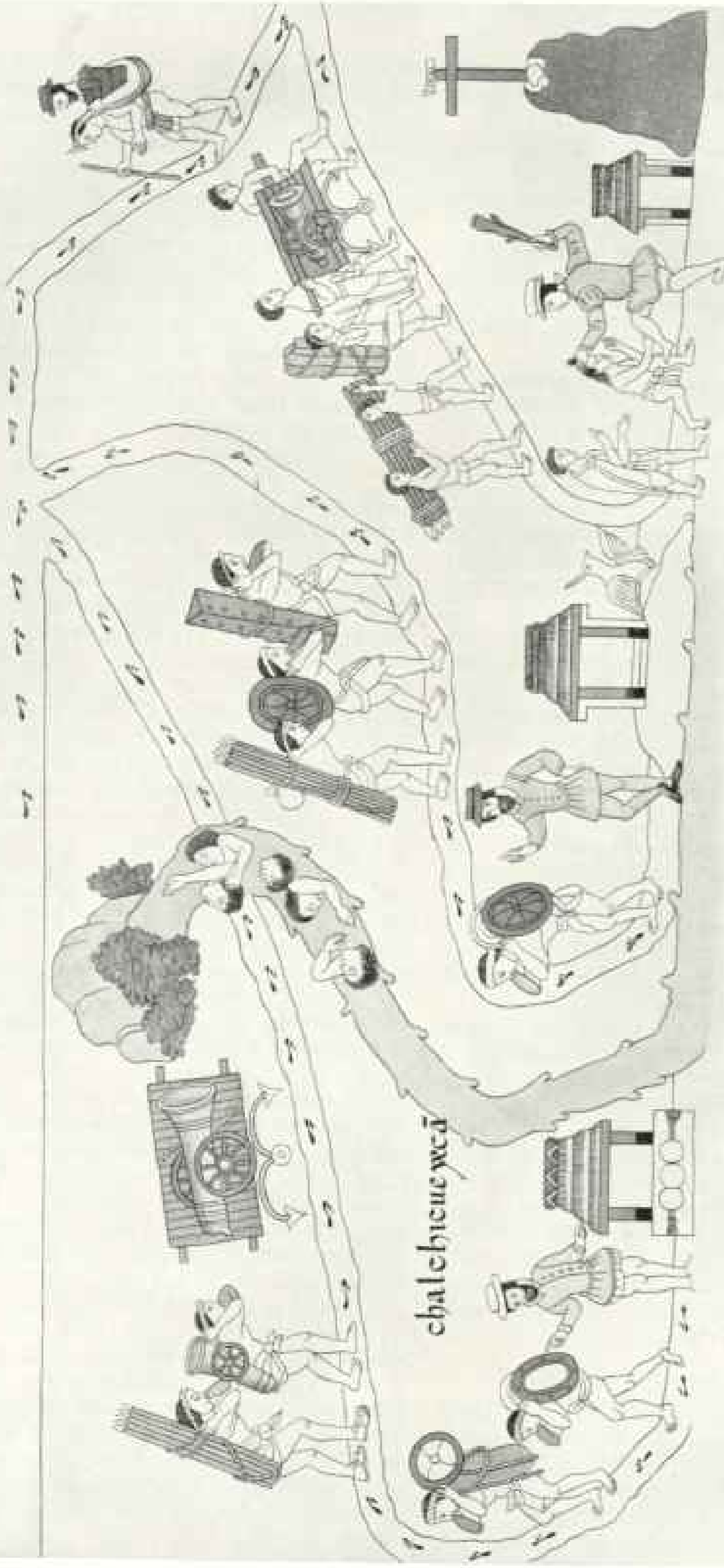
In Aztec times countless sacrificial victims were led up the broad steps of the Pyramid of Tenayuca, the restored base of which appears at the right. One of the best preserved of Aztec relics, it stands near Tlaltecotl, about six miles north of the Mexican capital. Tenayuca, in the Aztec tongue, means "Where They Erected Walls."



THIS TREE IS A DRAMATIC LINK WITH THE CONQUEST

Photographs by Luis Marlin

Under the giant ahuehuete, in the suburb of Popotla, Cortez is said to have stopped and wept as he watched the bleeding remnants of his army fleeing from the city after their horrible defeat by the Aztecs during the *Noche Triste*, or "Sad Night," July 2, 1520. An iron railing, reputedly forged from instruments of torture used during the Inquisition, protects the tree.



A 16TH-CENTURY INDIAN "COMIC STRIP" SHOWS HOW CORTÉZ RECEIVED BADLY NEEDED REINFORCEMENTS.

Escaping from the Aztec capital with a remnant of his followers, the Conqueror retreated to the domain of his allies, the Tlaxcalans. There he sent to the Spanish settlements on the coast for more men and supplies. In this painting, a Spaniard (left) dispatches Indian porters bearing harness, wheels, lances, cannon, and anchors for gunboats. On the way, some of the natives drown in a stream (upper center). Military equipment is also sent from two other places (lower center and right). Near the cross, denoting the town of Villa Rica de la Vera Cruz, a Spaniard chastises a rebellious Indian, while high up on the trail a bearded soldier rides pickaback across the mountains. These reinforcements enabled Cortez once more to attack Mexico City (page 746).

red. On the occasion of certain ceremonies various priests represented different gods and dressed accordingly.

The habitations of the farmers and poorer classes were wattle and daub with thatched roofs. Better-class homes were made from adobe blocks and the houses of the wealthier people and governmental buildings were of cut stone. The pyramids, or temple platforms, were of stone, but the temples were generally of wood with thatched roofs.

Many of the houses were erected on piles because of the swampy condition of the city and the frequent floods.

The walls of the structures in Tenochtitlán and other towns around the lake were covered with white plaster or were colored a dull, rich red. Some of the more important buildings had decorations painted on their walls, but for the most part the Aztec capital was a white city.

From all accounts it was indeed a beautiful place. The green of its numerous trees, the sparkling blue waters of the surrounding lake and many canals, the gay splashes of color from flower beds on the roof tops and in the gardens, the multitude of canoes loaded with products from the field and garden, and the brightly hued garments of the populace, all contrasted with the white and dull red of the buildings to make an enchanting scene.

The interiors of the better houses were cool and spacious and most buildings included a courtyard or patio, features still seen in many parts of the present city.

The daily life of the people was a busy one. Women were occupied with numerous household duties. The rooms and courtyards were carefully swept and cleaned. Corn, or maize, was ground to make meal for the tortillas, even as it is ground today in many parts of Mexico. There were rich sauces and other foods to prepare.

The markets of the city were as interesting as those of today. Most of the trade was by barter, but a form of currency consisting of feather quills filled with gold dust was used occasionally.

GIRLS MARRIED YOUNG

The older men taught the young boys. When they became older they were sent to schools and prepared for either the priesthood or the military service, or were apprenticed to merchants or artisans.

There were schools for girls as well, but

unless they went into one of the religious orders their education was not so rigorous as that of the boys. Girls were married between the ages of 11 and 18, all arrangements being made by their parents or priests. There were numerous ceremonies requiring the preparation of fruit, foods, flowers, and cloth as offerings to the gods.

The men devoted much time to military affairs and the general business of the city. Some served as bodyguards for the merchants, others as burden-bearer apprentices. Many were engaged in the various trades and those who entered the priesthood led an extremely active life.

WARRIORS BECOME LANDOWNERS

The social organization of the Aztecs was a complicated one. All land was owned in common by the tribe, and the chiefs—usually two for each tribe—were chosen by the people. These offices were not hereditary and unsatisfactory chiefs were deposed.

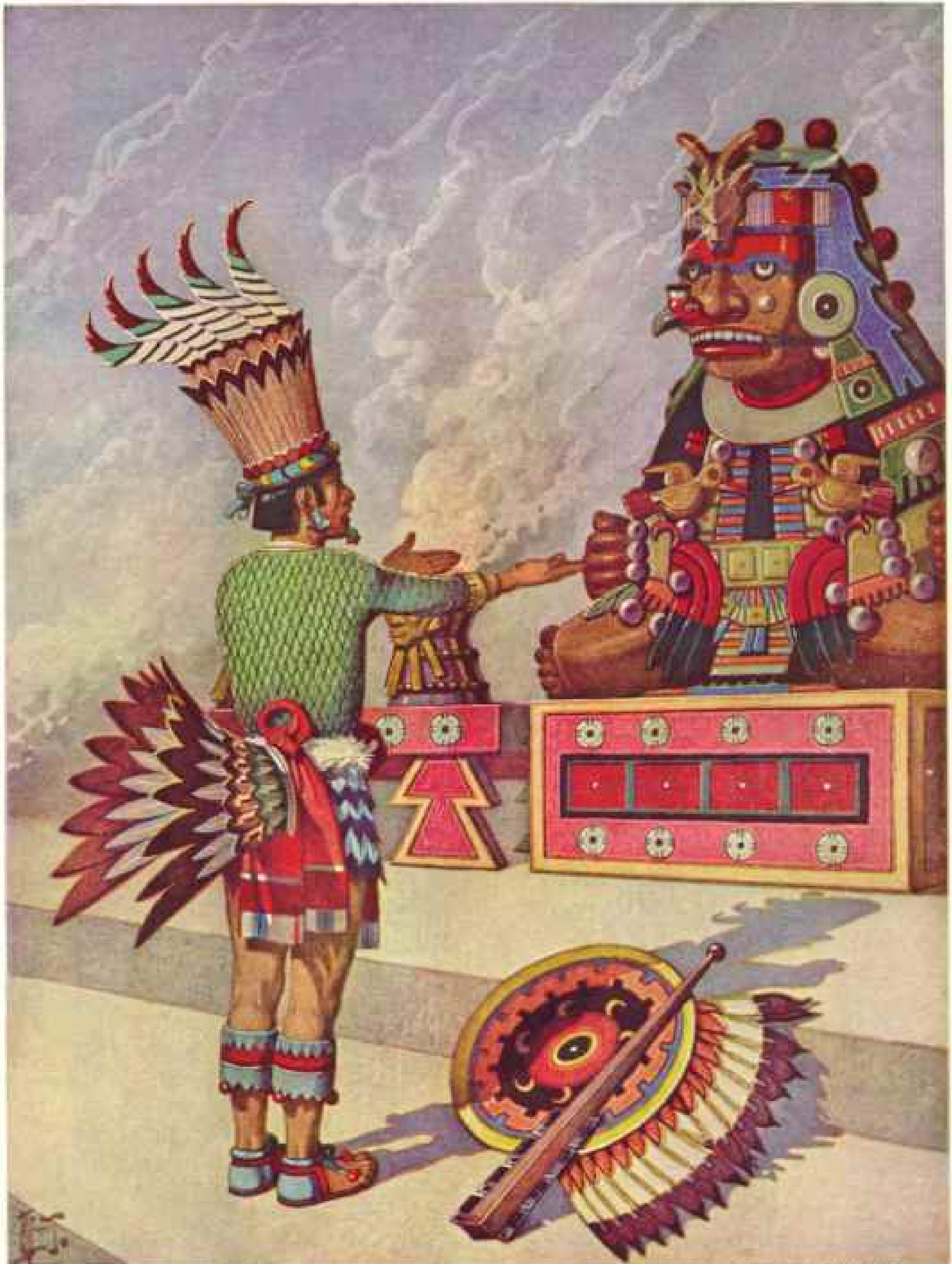
As time went on and the power of the tribes increased, such customs changed. Under Itzcoatl, the ruler who made Tenochtitlán a power, social classes based on captured wealth made their appearance and a tendency toward inheritance of office was noted. There was a distribution of spoils and land for the first time.

Conquered territory went to the warriors and made for a class of wealthy landowners. Members of the military body were able to advance themselves through merit and the priesthood occupied a high place. Certain crafts placed the artisans in upper classes and gave them special privileges.

Whether the entire organization was a monarchy or a democracy is largely a matter of definition. Even after the inheritance of office became established, men were nominally elected to their positions and when not satisfactory were ousted. There was a class of outcasts composed of those who were driven out of their own groups for infractions of laws, of those from other tribes who came to the city, and of those who failed to cultivate their gardens.

There were slaves, but they were not slaves in the present accepted sense of the word. The labor of people in this group belonged to another, but their persons did not, and it was entirely possible for a slave to have slaves of his own. The owner of a slave's labor could not sell it to another person without the consent of the laborer.

AZTECS UNDER THE WAR GOD'S REIGN

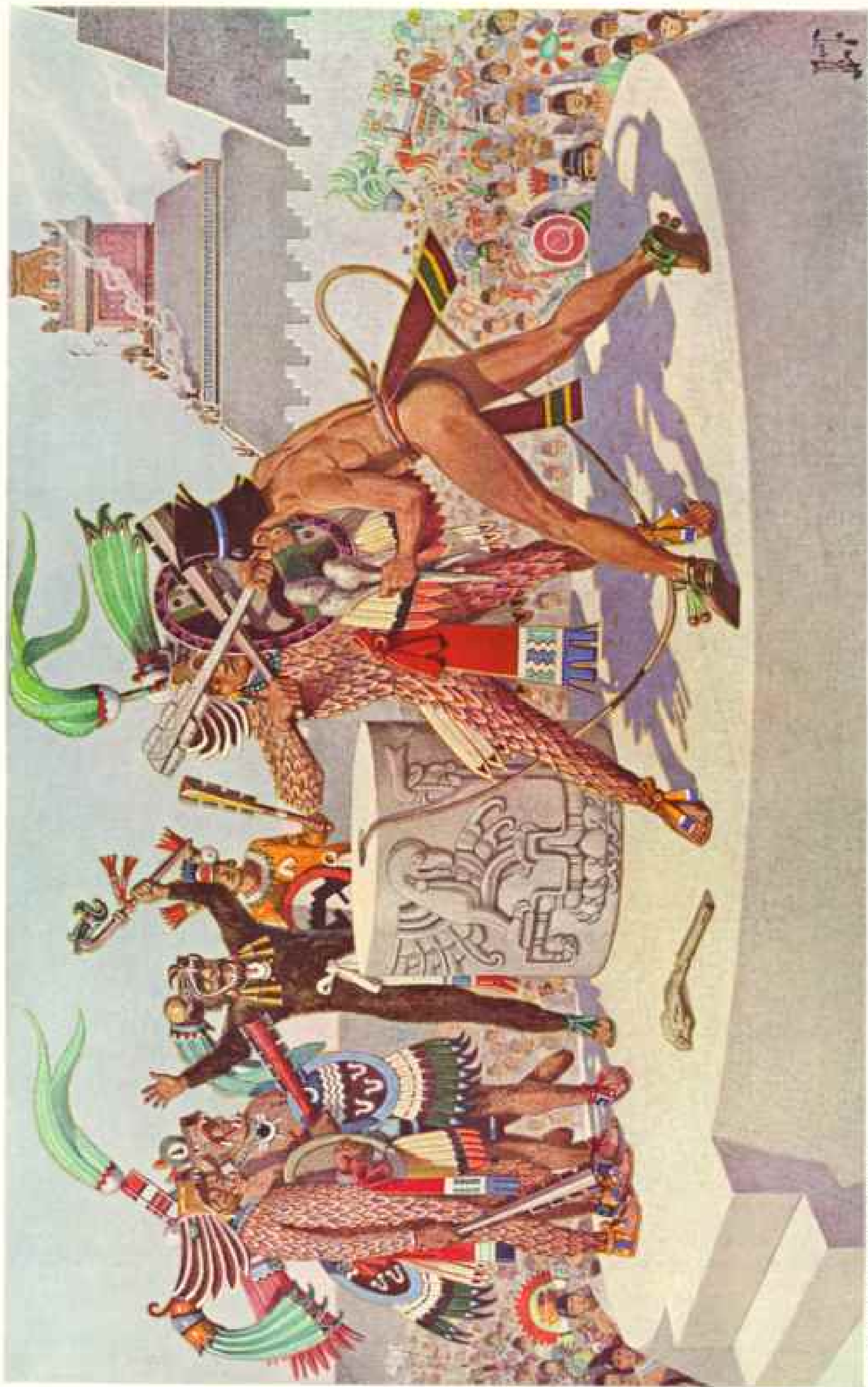


© National Geographic Society

Painting by H. M. Herget

"GRANT US, O DREADED ONE, VICTORY IN BATTLE!"

"By thine aid we have subdued many tribes and forced them to pay us tribute of gold, emeralds, amber, turquoise, and honey." So might a warrior have prayed to Huitzilopochtli about the time Cortez invaded Mexico. On the idol's cuffs rest two humming birds, symbol of the war god. The suppliant wears a feathered headdress and "bustle" denoting his military order. Shield and war club lie on the floor. Fighting and religion were the principal Aztec pursuits. Paintings in this series are based upon records left by the Spaniards and sculptures recovered by the Mexican Government.

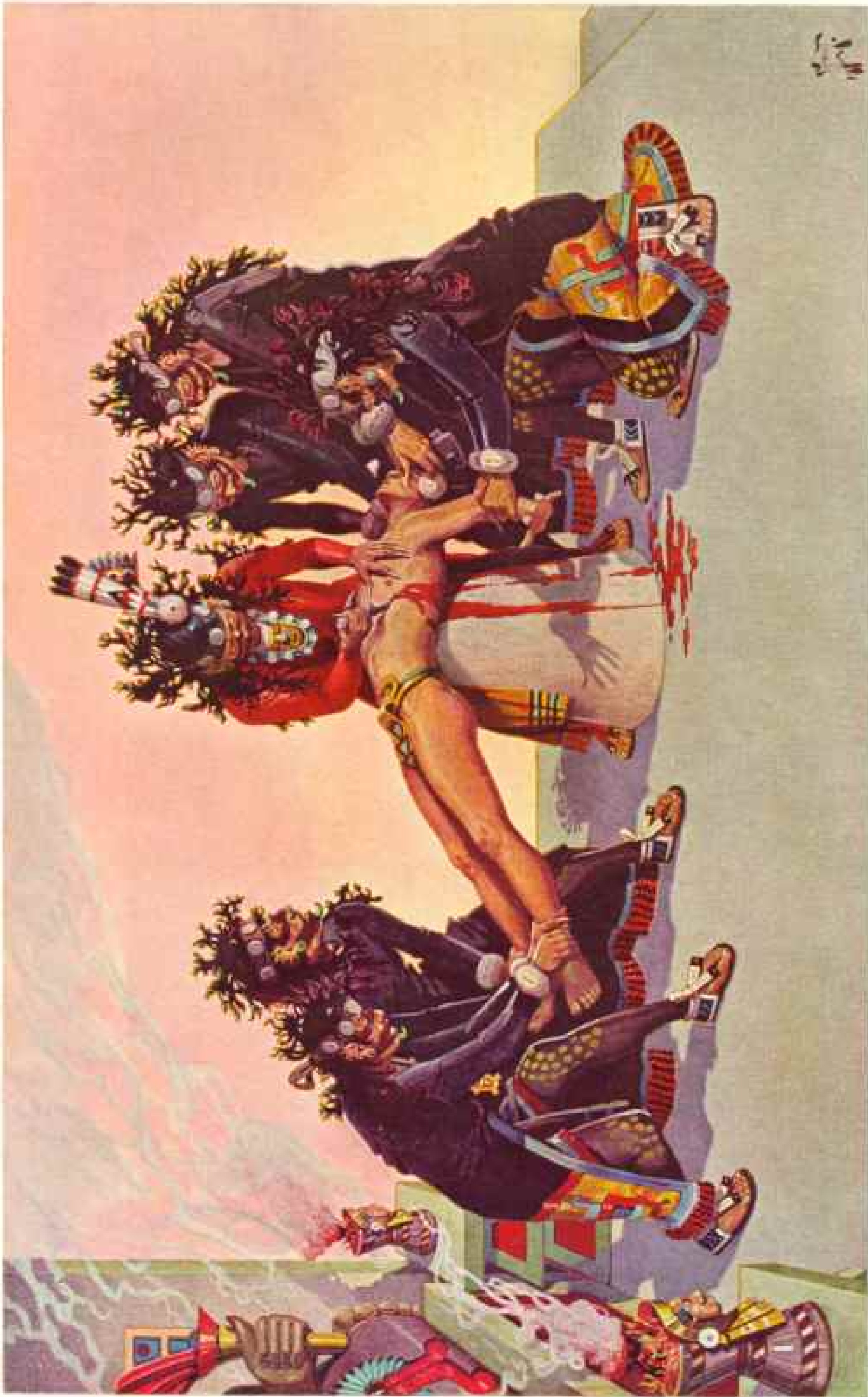


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WAR CLUBS CLASH AS "EAGLE" FIGHTS CAPTIVE IN A TEMPLE CEREMONY WATCHED BY THOUSANDS

Painting by H. M. Herrett

If the prisoner bests five warriors, he gains freedom, but since he battles shieldless and tethered, he has slight chance. Feathers fringe the sides of his long club, while the opponents' weapons are edged with sharp obsidian blades. If the captive wins the first encounter, he meets another warrior of the Eagle clan (left), then two "Jaguars," and finally the left-handed fighter behind the stone. A priest dressed as a black bear referees the fight;



© National Geographic Society

A FATTED HUMAN SACRIFICE DIES WITHOUT FLINCHING AS A PAINTED PRIEST TEARS OUT HIS BEATING HEART

Painting by H. M. Herrert

Five black-robed priests hold the young victim's head, arms, and legs, while the official in red slits the youth's chest, grasps his heart, and offers it to the god of war (left). Aztecs sometimes chose the victim from their own people. He was feasted upon delicacies, wore rich raiment, and was entertained by comely maidens. Then came the fatal day when, amidst pomp and ceremony, he marched to meet his god. This painting is based upon an eye-witness account of the ceremony, recorded by one of Cortez's followers. Thousands of prisoners were sacrificed annually, but without the feasting!



© National Geographic Society

OFF TO MARKET, WITH TURKEYS, PARROTS, AND SQUASH

Even today Indian farmers carry their wares to cities in this fashion, sometimes walking 10 or 20 miles. Native Americans domesticated the turkey long before the Spaniards came.



Paintings by H. M. Herget

DAUGHTER EARLY LEARNS HER MOTHER'S ART

Reeds for these baskets came from swamp lands that once surrounded Tenochtitlán, the Aztec capital. Corn grows beyond the pair, in front of the thatched houses.



Painting by H. M. Herzog

SQUATTING IN THE MARKET PLACE. A WOOD CARVER WITH OBSIDIAN TOOLS CHISELS A TEMPLE DECORATION

Pottery, dogs, and macaws are specialties in this mart. Highly decorated pots at the right came from outside the Aztec realm, for local artisans preferred simpler designs. A cloth awning, its edge visible in the upper left corner, partly shields buyers and sellers from the burning sun. A Spanish chronicler declared that the hum of voices in a busy market could be heard several miles away. Though fabulously rich in gold and silver, Aztecs traded principally by barter. Their society comprised three definite classes: nobles, commoners, and slaves.

© National Geographic Society



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THIS HIGH PRIEST SUPERVISES TEMPLE RITES AND CEREMONIES

His hair is matted with human blood. Scepter, crown, and cloak bear insignia representing minor gods. Priests usually dressed in black, and stripes were painted across their faces (Plate III). A pyramidal temple stands at the right.



Paintings by H. M. Hergert

AN "EAGLE" CAPTAIN WATCHES HIS RANK

Ear plugs and lip and nose rings denote his rank. Beneath the feathers is a cotton garment soaked in brine to make it stiff and impervious to arrows. "Eagles" and "Jaguars," principal Arctec warrior-clans, carried javelins, clubs, and shields.



© National Geographic Society

TEMPLE GUARDS STAND AT ATTENTION WHEN AN AMBASSADOR FROM ANOTHER TOWN ENTERS THE SACRED SHRINE

As his badge of office, this Aztec diplomat carries a fan. Incense made of copal and rubber burns near the temple wall. Across the canal, a rich chieftain rides in a litter, preceded by numerous retainers. When Cortez's soldiers came to Tenochtitlan, now Mexico City, they found it crisscrossed with canals along which most of the capital's traffic passed. Streets of today follow many of the old waterways.

Painting by H. M. Herget



© National Geographic Society

Painting by H. M. Herget

"LET US PREPARE AN OFFERING FOR THE GOD OF FLOWERS"

Not all Aztec rites were hideous orgies of human sacrifice (Plate III), for the people had many gods. Priests' headdresses and back ornaments were of light basketry decorated with carvings and quetzal feathers. Sacred symbols decorate the fringed cotton robes. Each ceremony had its special costume. Incense burns on one of the frescoed altars in the background.

The organization of the city was elaborate. After settling on the islands the Aztecs separated the area into four quarters. In each of these was a phratry composed of kindred peoples or those of common descent. There were 20 Kin to a phratry. Each Kin elected and deposed its own officers, consisting of a governor and a group of "Elder Brothers," or council.

There was also a group of councilors known as "Grandfathers." This group was in the nature of an order for merit and was open to any who qualified by warlike prowess, bravery, and superior shrewdness. Courage alone could not secure it.

Actions denoting particular wisdom, exceptional service in the councils, and extraordinary ability in trade also made a man available for the honor. Furthermore, it was conferred upon those who passed through a series of cruel ceremonial rites which put the courage and self-control of the candidate to the severest of tests.

At the head of each phratry was a war captain. These four captains served on the great council of the tribe in company with one representative from each Kin, Elder Brothers, and certain of the temple priests. There was a smaller council, composed of one speaker from each Kin, which met every 20 days in a directing and judicial capacity. The great council met every 80 days, separating into two judicial bodies which sat simultaneously and passed on all important affairs.

At the head of the entire tribal organization were the Chief of Men and the Snake "Woman."

The Chief of Men, elected by the council, was the executive officer. He later became the king or emperor. Toward the end of Aztec dominance in the Valley there was definite lineal descent of the office of Chief of Men, but even then he was voted upon by the council.

The Snake "Woman" was elected for life, but he could be removed for cause. He was a second "emperor" and functioned as a Secretary of State. All intertribal affairs were under his jurisdiction. He also kept account of the tribute from subject peoples and was the keeper of the tribute rolls—pictographic records of the materials to be paid by each conquered tribe.

There were two major divisions of crime among the Aztecs. One was the crime against a person's own group, the other an offense against another group. The group

to which an offender belonged was obligated to see that he was brought to justice.

Murder was punishable by death.

DEATH FOR THE INTEMPERATE—EXCEPT THOSE OVER 70

Intemperance, except for those who had attained to the age of 70 years, also carried the death decree.

Theft had varying degrees of punishment, according to the amount or nature of the stolen goods and the number of offenses charged against the individual. The stealing of gold or silver was a major crime and offenders were flayed. Lesser crimes carried terms of imprisonment.

A priest who broke the law was put to death. In certain cases the offender paid the death penalty on the great stone of combat in the *Zócalo*.

Slanderers were punished by their own Kin. They had their lips cut off.

The legislative power was vested in the ruler. He laid down the laws and stipulated the penalties for violations of his edicts.

Each phratry had a magistrate, elected for personal ability and integrity. The Aztecs were remarkable for their day and age; in fact, were superior to some modern governments, because there was an impartial treatment of all cases brought before the magistrates. The lowliest laborer and the richest noble were accorded equal justice.

Taxation bothered the average Aztec even more than it does present-day peoples. From 30 to 33½ per cent of everything went into taxes. Each section had great storehouses for the materials received for this purpose. Food, clothing, animal skins, pottery, gold, silver, feathers, tools, and similar objects were paid into the treasury.

At one time the "king" of Texcoco was supported by tribute from 29 cities. Fourteen cities furnished it for one half of the year and fifteen for the other half.

WAR WAS THE AZTEC NATIONAL SPORT

Warfare constituted an important activity of the Aztecs, various factors contributing to this condition. Traders or merchants going to other cities were preyed upon and resulting skirmishes between their guards and alien troops frequently led to war. Increasing costs of governmental activities and ever-growing demands by the priesthood for more and more victims to sacrifice



Photograph by Bramson De Cou from Gallery

COLLEGE STUDENTS TAKE NOTES ON THE HUGE AZTEC CALENDAR STONE

By reading the intricate markings on this 24-ton monolith of basaltic porphyry, priests are believed to have kept track of seasons and festivals and been able to tell farmers when to sow and reap their corn. The central figure of the sacred stone symbolizes the sun. Placed around this face are rectangles representing the four elements: earth, air, fire, and water. Other symbols are supposed to stand for days and years. Dug up in 1578, the Stone of the Sun was later set up here at the National Museum in Mexico City. Miniatures are popular as souvenirs.

to the gods played no small part in the promotion of conflict.

As a matter of fact, the Aztecs continually sought pretexts for starting hostilities. They deemed themselves "idle" if no war was in progress.

Actual declarations of war were decided upon in the council by very formal proceedings. The highest in military command was the Chief of Men, or Emperor, and he was assisted by the war chiefs.

These officers had three grades or ranks. First were the chiefs of the great subdivisions, the principal quarters of the city, and below them came the captains of the Kins, or minor quarters. All of these officers were elected on merit; their rank was not transmissible by inheritance and they could be deposed. Below the captains were the meritorious braves composed of three classes—the Tigers or Beasts of Prey, the Eagles, and the Wandering Arrows.



Photograph by Rudolf Rindiger

CHAPULTEPEC, IN THE AZTEC TONGUE, MEANT "GRASSHOPPER HILL"

Water from its springs was carried to the near-by capital by an Aztec aqueduct. Here Montezuma had his hunting lodge, harem, and baths. The present Castle of Chapultepec was begun in 1783 by a Spanish viceroy, and served as a residence for Mexican Presidents until recently.

These titles were honorary and were obtained solely in actual combat by the capture of one or more prisoners. Men in these groups served as scouts and skirmishers in the van of the army and acted as leaders of small bodies of men; on occasions they commanded larger subdivisions if their superiors deemed it necessary.

The meritorious braves had their hair cropped closely over the ears, as an indication of their rank, and wore, chiefly but not exclusively, the masks or helmets imitating the heads of wild animals and sometimes even the skins of those animals.

SWORDS OF WOOD AND OBSIDIAN

Common warriors, comprising the last group in the military organization, wore the quilted cotton armor of the Aztecs. Their weapons consisted of darts or javelins with heads of obsidian or copper, also slings and stones, bows and arrows, and a sword or club. The javelin was the principal weapon; one form of it is illustrated in the picture of the warrior in Plate VI.

The sword, called *maccuahuitl*, or sometimes *macana*, was of wood. It measured three and one half to four feet in length,

was four to five inches in width, and an inch to an inch and a half in thickness. Pieces of obsidian three inches long and two inches wide were fastened in grooves along the edges with cement made from the root of a tree pounded up with a certain earth and mixed with the blood of birds and bats. The warriors in the various colored illustrations are shown with weapons of this type.

For defense the warriors used round shields of the parrying type, which did not cover a large part of the body. Made of canes netted together and interwoven with cotton, they were covered on the outside with painted boards and feathers and were so strong that only a crossbow shot at close range would penetrate them.

The tactics used in combat were intricate and showed a good knowledge of military technique. Expeditions were never protracted, however, and all hostilities stopped at nightfall. Only two night engagements took place during the Conquest. One of these is outstanding and is called by Spaniards the *Noche Triste*, the Sad Night, when Cortez and his cohorts were driven from the city (page 732).



BUILDING A FLEET OF GUNBOATS, CORTÉZ ATTACKS MEXICO'S CAPITAL BY WATER

With fresh supplies and thousands of Indian allies, the Spanish launched a second campaign against the Aztec metropolis. On the lake, depicted in this painting by conventional curlicues, Cortez, Marina, and soldiers (above) arrive in a gunboat alongside a broad causeway. There Spaniards and Texcalans battle their way past a pyramidal temple bearing a sacrificed human head. Aztec warriors, including a "Jaguar" (Plate II), defend the causeway with help from natives in canoes. After a siege of nearly three months, Cortez entered the city in triumph.

The Aztecs were exceptionally fine engineers for a people in their stage of development, and constructed elaborate causeways leading from the city to the various towns around the borders of the lakes. Today the Pan American Highway runs into the city along one of these ancient causeways.

Particularly was Aztec engineering skill shown by a great dike erected during the years 1440-1450 to prevent flooding of the city by the Lake of Texcoco. This engineering work extended for about ten miles from Atzacualco on the north to the hill called La Estrella on the south. It was constructed with a core of clay and stone and crowned with a wall of rubble masonry.

On either side was a strong stockade to break the force of the waves. There were

numerous openings for canoes. These passages were provided with sluice gates to control the water when the lake rose and threatened to inundate the city. They also could be opened in summer to let fresh water into the lake when its level was lowered by the rapid evaporation of the summer months.

This dike was erected during the reign of Montezuma I, and the King of Texcoco, Netzahualcoyotl, was of considerable assistance to Montezuma in planning and helping with its construction.

RELIGION DOMINATED ALL ELSE

The dominating factor in all Aztec life, economic, social, and military, was religion. Everything revolved about the gods and all



MEXICO'S RULER STOICALLY SURRENDERS TO THE CONQUEROR

Cortez, with ceremonial feathers in his hat, is seated on the roof of a house. Behind him is the faithful Marina. Before him stands Cuauhtemoc, the Aztec sovereign (page 729), who reputedly pleaded: "I have surely done my duty in defense of my city, and I can do no more. . . . Take that dagger that you have in your belt and kill me at once with it." Below, a Spanish soldier guards Mexican dignitaries. On the roof (right) Cortez receives Cuauhtemoc's wife and family. The legend on the painting reads: "With this event, the Mexicans were finished."

efforts were bent toward placating the complex group of numerous deities.

Every day, every night, week, month, and year had its own particular god or goddess and, according to the belief of the people, if these were not properly propitiated or had not received sufficient offerings the world would come to an end at the conclusion of the 52-year calendar round, a period which corresponded to our own century designation.

The most important gods were probably Huitzilopochtli, the War God (Plate I), and Tlaloc, the God of Rain. Other deities were associated with flowers, maize, the earth, the sky, drunkenness, the lower regions, birth, and death.

The priesthood was extremely powerful

and its members were often civil as well as religious leaders. Two priests were at the head of the hierarchy. They were elected by the other priests on the basis of merit gained through careful observance and performance of all religious duties.

These two appointed other officials, one of whom was Mexicatlteuatzin (Color Plate VI). He had charge of minor priests and it was his duty to see that the rites and ceremonies were observed with due care and perfection in all the towns and provinces.

Especially, he supervised the priests in charge of the education of the youths in the monasteries. He also ordered all the religious houses to be built in the provinces subject to Tenochtitlan. As an added duty

he ordered punishment for all priests under his orders who had sinned in any way.

Women also performed ceremonial duties and there were regular nunneries for them. The women who entered religious institutions took a vow of chastity and the rules for its observance were very strict.

The priests had a busy routine. Incense, consisting of copal and rubber, had to be burned before the figures of the gods four times each day and three times each night; in fact, half the priestly duties were nocturnal. On the altars before the gods, the priests placed offerings of various kinds: food, clothing, flowers, and other objects.

The most important offering, however, was that of blood and the sacrificial rites connected with this phase of the religion are those most often associated with the Aztecs, although earlier peoples in Mexico, the Maya of Yucatán, for example, also had such observances.*

The priests poked thorns through their tongues, cheeks, and ears to obtain blood. The torn and ragged appearance of a priest's ears was one of his characteristic features, clearly shown in the various paintings (Color Plates III, VI, and VIII).

HOW HUMAN SACRIFICES WERE MADE

Pigeons or quail were a common source for blood offerings, but the all-important sacrifices for the major ceremonies were human victims.

Various methods were used for dispatching victims. Some were drowned, in rites similar to those practiced at the Sacred Cenote at Chichen Itzá by the Maya. Others were shot with arrows. Occasionally the priests clubbed a victim to death. Sometimes the human offering was sealed in a cave and allowed to starve to death.

The commonest method, and that frequently described, was to put a victim over a stone, slit his chest with an obsidian-bladed knife, tear out the heart and offer it to the god, as is well depicted by the artist in Color Plate III.

Spanish priests and soldiers who witnessed such scenes have left vivid descriptions of them. Sahagún, to whom we owe much of our knowledge of the Aztecs, tells us that the owners of captives delivered them to the priests at the foot of the temple stairway. The priests then dragged them

up the steps by the hair, and, on reaching the platform at the top of the pyramid, pulled them over toward the sacrificial block, a stone about two feet high and a foot and a half in width.

The victim was thrown across the stone on his back. Two priests held his feet, two his arms, and one his head. The priest who was to kill him came forward and struck him a blow on the chest with a flint knife held in both hands. He cut a hole in the chest, thrust in one hand, and tore out the heart, which he then offered to the sun before placing it in a bowl and setting it on the altar before the god. Sometimes the heart was placed in the mouth of the god.

The body of the victim was thrown down the steps of the pyramid and carried away to be cut up and distributed in small pieces for ceremonial cannibalism.

The victims of such rites were captives, criminals, children, or young men or women especially chosen and prepared for the ceremony by a series of rites extending over a considerable period of time.

These heart sacrifices were held at stated intervals. There was always a ceremony of this nature at the end of every year, a great sacrifice at the end of every thirteenth year. The longer the period of time, the greater the number of victims.

FIGHTING FOR LIFE WITH A FEATHER-EDGED SWORD

Next in popularity was the sacrificial fight in which a number of warriors engaged a victim in mortal combat (Plate II).

This was always a great spectacle. The victim was tied to a stone, called the *Temalacatl*, and forced to fight warriors who were fully equipped while he was armed only with clubs and a sword edged with feathers instead of obsidian blades.

The stone was set on a platform in the center of the great temple enclosure where all could see. It was similar to a large millstone and had a hole in the center to which the victim was tethered by a rope tied around his waist. The captive could walk around the stone but could move only so far before the rope checked him.

The artist has shown a rope tied to a smaller stone (Plate II). This type of fastening is illustrated in some of the manuscripts, but probably was not so common as the larger type of stone on which the combatants stood and moved about.

* See "Yucatán, Home of the Gifted Maya," by Sylvanus Griswold Morley, NATIONAL GEOGRAPHIC MAGAZINE, November, 1936.



Photographs by Luis Marden

WITH SUCH KNIVES, PRIESTS CUT OUT THE HEART OF SACRIFICIAL VICTIMS

Sharp flintlike stone or obsidian blades, their wooden handles encrusted with mosaic, were used in the ceremony depicted in Color Plate III. These reproductions in the National Museum at Washington, D. C., were copied from originals in the British Museum. Between 20,000 and 50,000 victims, mostly prisoners of war, were sacrificed yearly in the Aztec domain.

Sahagún is again the source for a good description of the rites at the *Temalacatl*. From the top of the Temple a large number of priests would appear in their costumes, each representing one of the gods. They formed a long procession and were followed by the warriors, two Tigers and two Eagles. These men were armed with swords and shields and advanced in a fighting attitude, making motions like fencers.

When the procession reached the foot of the stairway, it advanced to the stone and formed a wide circle around it. The priests seated themselves and began at once to play on their flutes, trumpets, and shell horns, to whistle or to sing.

The victim was then dragged forward. He was given pulque, liquor of the country. He raised the bowl to the east, the west, the north, and the south, as if offering it to the cardinal points of the world, and then drank the liquid through a hollow cane.

A priest came forward with a quail, tore its head off in front of the captive, took the captive's shield, raised it high above his head, and then threw the beheaded quail behind him. The victim was made to take his place on the stone and was tied with the rope fastened to its center. This was done by a priest dressed to represent a bear (Plate II).

The captive was now handed the sword with feathered edges and the skirmish began. One after another of the warriors, armed with real weapons, fought the victim. Sometimes the captives were very brave and wore down the four who sought to kill them. In such cases a fifth, who was left-handed, was sent against him and usually conquered him.

The victim's breast was then torn open and his heart offered to the sun. The body was carried away, skinned and cut up, and the flesh was distributed for ceremonial eating.

The skin was worn about the streets by some warrior and everyone who met him presented him with a gift. These gifts were taken to the man who had captured the victim and he distributed them as he saw fit.

FOND OF FLOWERS AND GAMES

Despite these bloody rites the Aztecs were not so savage as many have thought them. They had numerous ceremonies in which there were dancing and singing, and the main offerings were flowers and fruits. Their love of flowers is one of the traits handed down to their present-day descendants and is one of the noticeable features about modern Mexico City. The music was produced by wooden and pottery flutes, conch shells, rattles, drums, and rasping instruments made from notched bones.

The Aztecs were fond of all kinds of games, the best known being *tlachtli*, for which there was a special court. The players endeavored to propel a rubber ball through rings set vertically in the walls. The rules required that the ball be struck by the hips of the players; they were not permitted to use their hands or other parts of the body.

Tumbling and juggling of all kinds were very popular. Montezuma II, the emperor at the time of the Conquest, was especially fond of acrobatic performances and of dances. A house near his palace was devoted to the dancers, and he also had dwarfs and midgets to entertain him.

The zoo and aviary impressed the Spaniards. They saw animals that were new to them and were amazed at the variety of species exhibited. Many of the soldiers saw their first American buffalo in Montezuma's zoo and one of the earliest descriptions of that animal is in the writings of Cortez himself.

The Spaniards were also fascinated by the serpents in the zoo, particularly those "with bells on their tails," the rattlesnakes.

BIRDS KEPT FOR THEIR FEATHERS

Every kind of bird known in Mexico, and some from other areas as well, was in the collection in the aviary. There were eagles, macaws, and quetzals; also parakeets—tiny specimens with brilliant plumage—and numerous long-legged water birds. They were kept for their feathers, which were plucked from time to time as needed.

The feathers used in the royal fans, head-dresses, cloaks, and other paraphernalia came from the aviary. Special attendants cared for the birds and were particularly attentive during the breeding season so that there would be a continual supply.

The Aztecs were extremely superstitious, and magic and shamanism were widespread. There were fortunetellers, sorcerers, medicine men, and witch doctors. The people consulted fortunetellers continually to determine whether the fates were propitious for any proposed event, such as a journey, a business transaction, or any ordinary feature of their daily life.

All kinds of divination and prophecy were popular. Certain days were regarded as unlucky and no new undertaking would be started then. A child born on one of these days was doomed to misfortune throughout life. This attitude gave the priests a strong hold on the people and much of their activity was concerned with divination.

For treating diseases the medicine men had a number of methods. Commonest and most consistently used was the sweat bath, although some forms of sickness were treated by sucking the cause of trouble out of the patient.

HIGHEST HEAVEN FOR VICTIMS OF BATTLE, SACRIFICE, AND CHILDBIRTH

When an Aztec died there were a number of heavens to which the spirit might go. Those slain in battle, victims of sacrifice, and women who died in childbirth went to the highest heaven. Death from storm or lightning sent the soul to a heaven of plenty at the top of a hill. A person prosaically dying in bed from natural causes had to go down below to a place called Mitlan and death from corruptive diseases sent the spirit to an even lower place.

The funerals of wealthy people or those of the upper classes were elaborate, while those of the poorer classes were extremely simple. In the case of the well-to-do, offerings of jade, gold, and other valuable articles were placed in the tomb. A poor man was fortunate if an ordinary clay vessel was placed in his grave.

As a people the Aztecs developed one of the most interesting New World cultures, and despite the fact that they passed from power and prominence more than four centuries ago, they still exert a definite influence on all things Mexican.

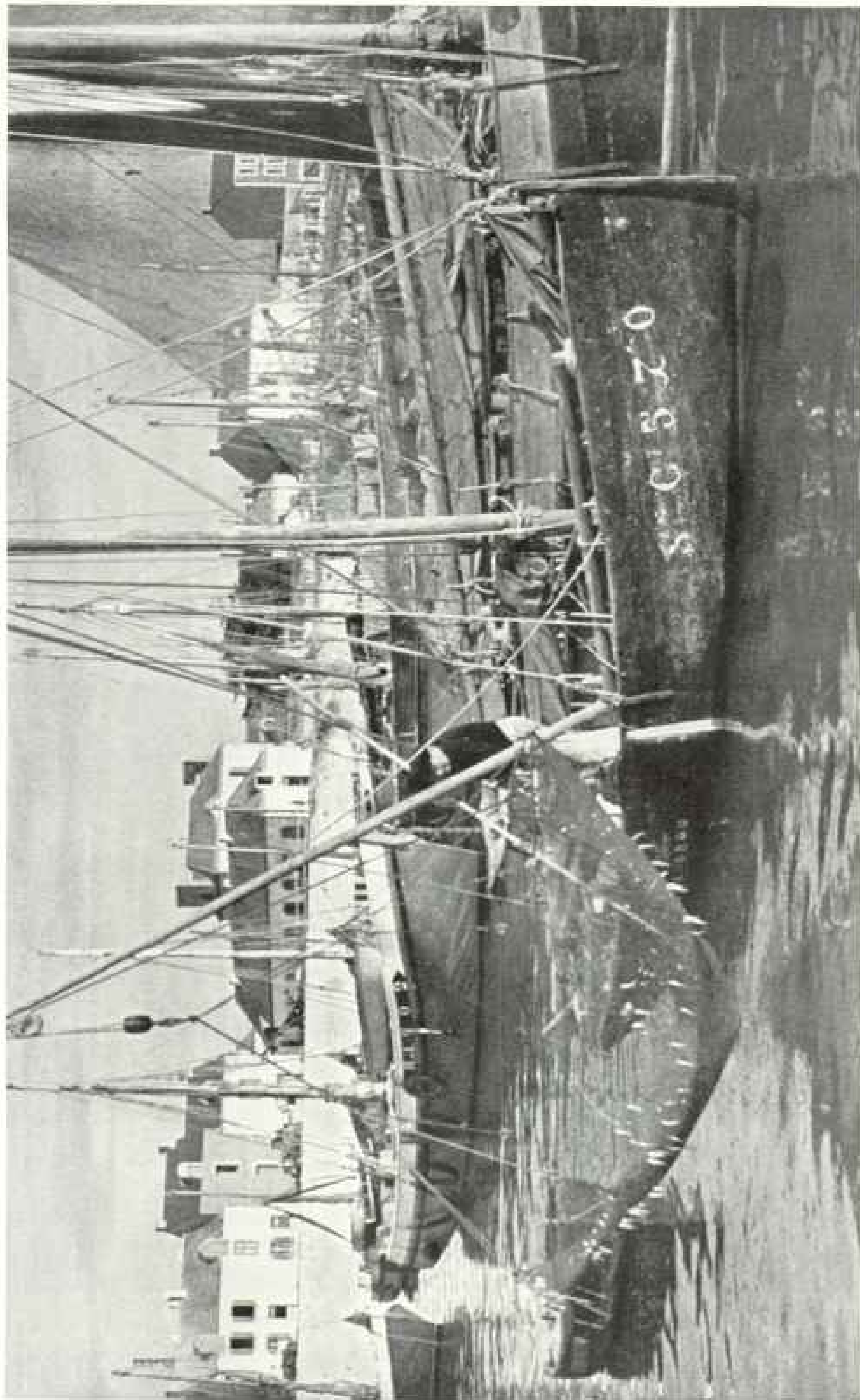
Where Bretons Wrest a Living from the Sea



Photograph by F. W. Goro

WHITE COIFPS BOW OVER PURSES AS BRETON HOUSEWIVES COUNT THEIR SOUS

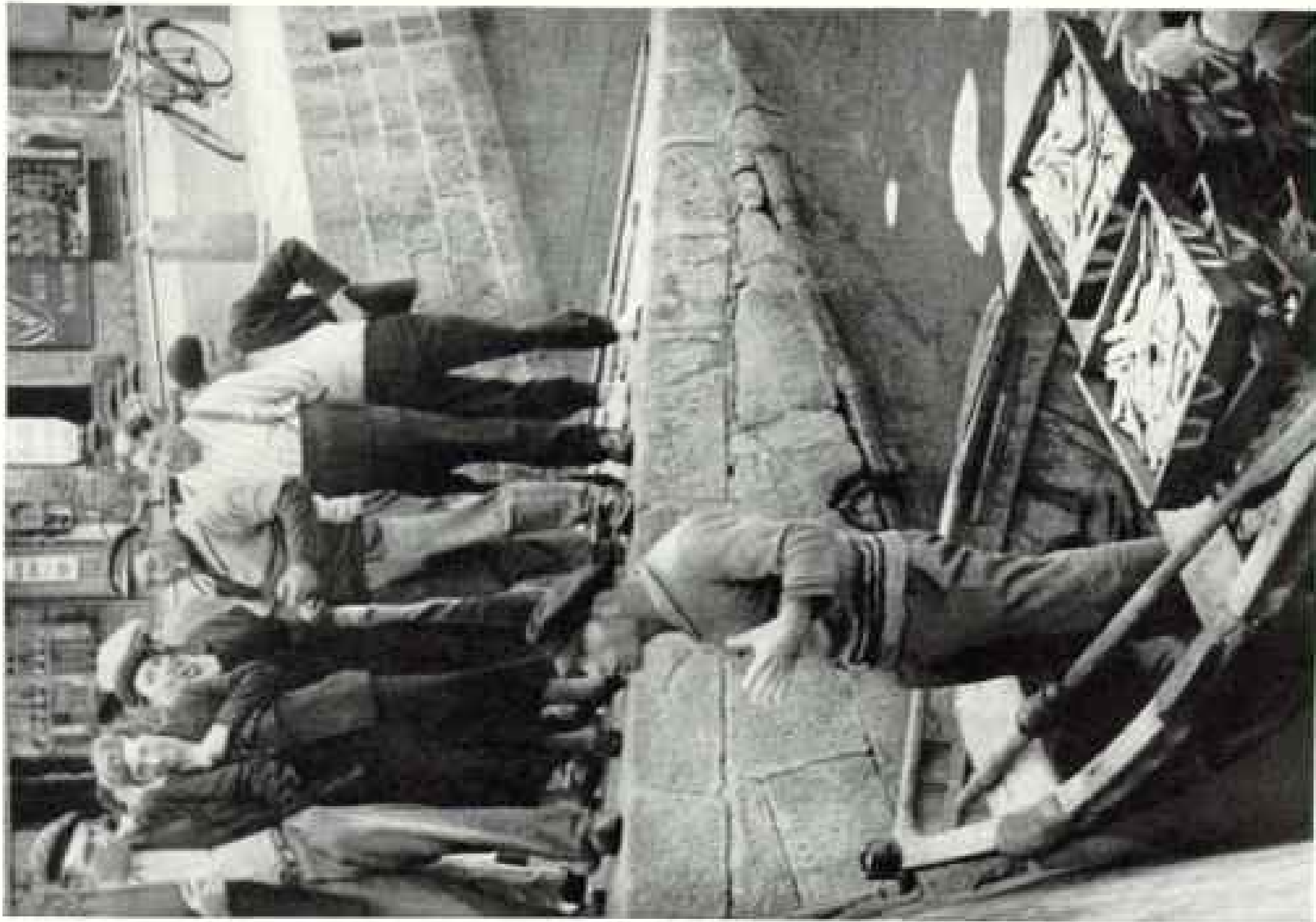
Thrifty, they take stock of funds while riding home from market across a bay in Brittany. The white lace headdress, beribboned and starched, varies in style in the different cantons (pages 761 and 765). Seagirt Brittany, westernmost tip of France, was named after Britain, homeland of Celtic colonists who fled here to escape Saxon invaders during the fifth and sixth centuries. A seafaring race, the Bretons number among their celebrated sailors Jacques Cartier, discoverer of the St. Lawrence River. Mr. Goro's photographs depict life in the Guérande peninsula, southern Brittany.



Photograph by F. W. Ginn

IN LA TURBALLE'S CROWDED HARBOR, A FISHERMAN DEMONSTRATES ONE WAY OF CATCHING BRITTANY'S FAMED SARDINES

First he lowers his little old-fashioned net and throws in cod's roe or other bait to lure the tiny fish. In trying to swim through the fine meshes, sardines are caught by the gills and cannot withdraw their heads. Now the net is being hoisted aboard with silvery fish dangling from it, after which the catch will be shaken off. For big catches much larger nets are used (pages 756 and 758). The sardine fleet puts to sea before daybreak, returning about 4 p. m.



"FIVE FRANCS BID! WHO'LL GIVE SIX FOR MY FISH?"

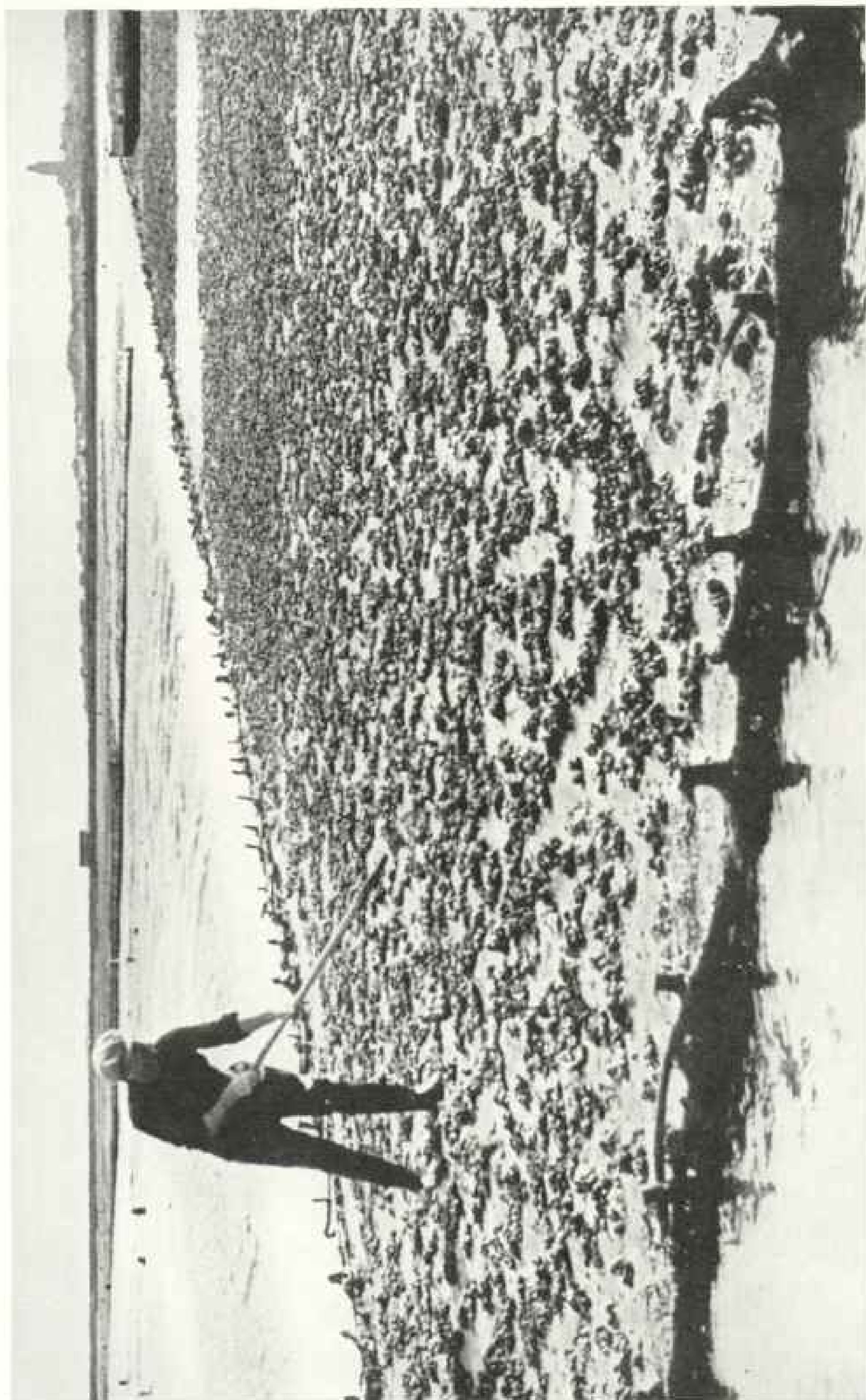
Housewives and shopkeepers gather on Le Croisic's sea wall as the fisherman auctions off his day's catch. Bretons have "a humor as flexible as their character is obstinate," wrote Chateaubriand, a native son.



Photographs by F. W. Coope

A RARE DELICACY IS THE "SEA CAT," A SMALL SHARK

Wooden shoes are worn at sea as well as ashore. "Long live the sabots of wood!" runs the refrain of a song relating how Anne of Brittany wore her native footwear when she mounted the throne of France some 450 years ago.



Photograph by F. W. Goto

A SEASIDE FARMER RAKES IN HIS CROP OF "POOR MAN'S OYSTERS."

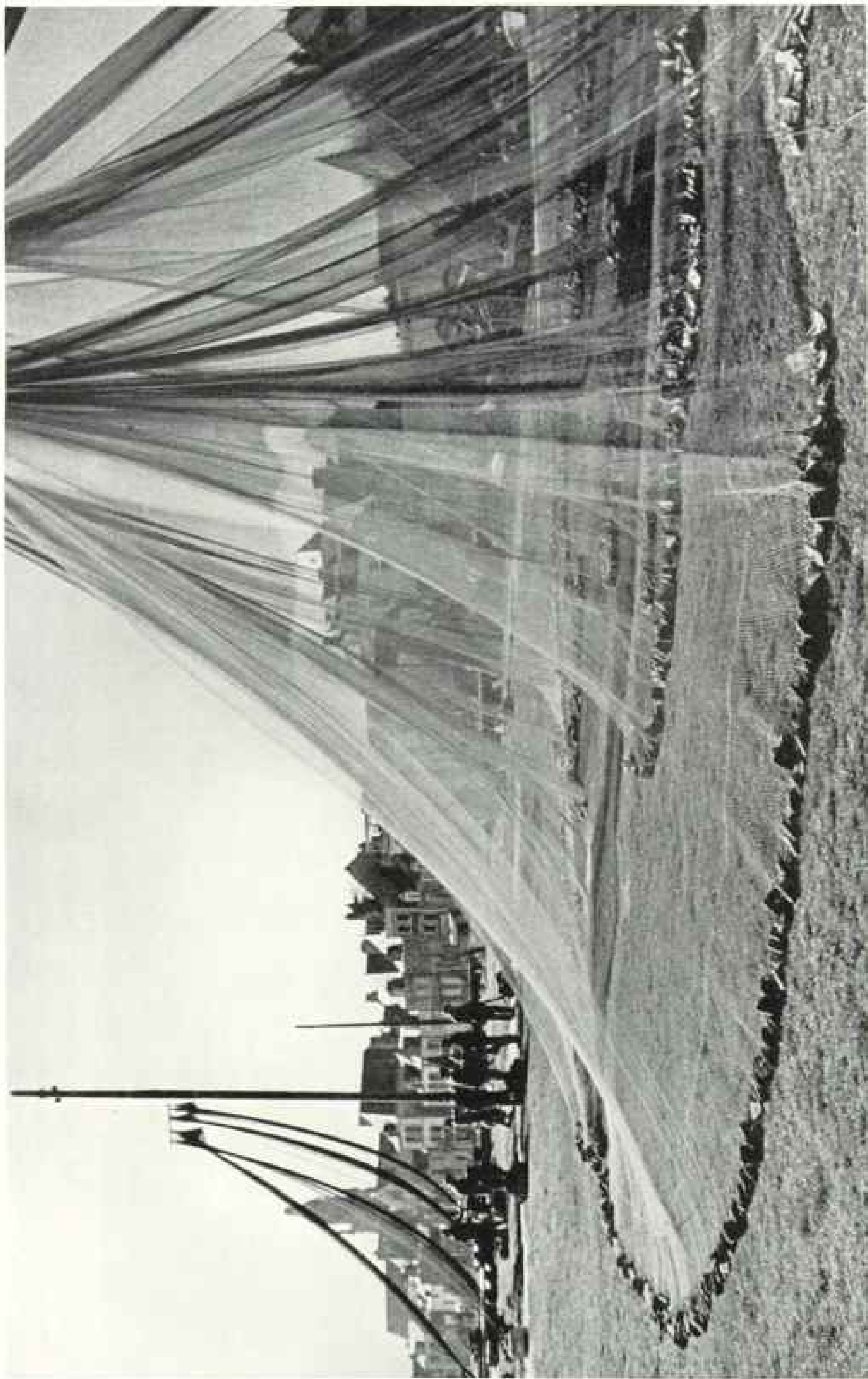
He rakes the black, edible mussels beside the bay of Le Croisic, on a sandy beach which is flooded at high tide (page 759). Abundant along the coast of Brittany, these bivalve mollusks have been cultivated by man for more than eight centuries. A shipwrecked Irishman named Walton reputedly invented the wooden enclosures in which the mussels are grown. He laid out the fences of the enclosure in such a way that they formed the initial of his name.



Photograph by P. W. Grant

ON SUNDAY, FISHERMEN ENJOY A "BUSMAN'S HOLIDAY" AMID NETS AND SAILS ABOARD THEIR VESSEL.

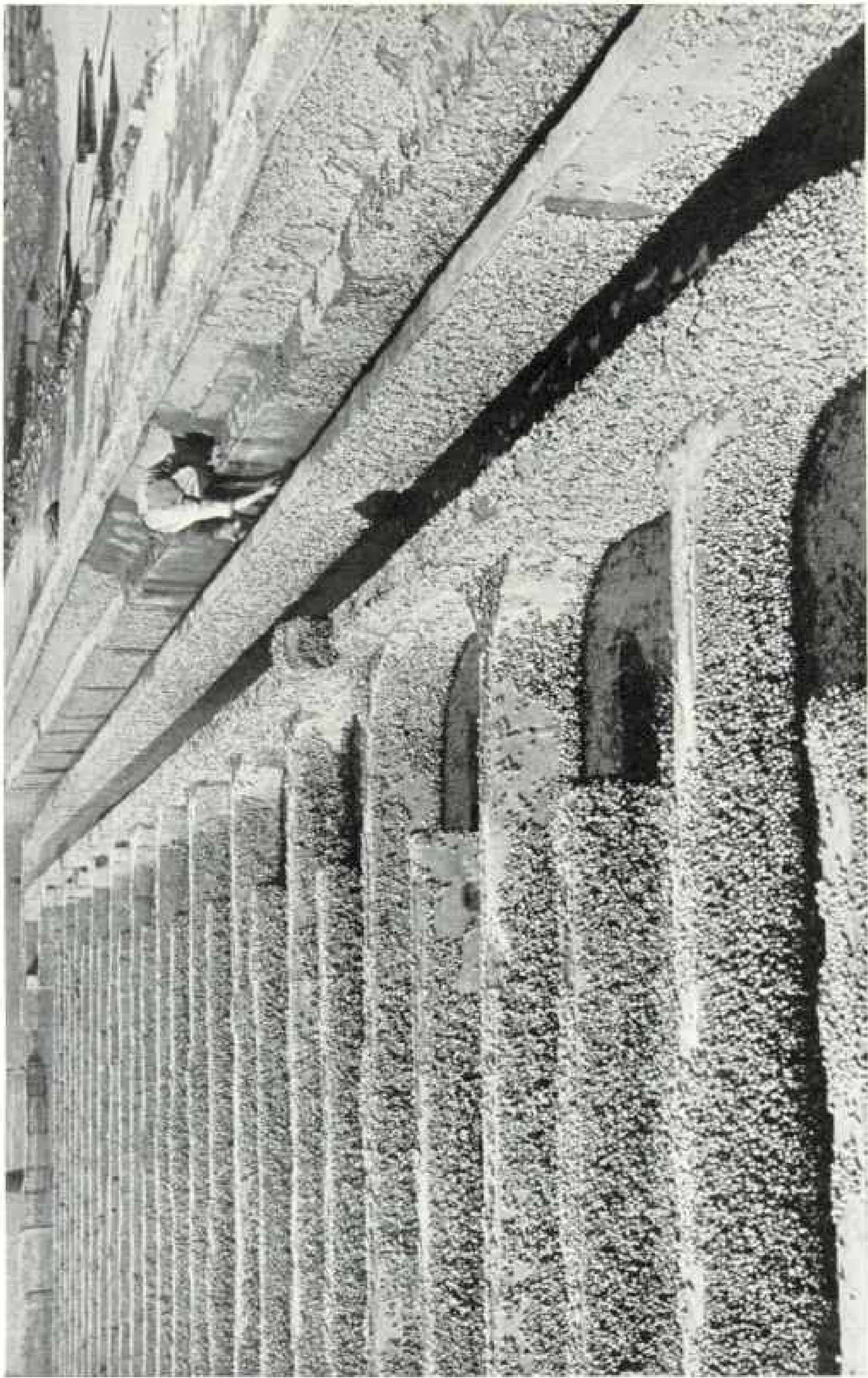
The men's everyday pants and jackets ringe in color from brightest red to most delicate pink, with patches of other brilliant hues. When a fleet departs on a long voyage, the young girls of Le Croisic bid their sweethearts adieu with a song called "Sea Gulls." Breton codfishers, who for centuries have ventured as far as Iceland, and Newfoundland, are immortalized in Pierre Loti's stirring novel "An Iceland Fisherman." Many sailors work on farms in winter and go to sea in February or March.



Photograph by F. W. Goetz

LIKE GOSSAMER TENTS, SARDINE NETS ARE DRAPED FROM TALL POLES AND SPREAD OUT TO DRY

Costliest item of the fisherman's equipment, the gauzelike fabrics are dyed a bright blue so that the fish, attracted by bait, cannot see the meshes in the blue water (page 752). Lead weights on the lower edge, and floats on the upper, make the net hang like a vertical curtain in the sea. Fishing is generally done from rowboats which put off from the larger vessels. In front of Le Croisic's steep-roofed houses, left, men hoist four nets on a lofty pole.



Photograph by F. W. Gony

EDIBLE SEA SNAILS ARE THE HARVEST ON THIS "FARM."

Myriads of small black mollusks grow on the sides of concrete tanks at Batz. At low tide they are scraped off, packed in sacks, and shipped to large cities. The Frenchman regards snails much as Americans do the oyster. Paris restaurants devote tender care to their preparation; many first-class establishments employ special "snail waiters." Tons of different types of these mollusks are consumed daily in Paris at the height of the season.



NO MAYPOLE—THIS IS NET-DRYING TIME IN LE CROISIC

On the ground are several lobster pots or traps. Baited with fish, these are fastened to lines and lowered to the bottom of the bay. Scenting the bait, the crustacean enters the pot through the funnel-shaped opening on top, drops inside, and is caged as in an old-fashioned rattrap.



Photographs by F. W. Goss

WITH A "CLOMP-CLOMP" OF SABOTS, SAILORS TRUDGE ASHORE BEARING THEIR NETS

Dolphins and tunnies often destroy the nets in their pursuit of sardines. Some fishermen use as sardine bait a powder made of peanuts. This beclouds the water, preventing the big fish from following their prey.



MUSSELS ARE SACKED FOR SHIPMENT TO CITY MARKETS

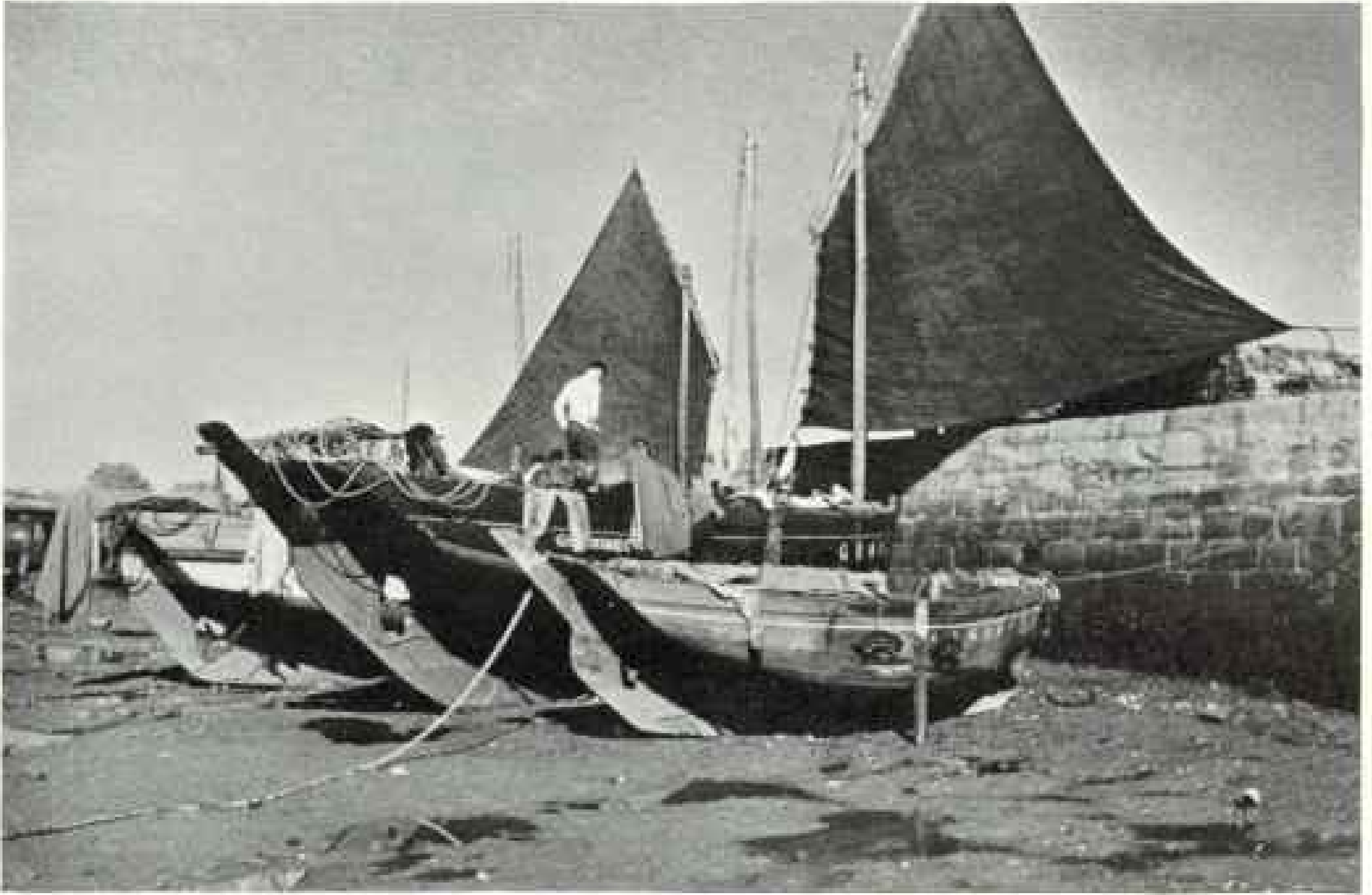
A dejected nag stands fetlock-deep in sand, waiting to cart the sacks to Le Croisic, whence they will be dispatched to Paris and other centers. Brittany's ancient Latin name, *Armorica*, came from Celtic words meaning "on the sea." No longer a governmental unit, the old province now includes five *départements*.



Photographs by F. W. Goss

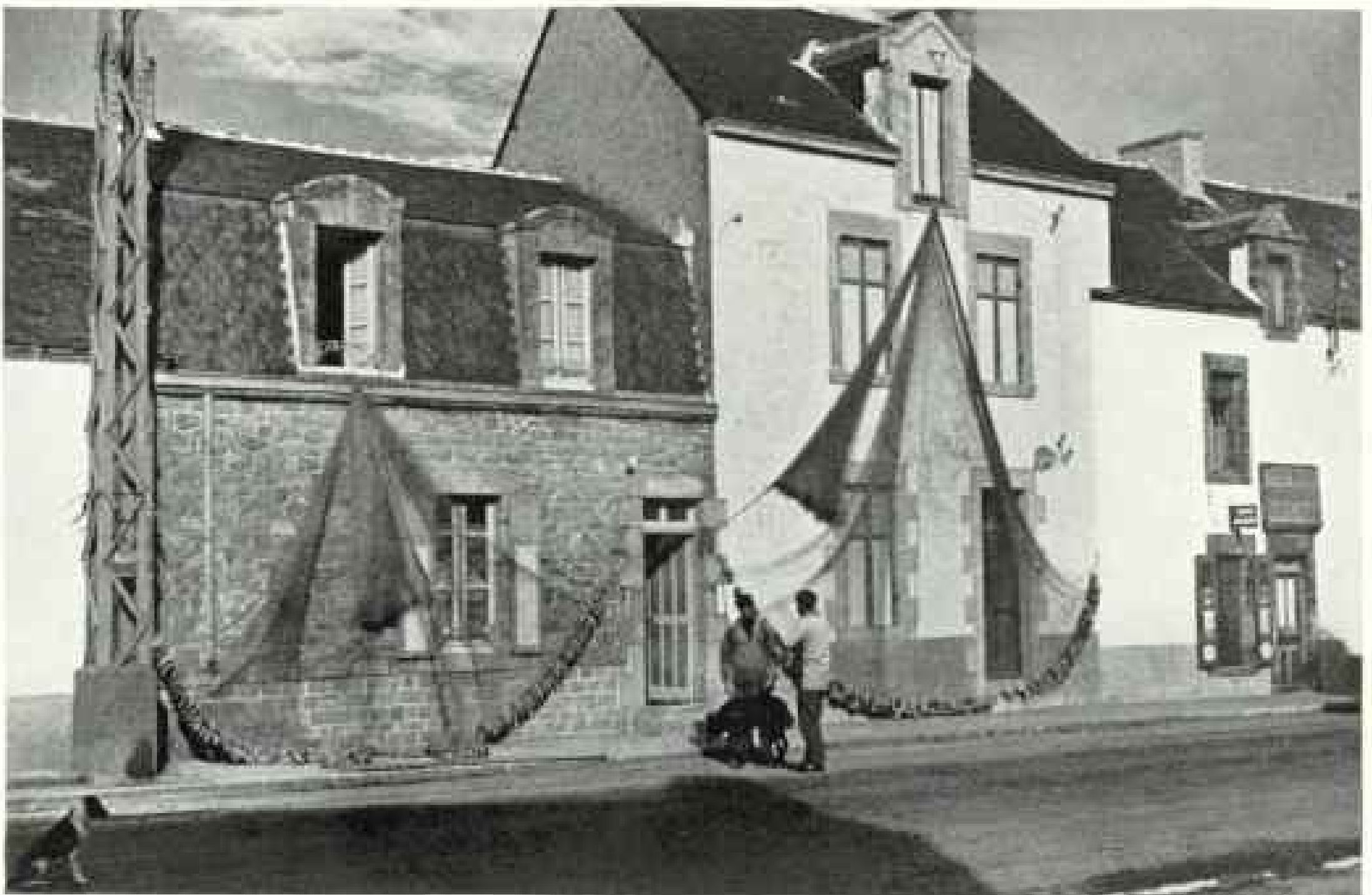
YOU PUT YOUR FOOT IN IT WHEN WASHING MUSSELS IN A WIRE BASKET

Floated out from the shore on barges, the mollusks are washed in the salt water by men wearing hip boots. Crude sea boots are sometimes made by attaching oilskin uppers to sabots.



AGROUND AT LOW TIDE, BOATMEN HOIST THEIR BRIGHT RED SAILS TO DRY.

When the spring tide sweeps in at a speed of four knots through the channel leading to the port, the water at Le Croisic rises more than 18 feet. Many sardine boats carry auxiliary motors.



Photographs by F. W. Gorn

NETS FRINGED WITH FLOATS HANG LIKE GIANT SPIDER WEBS ON HOUSE FRONTS

Their day's work done, the fishermen set off for a wineshop to relax and talk politics. Women and girls clean, sort, and pack the sardines, often toiling all night if the catch is unusually large. La Turballe had one of the world's first sardine canneries, established nearly 100 years ago.



A DEPARTMENT STORE ON WHEELS VISITS GUÉRANDE ONCE A WEEK.

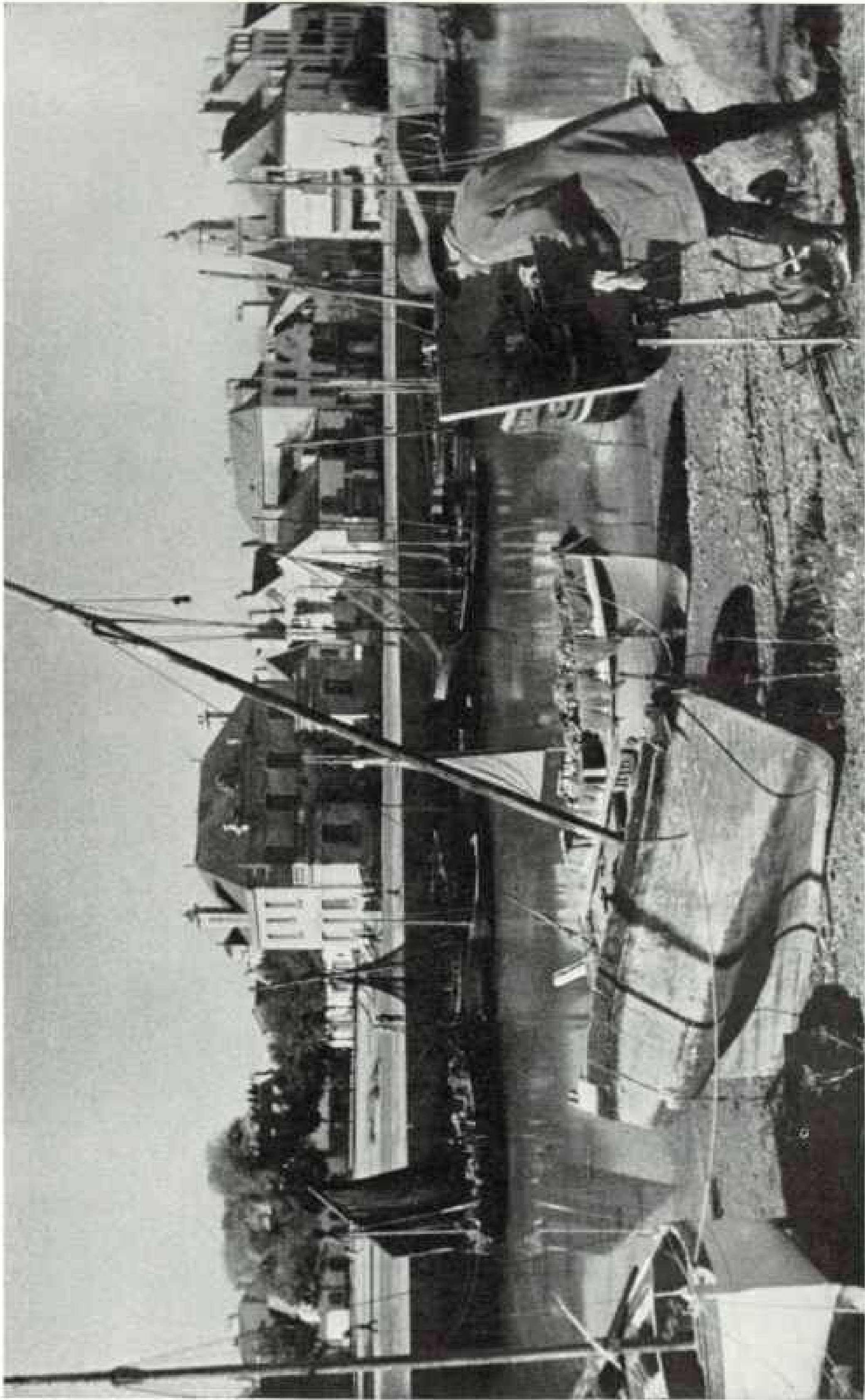
A toot of the horn brings women in coifs hurrying into the street. Here a housewife may buy a gay sweater for her husband, novelties for the children, and perhaps a bit of silk for herself.



Photographs by F. W. Goss

ALL THE COUNTRYSIDE GOES TO TOWN ON SATURDAY, MARKET DAY

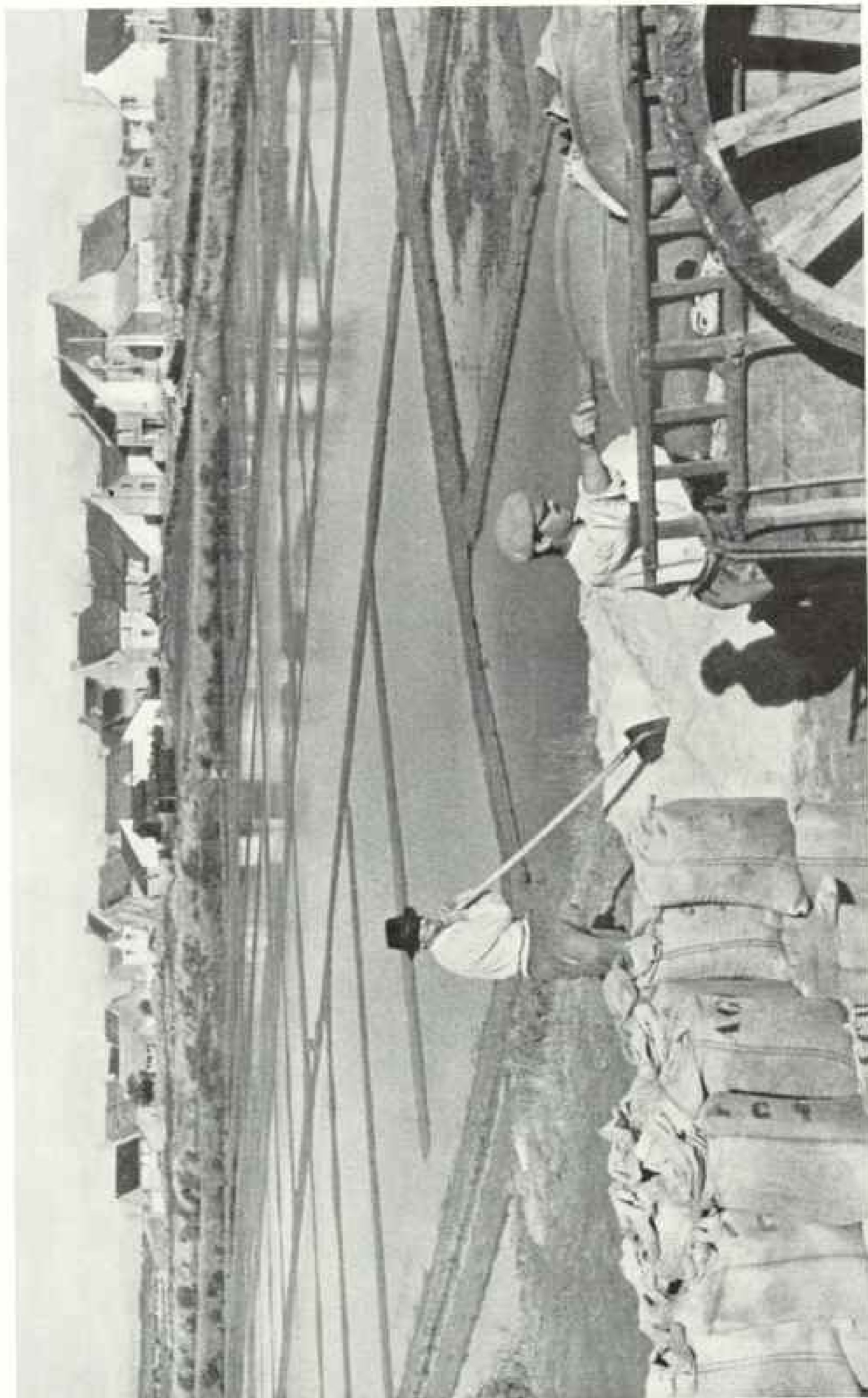
Peat cutters from the plain of La Grande Brière, salt workers from the marshes (page 763), and fisherfolk from the near-by coast flock to Guérande to buy their week's supplies from farm women's baskets. Old-time coifs rapidly give place to more modern millinery here as in many of the larger Breton communities.



Photograph by F. W. Clauo

AN ARTIST AT LE CROISIC PAINTS A SCENE THAT ROBERT BROWNING LOVED

Seeking solitude after Mrs. Browning's death in 1861, the poet spent two summers in this Breton village. Here he wrote one of his best-known poems, "Hervé Riel," the story of a local seaman who saved 21 ships of the French Fleet after its defeat by the English at the battle of La Hogue in 1692. "Hervé Riel the Croisicese" piloted the fleeing squadron "safe thro' shoal and rock" to St. Malo, while the English could only "gnash their teeth and glare aistance."



Photography by F. W. Geary

AS IN BROWNING'S TIME, SALT WORKERS OF "WILD BATS" . . . GRUB THE GROUND FOR CRYSTALS"

From their Roman conquerors the ancient Bretons learned how to obtain salt from sea water in the 1,700-acre marshes at Batz, near La Croisic. Lying about six feet below high-water mark, the rectangular reservoirs are flooded at spring tides. When the water evaporates, workers gather the crystals and pack them in bags to be shipped. Coasting vessels from the north bring whe and wood in exchange for salt. Many of the marsh men go to sea during the fishing season.



"HURRY UP, TOSS YOUR SOU!" LAUGH THE SAILORS

Pitching coins and bowling are favorite Sunday pastimes at Le Croisic, across the channel from the large hospital on the Pointe de Pen-Bron. Many of the fishermen are old man-of-war's men. Brittany has long been known as "the nursery of the French Navy."



Photographs by F. W. Gard

MENDING NETS IS THE FISHERMAN'S HOMEWORK

After each day's catch the nets are carefully inspected and repaired. This one, with comparatively large meshes, may be used to capture herring or whitefish at Le Croisic. Breton youngsters swim, go fishing, and play with toy boats almost as soon as they can walk.



TO BUY OR NOT TO BUY—THAT IS HER QUESTION

Typically Breton is this venerable shopper of Guérande, with her little flat coif and big umbrella. Brittany's ancient Celtic language, allied to the Welsh and Cornish tongues, is still spoken in many places.



Photograph by F. W. Conn

FINDING A PLACE IN THE SUN, MADAME STOPS TO KNIT

Rain or shine, the women seen always to keep their cuffs spotless. It has been estimated that more than 1,000 different styles are worn in Brittany. Many women can tell where a stranger hails from by glancing at her handiwork.



Photograph by F. W. Glen

FLOWER AND VEGETABLE STANDS CLUSTER BEFORE A MEDIEVAL CHURCH IN BRITTANY

In the stone-paved street of Guérande, shoppers stop to chat and peer into a baby carriage. Ramparts more than five centuries old still encircle much of this town, which Balzac praised as a "correct likeness of the feudal ages." The first contingent of American troops sent to France during the World War landed in June, 1917, at St. Nazaire, about ten miles southeast of Guérande.

MEN AGAINST THE RIVERS

BY FREDERICK SIMPICH

NO MARKS made by man on his earth can compare, in magnitude, with the giant Mississippi levee system. It overshadows even the Great Wall of China.

More than 2,000 miles of dikes parallel this Father of Waters from Cape Girardeau, Missouri, south to the Gulf of Mexico. These were built under the direction of U. S. Army engineers. Along many more rivers, great and small, that flow into the Mississippi, still more dikes and levees have been thrown up, some by local authorities, some by the Army.

Into the Mississippi itself there pour the waters of so many hundreds of rivers, creeks, and other streams that nobody even knows all their names. Fifteen thousand miles of its system are navigable; total length of all tributaries in a rainy year may be close to 300,000 miles. The whole mighty Mississippi Basin drains territory in 31 States and two Canadian Provinces.

Imagine the big river suddenly reversing itself, running upstream! How unexpected its ramifications—tiny water fingers reaching into gullies and roadside ditches from Montana to Pennsylvania!

Among its greater tributaries are the Missouri, Wisconsin, Des Moines, Illinois, Ohio, White, St. Francis, Arkansas, and Red Rivers (map, pages 770-771). At no time in recorded history have all these been simultaneously in dangerous flood. Such a calamity is not good to contemplate.

WHEN 60 BILLION TONS OF RAIN FELL

But early in 1937, heavy rains along the Ohio alone swelled it to such unheard-of heights that it sent the greatest volume of flood water in Mississippi annals racing down that river.

"All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again," says the Bible (Ecclesiastes 1:7). In what simple words Holy Writ condenses the Ohio flood's cycle of four phases: evaporation from Gulf and Caribbean; clouds blown north two or three thousand miles; rainfall over the Ohio Basin; run-off, flood.

Man can tamper with only one phase of this great cycle—flood.

Yet look at its power!

Think, too, what strength Nature used

to get this water up out of distant seas and haul it north over the Ohio Basin, where they say 60,000,000,000 tons fell in 25 January days. To lift that bulk of water from the Gulf and the Caribbean, and to move it so far, probably took more strength than the combined power of all motors, machines, winds, waterfalls, and animals then working in the whole United States.

To gauge such power, imagine this river, in January last, as frozen solid from Pittsburgh to New Orleans—a 2,000-mile-long glacier sausage of ice sliding south across the United States at ten or twelve miles an hour, pushing down thousands of houses, bridges, trees—scraping away colossal cubes of field soil and river banks.

"Time is a fourth dimension in floods," engineers say. "Length, depth, and width—they're the familiar old three. But time, or the rate at which the stream runs, forms another."

On the State of Ohio alone, in three January weeks, some 28,000,000,000 tons of water fell. Furiously the Ohio rose till its whole winding course from West Virginia to Cairo, Illinois, where it empties into the Mississippi, was a boiling, stinking torrent of muddy water, clogged with smashed houses and barns, fences, furniture, telegraph poles, floating lumberyards, and drowned animals.

From whiskey warehouses in Lawrenceburg, Indiana, came infinite multitudes of empty barrels. For miles below they littered the world, lodged against trees, fences, railroad embankments, with a line of barrels many miles long rimming the hills, showing the high-water mark.

Hit by mad currents, smaller hamlets were swept away; some may never be rebuilt, at least not on the same sites. Every river town and city suffered inundation in whole or part. Paducah, with 35,000 people, was 90 per cent under water.

HOUSES SMASHED BY A RIVER RUN MAD

Pushed by racing, icy flood, windows and doors of houses first smashed in; then, groaning and crumbling, the structures collapsed or turned crazily over and over and moved off downstream. People drowned.

As the Ohio rose, water backed up into every stream that feeds it and overflowed behind dikes and railroad embankments,

submerging towns, villages, and farms. Lights, power, and water plants failed. Rescuers worked with kerosene lanterns. Water to drink had to be imported. One Cincinnati newspaper hauled in water by carloads and issued it free; to get it people formed in line, with buckets and cans.

In this calamity rose odd bits of speech.

"Pop, I've found our house," called a small boy. "It's three miles down the river, against some trees, and upside down. Everything's in it, but what a mess!"

Said others: "Whose barn is that on our lawn?" . . . "I bought a brand-new Chevrolet that had been under water ten days for only \$25. I'm a mechanic. In two hours I cleaned it out; it runs fine." . . . "There's a cow walking around on our upstairs porch, bawling for food."

SOAKING AND SLIME BRING SLOW RUIN

One thinks of flood as a violent force, tornadolike in lateral pressure, sweeping all before it. Not so in backwater, or sluggish currents slowed down by walls and embankments.

As in Paducah, under water for 15 days or more, it was slow soaking and settling slime which wrought ruin. Walls and foundations crumbled; in shop windows light objects of merchandise floated foolishly about on top of the water. Candy in showcases turned to glucose masses streaked with color. In a drugstore rows of muddy bottles stood on shelves, their labels soaked off, and a newsstand rack was a mass of sodden, swollen pulp.

In homes, saturated mattresses and upholstery bloated to twice normal size; wallpaper peeled; rugs were thick with slime and mud; pianos and cheap, glued chairs and tables literally fell to pieces.

Grotesquely, bedclothes, rocking chairs, picture frames, baby buggies—and a cow—hung high in treetops, tossed there by the flood's crest (page 779).

"There's a dead horse against our kitchen door," complained a Paducah man. "It's been there three weeks. P.W.A. is supposed to be cleaning up the town. Why don't they get that horse?"

News dispatches told volumes in few words: "On board steamer *Thomas Moses*, Henderson, Ky., January 28.—Tied up in a cornfield five miles from the Ohio River, in 13 feet of water, and with 87 refugees on board, 150 mules, 350 hogs, 14 cows, 1 dog, 4 chickens, 1 guinea, 1 pigeon, 2 quail, 1 pheasant, 1 coon, and 1 possum."

"Aided by the Coast Guard, Army engineers, and private shipowners, we used some 5,863 boats in rescue and relief work," said Admiral Cary Grayson, head of the American Red Cross.

"At one time, in one warehouse at Columbus, Ohio, we had stored 40,000 tons of food. In all, we ministered to more than 1,200,000 people—from Pittsburgh to the Gulf."

Headlines and odd items from Admiral Grayson's scrapbook of the flood vividly unfold the sorry tale.

"Sees sister drown in flood."

"Fear-crazed convicts fight in flooded cells."

"Woman adrift 10 days."

"Missing Persons Bureau reunites families separated by flood."

"Flood drives 4,000 rabbits to levee, quickly caught and sold."

"Thirteen men cling 16 hours to floating barn."

"Floods close 15,000 miles of highways."

"Flight from Missouri bottom lands like wartime exodus."

Sometimes the dreary melodrama is lightened by a touch of comic relief.

"New-born baby named 'Highwater.'"

"Piano floats away—Another floats in."

"High-water warnings, broadcast from airplane, said by negroes to be voice of God announcing second flood."

Looking into a floating Louisville house, rescuers saw a parrot roosting on a piano. Saved, warmed, and fed, the bird squawked in a hoarse but cheerful voice, "This is fine! This is fine!"

To calm Evansville refugees, phonograph records were played over a factory's public address system. The plaintive tune, "Mississippi Mud," brought cheers—and "raspberries."

Turned over to the Red Cross at Evansville, the Chrysler assembly plant was used as an emergency hospital. At Cincinnati a Chevrolet plant turned to the manufacture of boats; a cash-register concern made oars.

A Louisville home economics teacher joined the Red Cross forces. Part of her class-study equipment had been a crib, with a big doll doubling for a real baby. Returning later to her classroom, on some errand, she saw there in the crib a live negro baby, snugly covered up, doubling for the doll!

Eunice Guthrie, telephone operator at Lake City, Arkansas, remained at her switchboard for three and a half days to



Photograph from Wide World

MUDDY TORRENTS POUR THROUGH A LEVEE BREAK NEAR NEW MADRID, MISSOURI,
DYNAMITED TO LOWER THE FLOOD CREST THAT MENACED CAIRO, ILLINOIS

Below Cairo, where the Ohio empties into the Mississippi, Army engineers have established the 131,000-acre Birds Point-New Madrid Flood Basin, into which surplus water can be diverted at will when the river is rising to dangerous levels (page 779). In normal years much land flooded only in emergencies is cultivated, and when flood does come, these lands, like farms along the Nile, are richly fertilized with silt.

put through 850 important long-distance calls. There was no one available to relieve her.

Rescuing farm animals, near Henderson, Kentucky, when flood had subsided, workers found where famished beasts had eaten all bark from trees to a height of six feet. A farmer near Sorgho, Kentucky, had a cow and eight hogs in his bedroom—water was up to his second floor. When found, he was sitting on his bed, milking the cow!

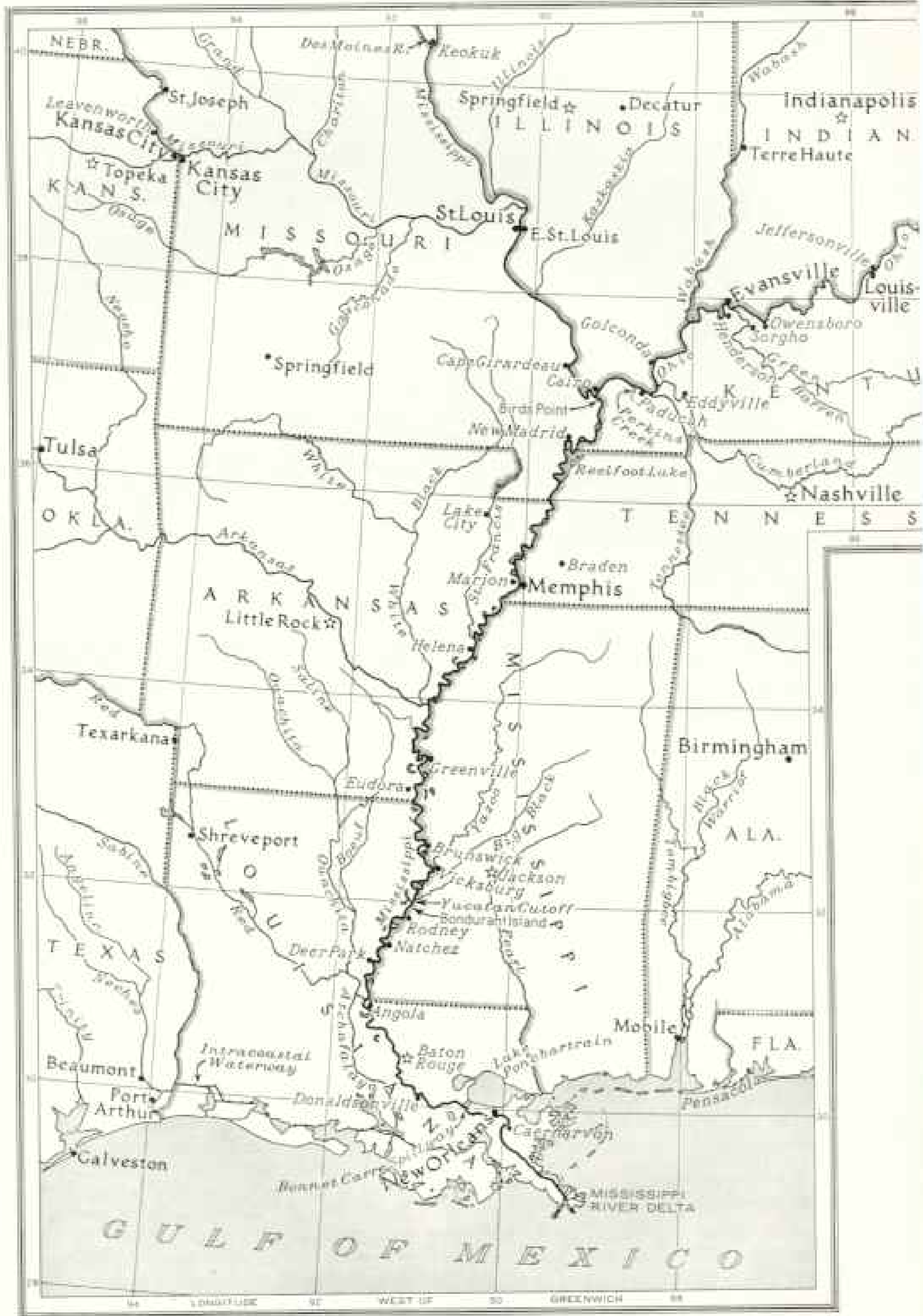
A "NAVY ON WHEELS," AS COAST GUARD
BOATS RIDE RAILS LIKE CIRCUS TRAINS

Coast Guard boats en route to Parkersburg from New York detained 20 miles above the West Virginia town and took to the water, starting down what the com-

mander took for the Ohio River. But both the Ohio and Little Kanawha, out of their banks, formed one whirling yellow sea.

Pushing trees aside and dodging telephone wires for hours, the fleet got lost. Suddenly an angry voice called from Stygian darkness, "Get the — out of my chicken yard!"

Inland Americans never saw a more curious sight than long trains of flatcars loaded with Coast Guard boats rushing from Great Lakes ports, from the Atlantic seaboard as far north as Maine, bound for the flood. Many Coast Guards, unwilling to trust the handling of their favorite craft to landlubbers, rode in the boats across the States, foraging for food wherever trains halted (page 794).





Drawn by Newman Bumsted

FLOWING 2,000 MILES FROM PITTSBURGH TO NEW ORLEANS, THE OHIO-MISSISSIPPI STREAM CUTS A FASCINATING CROSS SECTION OF AMERICAN CULTURE

From coal mines and steel mills to cane and cotton fields it flows, carrying much of the commerce of the Nation—and often rising in fearsome flood.

"Our larger boats cruised down through the Gulf of Mexico and up the Mississippi," said Lieutenant Commander G. E. McCabe, then at Memphis. "Our amphibians flew in—and our smaller boats we shipped by rail. . . . Ours was the biggest inland movement of boats, in point of numbers, in American history; working under us were 329 of our own and about 72 other Government craft."

I saw a radio report to Memphis headquarters which hints at how much work was done by one Coast Guard unit alone—that at Evansville: "Refugees transported, 25,061; sick persons transported, 894; food delivered, 8,501 tons; miles cruised, 55,600; gas expended, 33,189 gallons."

"Variety actors have nothing on us," said a Staten Island cutter man riding a self-bailing surfboat out of Vicksburg. "First they say drag off a dead horse. Then go feed somebody's cows marooned on the levees; then help the doctor catch some refugees who don't want to be inoculated."

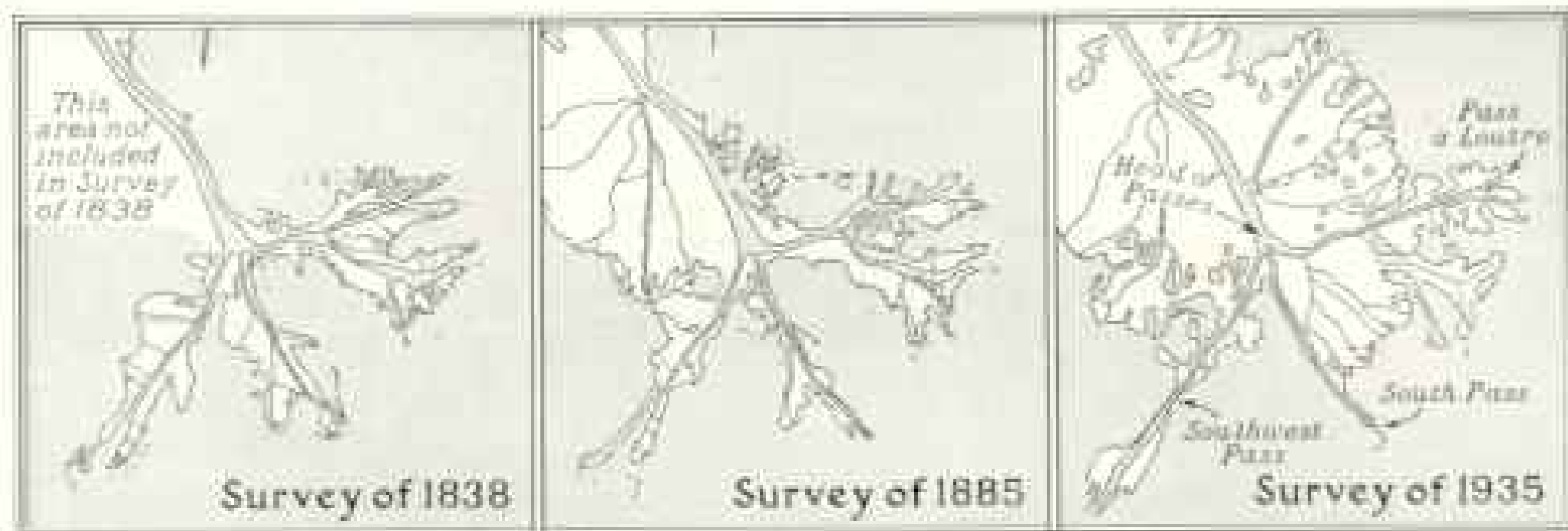
"I served three years in Alaska waters, but never felt water as cold as this," declared another. "You can even hear the

frogs' teeth chatter when they try to croak."

Downstream from New Orleans, where a roaring, tree-laden current was churned to whitecaps by upriver Gulf winds, we watched long lines of rubber-booted workers building pineboard barriers to stop lapping waves from eating into levee tops.

Below, in lazy indifference, life was as usual. "I trapped 36 minks last winter," said an ex-Marine who owns a small cane farm and sells syrup at a wayside stand. "That helped—so did the two wild cattle I shot for meat. . . . Sure, the swamp is full of them; but they see you first, and go splashing away through brush and water. It's hard to get a shot. . . . Yes, this is rich soil—everything grows—especially mosquitoes. . . . But if it wasn't for mosquitoes, this land would be so high-priced a poor man like me couldn't touch it."

With Joe Roberts, Geographic camera man, I rode this flood on Coast Guard and Army boats, and prowled watery wastes behind the levees. "There's a picture," he'd say—and jump from one rocking boat to another, or leap from a moving train, or



HOW THE MISSISSIPPI'S MOUTH HAS CHANGED IN LESS THAN A CENTURY.

Vast quantities of sediment brought down from all mid-America and dumped here in the Gulf of Mexico make the Mississippi Delta a constantly changing, growing thing. These three maps of a 30-mile square show that far greater growth has taken place in the last half century than in the period between 1838 and 1885—a graphic commentary on how, with the plowing of the plains, many States have been robbed of topsoil by erosion.

go flying off into the windy rain in some one's shaky old airplane.

Audacious, stubborn, determined, these adventurous knights of the lens! Once when Joe, camera in hand, was climbing precariously over a tumbled, floating lumberyard, a skipper said, "On Judgment Day, I'll bet my socks, that guy'll be right in the thick of it, snapping the goats getting separated from the sheep."

HUNGRY BIRDS RIDE THE WRECKAGE

Balanced on bobbing timber, Joe fitted his telescope lens, ready to shoot a flock of crows, blackbirds, and gulls riding down-river on logs and brush.

"Why do so many crows ride on drift-wood?" I asked the old pilot who steered our "wet tail"—river slang for stern-wheeler. "To eat what crawls out of the flood," he said "Toads, bugs, snails, crickets, little snakes."

"Variety" was that Staten Island Coast Guard's word for flood scenes. He was right. Picked from a dirty dog-eared notebook come these stray reminders:

Hillbilly refugees at Vicksburg, playing guitars and singing piously, "I Can't Feel at Home in This Land Any More." Locomotives and a diner, under water. A car-load of chickens, all drowned.

In Yazoo Basin, herds of deer swimming, fleeing the flood—only to be chased, on gaining dry ground, by dogs in cynegetic clamor. Quail, exhausted, falling into the flood; wild turkeys in island willows.

In a skiff, a brakeman paddles along through flooded railroad yards below Natchez, throwing the switches.

Arkansas refugees refusing a C.C.C. camp's fresh beef and hot biscuit, demanding salt pork, corn cakes, and molasses.

Tied to a tree is the floating body of a dead negro. "We had to save him till the insurance man saw him," his friends explain.

Pigs marooned on a levee near Rodney run toward our boat, squealing to be taken off. In the 1927 flood, a billy goat got aboard a Coast Guard craft, and lived there five years!

Into one camp at Braden, Tennessee, comes a Government playground man, bringing shiny new bows and arrows, skipping ropes, boxing gloves, basketballs, baseball outfits, horseshoe-pitching sets—all free—to entertain the refugees.

Fiddles scrape, banjos twang, and women social workers organize dances. A preacher calls the measures for a square dance. "He's done laid his Bible down," comments an Arkansas field hand who escaped only in boots and overalls.

BANJOS HELP TO BANISH THE BLUES

To one ragged but engaging 10-year-old a dollar was given. "Now I can get some new guitar strings," said he.

"Guitars and banjos!" chuckled a Salvation Army worker who runs a gospel boat on the Yazoo. "They always grab them first when floods come."

When a horn blows, everybody rushes to get in line at a big dining hall.

Two-way radio telephones between boats were miraculous help in this flood work. Day and night we heard mysterious voices saying from the cold, wet air: "This is



Photograph by AP from Pictures, Inc.

BEWILDERED HENS SURVEY A WORLD OF WATER

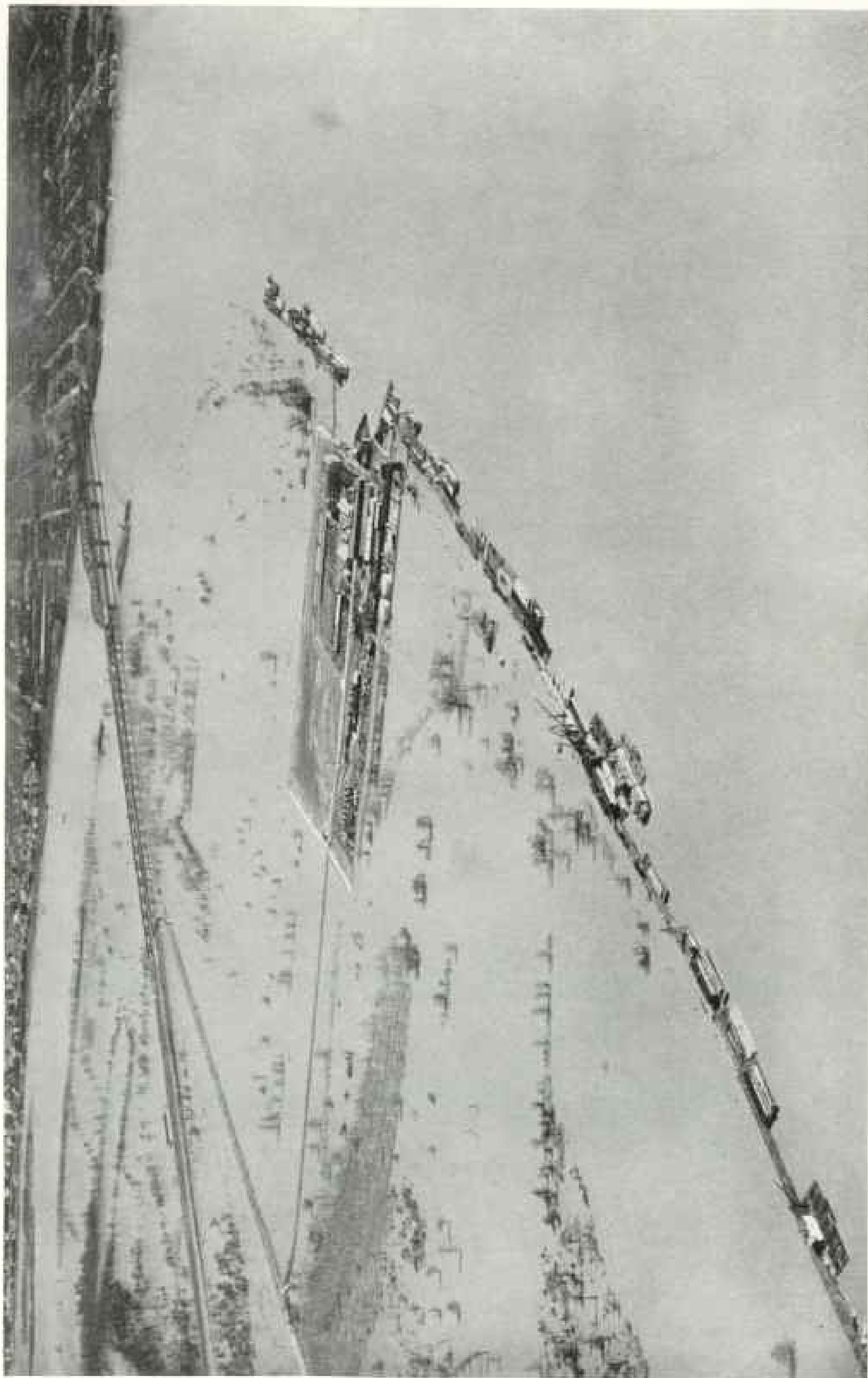
Flood-wise old low-land men say deer are first of all animals to make for high ground when waters rise. Chickens stay and helplessly drown or starve, as on this barn near New Madrid, Missouri.



Photograph from Acme

"JUST A STRAY DOG" IN ANY CITY STREET, BUT HERE ANOTHER FLOOD VICTIM TO BE SAVED

Cattle and pigs on levees, poultry in trees, horses and mules standing so long in water that fish have nibbled skin from their legs—all these are among the dumb creatures that intelligent man, with boats, has taken from the floods. This rescue was made in the outskirts of Louisville, Kentucky.



U. S. Army Air Corps Photograph from Memphis Engineer District
FLOOD COMPLETELY SURROUNDS THE LEVEED, FORTLIKE PLANT OF THE U. S. ARMY ENGINEERS, SET ON THE MISSISSIPPI'S WEST BANK,
OPPOSITE MEMPHIS

High and dry on bluffs stands the Tennessee city in the background. Across the swollen river to Arkansas stretches a bridge, with a graded highway leading off to engineering headquarters, safe behind a sea wall. Along a partially submerged levee are tied towboats, barges, steamers, and engineers' boats.



U. S. Army Air Corps Photograph by Major Albert W. Stevens

FLOODED INDUSTRIAL PLANTS IN CINCINNATI'S MILL CREEK DISTRICT SHOW NEED FOR SOME PERMANENT FORM OF OHIO RIVER CONTROL. Backwater, unlike swift currents, sweeps no property away, but its prolonged soaking effect involves enormous loss. Led by Army engineers, the Government now gives intensive study to far-reaching plans for dams, storage basins, and other flood-control works, not only on the Ohio but on many other important rivers.



Photograph by J. Taylor Roberts

REFUGEES LINE UP FOR FREE FOOD AT A RED CROSS STATION IN A GREENDALE, INDIANA, SCHOOLHOUSE

Ministering in all to some 1,200,000 flood victims, the Red Cross issued thousands of tons of food and clothing; it directed rescue work by various Government and private forces, doctoring the sick, reunited separated families, and now supervises the tremendous task of resettlement and rehabilitation.

the *Dione*—at Brunswick—taking off people and livestock" . . . "Turn on your searchlight, so we can see where we are." . . . "This is 244—we've got a tree against our beam—no headway . . . Propellers and shafts bent by drift logs." . . . "People on Deer Park Levee here won't come off without their cows!"

Blending oddly with radio code's monotonous murmur in a Coast Guard boat's tiny cabin comes the strangely similar call of tree frogs in near-by willows. "Now that you've said it," "Sparks" grumbles at me from between his earphones, "you've got *me* hot and bothered; those darn frogs *do* use a code."

To Vicksburg comes a Coast Guard ship's radio call, reporting certain flood victims roosting on a house, and giving their location—after the manner of blue-water men—by latitude and longitude!

Through a Memphis hotel lobby crowded with Coast Guard men and Red Cross nurses comes a page, yelling, "Mr. Romeo—call for Mr. Romeo!" "With all these Juliets," says a traveling man, "Romeo *must* be here."

Out of Natchez a slow train whistles constantly—and often stops—to let thin cattle, all hoofs, horns, and tail, stroll off the track.

Hung on a levee post is an old steamboat bell, for calling plantation field hands to dinner. A girl in overalls roosts idly on it.

"I didn't have my clothes off for two weeks," says a Paducah taximan. "We moved 5,000 people in rowboats across Perkins Creek, some from tourist cabin roofs. Coast Guard scout boats with radios located 'em, reported to another station they had in the Irvin Cobb Hotel, and we'd go get 'em. . . . Lots of autos, standing under water, had their tops torn off by powerboats running over them."

Paducah signs read, "Food for Workers Only." All day, we found no coffee—a month after the flood hit this town of 35,000—only sandwiches and Coca Cola in a sole surviving hot-dog stand. Its sign read:

"Love to all
Credit to none
We love you all
But need the mon."

At night we got coffee, from the Red Cross feeding station in a schoolhouse.

Nobody could enter the littered, mud-covered streets without a National Guard pass stuck in his hat.

"Towing in steel barges, we built a floating pier before the Irvin Cobb Hotel," said Red Cross Director Gus Myer. "We moved over 30,000 people." Then he answered a phone call for 21 coffins. "Once when a coffin call came in, I said to a colored truckman, 'Get the three from our backyard shed' . . . Wide-eyed he quickly rushed back, saying the three coffins we thought were empty 'had people in them!'"

Everywhere we went, from Cairo to the Gulf, men fought with lumber and sandbags to whip the flood.

Opposite Memphis, on the Arkansas side, one district engineer's staff occupies what is actually a vast fort, entirely hemmed about by high, waterproof walls that defy the floods (page 774).

"We have organized our six hundred miles of main stem levees as in battle," said Colonel Eugene Reybold. "Flood fighters hold each sector of the river, just as we would assign companies, battalions, brigades, and divisions in wartime. Each sector commander must maintain at all costs the integrity of his levee line. Levees are patrolled day and night. With radio nets and field telephones we at headquarters are advised on a moment's notice what is taking place. Sandbags, lumber, tools, and food are on hand and ready to move by land or water to any area where needed."

SIMPLE DIALOGUE ON HOW MAN WORKS TO TAME THIS BIG RIVER

Why do Army Engineers work on the levees?

Because in early days West Point men composed Uncle Sam's only group of trained engineers. They not only had to build forts; they also dug canals, built locks and roads, and dredged and improved rivers and harbors.

How much earthwork has gone into all these Mississippi levees?

Mountains of it. In their busiest year, 1932-33, engineers moved more than 125,000,000 cubic yards; for one month, they moved an average of 613,000 cubic yards a day—or say about 950,000 one-ton truckloads. In plain words, they made the dirt fly here nearly four times as fast as in their busiest days digging the Panama Canal.

How are levees built?

With earth, which is dug and piled with tower machines, draglines, tractors, wagons, and trucks. Sometimes a hydraulic dredge



Photograph from *Actae*

BATTILING THE RISING OHIO, MEN ERECT BULKHEAD EXTENSIONS ATOP THE STEEL-CONCRETE SEA WALL PROTECTING CAIRO, ILLINOIS

The Cairo levee rises to 60 feet, but a flood crest of 62 or 63 feet was predicted; hence this "topping" or heightening with lumber and sandbags. But, when Army engineers diverted much water into near-by floodways (page 769), they held the Cairo crest to 59.61 and kept the city dry.

pumps mud, or clamshell dredges work on floats.

Did Army men build the first Mississippi levees?

No indeed! French pioneers, founding New Orleans in the cypress swamps of 1718, soon afterwards built low dikes about three feet high to protect their rude huts from flood.

But if three-foot dikes kept early New Orleans dry, why are some Delta levees now built up to 25 or more feet?

Simply because, long ago, whenever a big flood came—like the one De Soto's men saw in 1543—it spread easily out over the vast Delta lowlands, nature's own spillway, and slipped into the Gulf.

WHY MAN HAS BOUND A GIANT

Today, confined in levees and not allowed to spread, the river's surface at New Orleans may reach 20 feet above the high-water mark of French times.

But *why* is the river now confined between 2,000 miles of high levees?

That tale is long; it involves many things, from colonial frontiers to politics, local pride, and economic necessity. At this late date it seems safe to blame the pioneer French; had they gone even as far upstream as where Baton Rouge now stands, on high, dry ground, to found their settlement, they would have needed no levees.

But, once levee making began, and audacious man learned how miraculously fertile this Delta is, not even the certainty of recurrent floods could keep him out.

Decade by decade the levee system spread. As early as 1844 levees reached as far north as the Arkansas. Finally, running beyond State lines, beyond local engineering genius and financial ability, involving the politics of river navigation and even the problems of naval warfare, as in the siege of Vicksburg, the whole, vast, complex question of Mississippi flood control



Photograph courtesy Dr. Lewis Eckert, from U. S. Engineer Office, Nashville

FANTASTICALLY, LIKE SOME IMAGINARY TREE-CLIMBING VARIETY OF BOVINE, A DROWNED HEIFER DANGLES HIGH IN AIR

Similar cases are recorded from previous floods. One theory is that the beast, swimming in high water, became exhausted, laid its head between forked limbs to rest, and was caught there as the flood subsided. Photographed on the lower Cumberland, below Eddyville, Kentucky.

and navigation fell into the ample, long-suffering lap of Uncle Sam.

Today, when you look at rich, populous, powerful New Orleans, at all the Delta's vast sugar, rice, fur, farming, and lumber lands, at all the railways and great industries like refineries, oil fields, sulphur mines, Celotex and sisal mills, you can see how useful these levees are—and what a grave responsibility rests on the Corps of Engineers.

WHEN THE GIANT BURSTS ITS BONDS

Can the engineers keep all flood water between these big walls of dirt?

No; they don't try. A gap exists in the levee, of course, wherever a tributary flows into the Mississippi. When it rose in 1937, for example, higher than the level of the Yazoo River, backwater from the Mississippi spread over some 1,200 square miles of the Yazoo Valley, creating the familiar old picture of submerged farms,

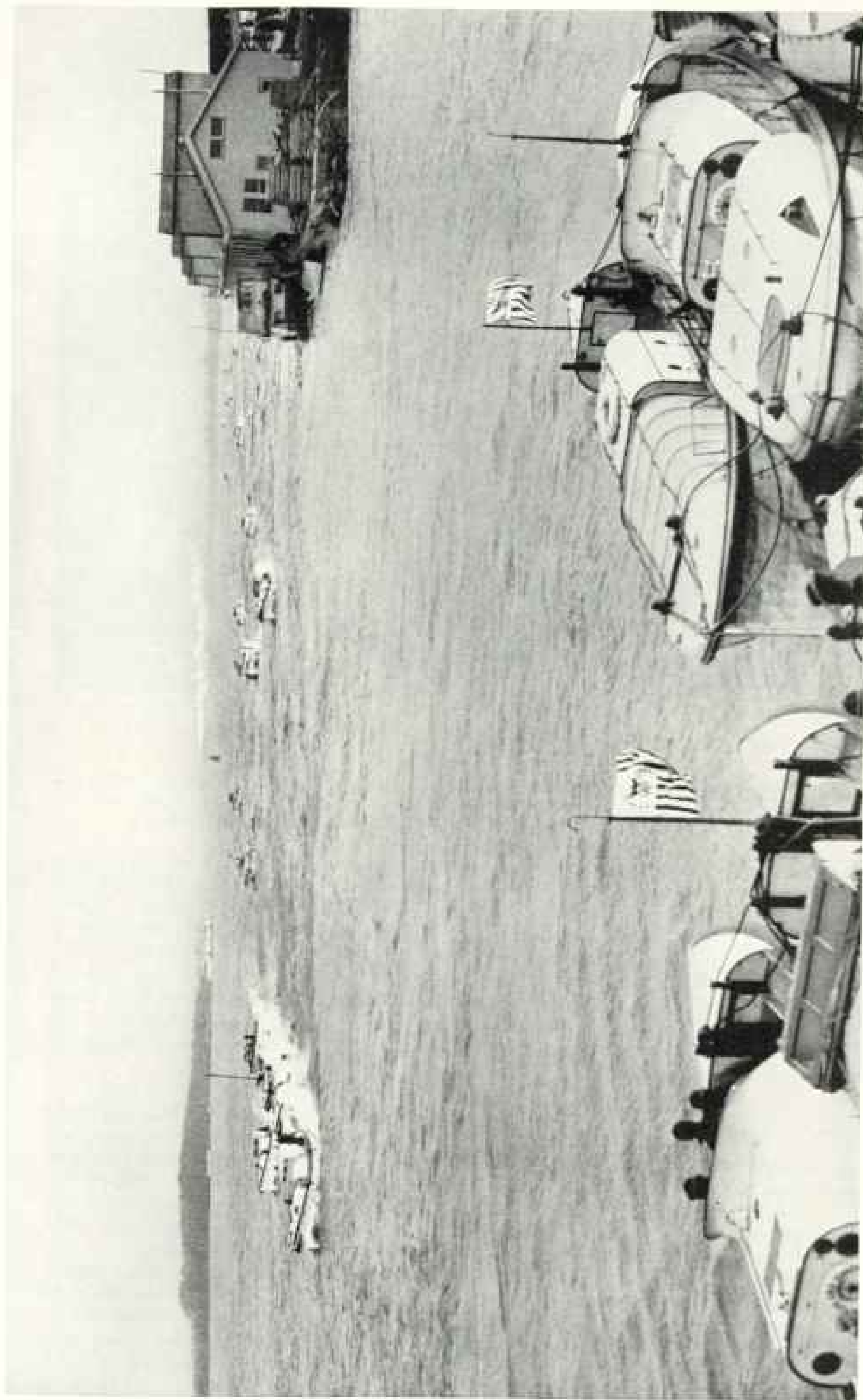
rescued refugees, relief and Red Cross camps. The lower end of this Yazoo Valley, like those of the St. Francis, White, Arkansas, and Red Rivers, forms what is called a natural overflow or "flood basin."

It was backwater in such basins, and not levee breaks, which kept the Red Cross and Coast Guard so busy here in 1937, moving out people and livestock and caring for them.

What is a "fuse plug"?

That's a stretch of levee which engineers purposely leave low, so it can overflow when the river gets dangerously high and drain off surplus water into lowlands reserved for that emergency. In plain words, a fuse plug is like the emergency spillway on any common earth dam.

Cairo, Illinois, was saved from major disaster in 1937 not by its 60-foot sea wall alone, but because engineers "pulled" their fuse plug and let surplus water pour into the 131,000-acre Birds Point-New Madrid



© International News

"IT'S A REGATTA WITH HUMAN LIVES AS PRIZES," MEN SAID OF COAST GUARD FLEETS RACING ON ERRANDS OF MERCY

This is how the racing Ohio River looked near Cairo in January and early February, 1937, when scores of Coast Guard and other boats patrolled it, answering radio calls for help, distributing food and medicine, and transporting those in peril. Happily for Cairo, levees and the floodway saved it from inundation (pages 769 and 778).



U. S. Army Air Corps Photograph by Major Albert W. Sherman

MERE LINE A VAST INLAND SEA THAN A MERE RIVER, THE OHIO IN PLACES SPREAD FOR MILES BEYOND ITS BANKS

Cold, bewildered cattle huddle in high spots on the road where water is shallowest. Horses seek the consolation of human kind by crowding close to kitchen windows. Abandoned automobiles and trucks stand near a house. Trees, windmills, barns, fences, and telegraph poles sketch the pattern of farm homes against this watery waste below Louisville.



Photograph from Acme

LOUISVILLE GROCERS IN SKIFFS DELIVER FOOD TO FLOODBOUND CUSTOMERS

Girls and men walk from second-story windows to porch roofs, viewing the scene, which includes family motorcars standing deep in muddy currents. Disagreeable and dangerous was the failure of many water and light plants; cleaning mud and slime from houses, afterwards, was a terrific task.



Photograph by J. Taylor Roberts

"I CAN'T FEEL AT HOME IN THIS LAND ANY MORE," SANG THESE YAZOO VALLEY REFUGEES AT VICKSBURG

Lodged at a Salvation Army home, they met adversity with song. Thousands faced severe privations with courage and humor. "Others," said an Army aide, "haven't much to lose anyway. Periodically they get saved from flood—and get free food and clothes. 'It could be worse,' they say!"

floodway (page 769). Seventy river miles south, this flood flowed back into the Mississippi.

What is the Bonnet Carré Spillway?

That's a big wood and steel gate 7,000 feet wide, which engineers set in the levee above New Orleans on the Mississippi's left bank. It was opened—a panel or "needle" at a time—in February, 1937, to drain part of the big flood into Lake Pontchartrain and thence into the Gulf.

Might the levees have broken but for the new Bonnet Carré Spillway?

It was built to avoid just that risk. In 1927 the State of Louisiana dynamited the main levee, at Caernarvon just below New Orleans, because it was feared that city was in danger.

ENEMIES OF THE LEVEES

What makes levees break?

"We hope levee breaks are a thing of the past," engineers answer. "Crevasses, heretofore, were due to overtopping, to sand boils, seepage, sloughing—and in small, weak levees probably to crawfish holes. Wave wash, from cross winds and steamer wakes, may cause breaks when water is high up on the levees."

What is the Atchafalaya Basin?

That's another huge, natural flood basin, in south-central Louisiana. Some say it's the old course of the Mississippi itself. It takes off, now, from the Red River near Angola, and carries a veritable rolling yellow sea down to the Gulf west of New Orleans, in every major flood. To help it function, the Army has dredged deeper channels for it, and built three systems of levees and guide levees in it. Its chief stream is the Atchafalaya; some 70 miles below its head it splits into many channels—like the Nile Delta—which finally spread into shallow lakes that drain into the Gulf.

You hear that Army Engineers have "shortened" the Mississippi by some 100 miles, between the mouths of the Arkansas and Red Rivers, with a dozen "cutoffs." What are these?

Look down from an airplane (page 789). See how the river loops and bends, especially above Greenville, Mississippi. So tortuous is the stream here that boats, in making 40 meandering miles, may steer twice into every point of the compass.

To straighten out, shorten, and speed up flood flow, to stabilize the river channel,

the engineers cut directly through 11 necks or points formed by these sinuous bends. To navigation, these cutoffs, initiated by General Harley B. Ferguson, President of the Mississippi River Commission, are of infinite value. They also help in flood control by speeding up discharge.

A MISSISSIPPI IN MINIATURE

The Mississippi River Commission—what is that?

A body set up by Congress, in 1879, to work on river problems—floods and navigation—which had been increasingly troublesome since the Mississippi came wholly into the territorial limits of the United States after the War of 1812-14.

This Commission, made up of Army and civilian engineers, now has its headquarters at Vicksburg; from here it supervises U. S. Army District Engineers, stationed at various cities from Memphis to New Orleans. Each great watershed in the United States forms an Army Engineers' "District." The Commission's offices stand in the hills of Vicksburg National Military Park, where monuments mark the old Union and Confederate lines in the siege of Vicksburg.

If you doubt that engineers have imagination, look at their 1,100-foot miniature model of the lower river, built on a 245-acre tract near this park, at what is known officially as the "United States Waterways Experiment Station." This model of the river from Helena, Arkansas, to Donaldsonville, Louisiana, permits the study of flood-control plans for much of the lower valley and the overflow areas of its alluvial plain.

Forests are represented by fine bent wires; levees, bends, bars, and cutoffs are all graphically shown in miniature works; powdered coal moved by the tiny currents shows how silt is handled by the real river.

Like children at play, building their puny bridges or little mud dams in a backyard "river" formed by heavy summer showers, serious-minded Army engineers here also play—but very keenly—for what they can learn from this tiny model stream. To them, its behavior, as toy floods are made to rise and fall at will, is full of lessons. By it they learn where sand bars may form or levee breaks occur or where new cutoffs may come (page 785).

A vast experimental hall houses volumetric measuring tanks and apparatus for the study of stream velocity, spillways, and settling basins.



Photograph courtesy Mississippi River Commission

MUD FLIES 300 FEET HIGH AND MANY FISH ARE KILLED WHEN ENGINEERS USE DYNAMITE TO HELP OPEN SARAH CUTOFF, 40 MILES BELOW GREENVILLE

A cutoff is an artificial channel cut between two bends in the river to straighten its course (page 789). By digging 11 such cutoffs, and using one scoured by the river itself, man has actually shortened the lower stream by more than 100 miles. "They aid navigation, and they help control floods by speeding up discharge," an engineer explained, "letting flood water get downstream in a bigger hurry."

Study models have also been built here of the New York and Los Angeles harbors, San Francisco Bay, and—for the Standard Oil Company—a complete model of the Lake of Maracaibo in Venezuela.

MANY A MIDWEST FARM NOW LIES AT THE MISSISSIPPI'S MOUTH

Here, too, silt studies are carried on with a view to determining how much sediment is carried by the river. It has been estimated, for example, that from the State of Missouri alone in a flood year a mud pie a mile square and about 600 feet deep is dumped into the Mississippi.

Measuring the sediment it carries, engineers estimate that in one day during high water the big river may carry 1,886,000,000 pounds past a given point. In easier words, mud enough to load about 23,600 railway cars of 40 tons capacity, or 472 freight trains of 50 cars each.

Look how the river has built its Delta for scores of miles out into the Gulf, and you can imagine how enormous its annual cargo of mud is (map, page 772).

Have Army engineers other work to do in this big basin besides flood control and keeping the lower Mississippi channel deep and wide enough for navigation?



Photograph courtesy Mississippi River Commission

NEAR VICKSBURG, U. S. ARMY ENGINEERS BUILT A MINIATURE MODEL OF THE LOWER MISSISSIPPI FOR USE IN FLOOD-CONTROL STUDIES

From the lake at the left, water is drawn at will for simulating flood conditions in the tiny river. Here are Lilliputian levees; toy "forests" are made of bent wire, and fine coal dust is moved about by baby currents, showing just how the big river forms sand bars, cuts away banks, and scours deep holes in its channel (page 783).

Plenty of it. They built fifty-odd locks in the Ohio and its upper tributaries, the Allegheny and Monongahela, opening this long waterway to enormous traffic. From Minneapolis to St. Louis they are building locks and dams, opening this water route to the Northwest to deeper-draft boats. The big dam in the Missouri at Fort Peck is being built by Army engineers; but the power dam in the Mississippi at Keokuk was built by private enterprise.

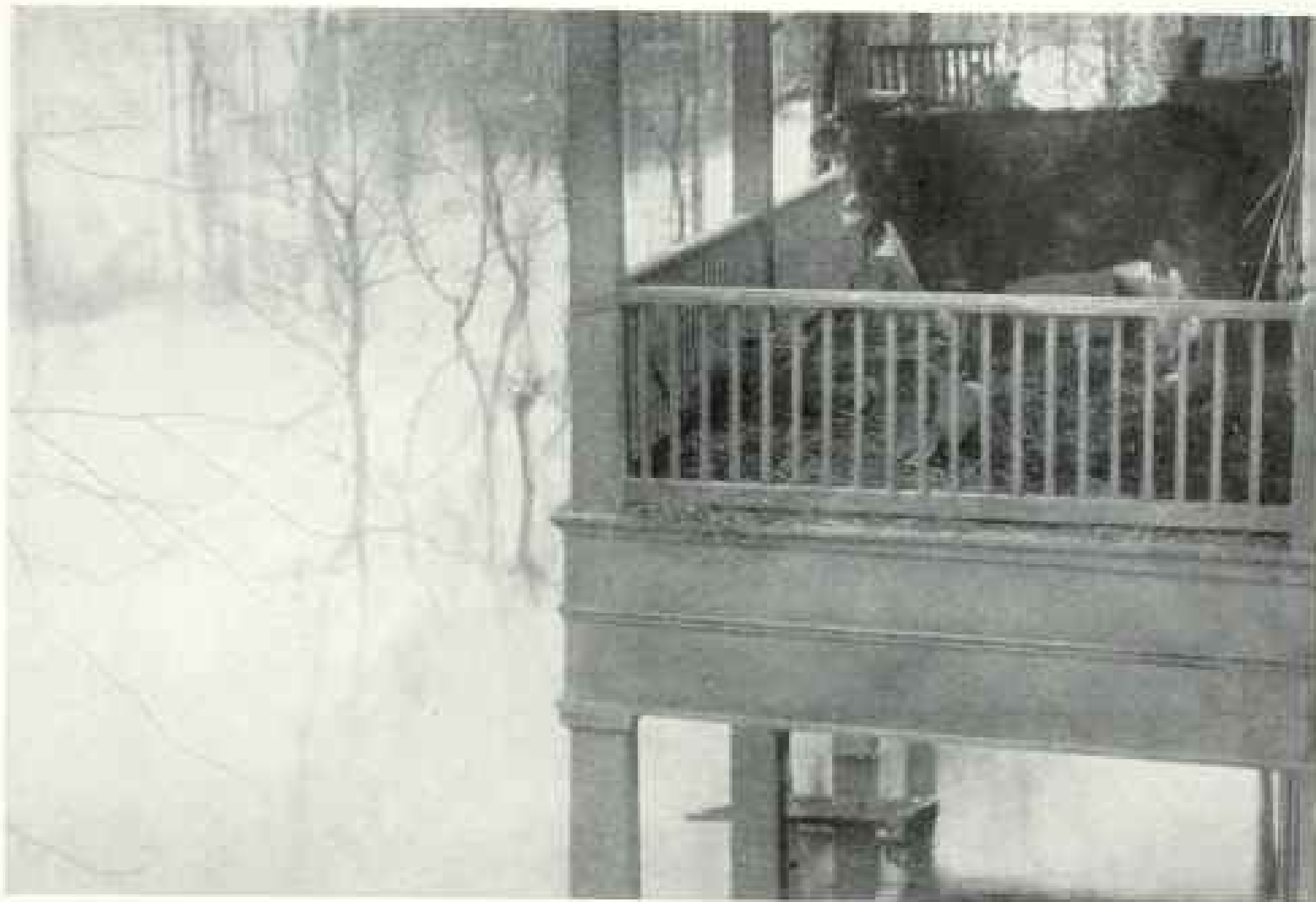
Today, thanks to Army Engineers' labors, boats and barges haul goods to and from Leavenworth, Kansas, on the Missouri; up and down the Mississippi as far

north as St. Paul and Minneapolis; and, by the Illinois River and ship canal, between the Great Lakes and the Mississippi.

Dredging snags and sand bars, deepening channels, revetting banks, is all part of their work.

Finally, under the Flood Control Act of 1928, they did a seven-year job of study and survey concerning more than 150 dams and reservoirs which may eventually be built in scores of Mississippi tributaries. Sites chosen for such proposed reservoirs are scattered from Montana to Pennsylvania.

Engineers' opinion is that such reser-



Photograph by Twinkling Star

MOOING COWS CLIMBING UPSTAIRS AND WALKING OUT ON YOUR SLEEPING PORCH CAN BE MORE THAN A NIGHTMARE IN HIGH-WATER TIMES

Here she is, on a porch in Paducah—and was the occupant of the house surprised? Somewhere under that unexpected lake there's a lawn, maybe with flower beds and nice gravel walks. What a clean-up job when the water goes!

voirs, which might cost close to a billion dollars, would be most useful for local flood control and would also have a moderate effect in diminishing super-floods in the lower Mississippi. Others say a giant storage reservoir, perhaps near Cairo, might cover as much ground as the two States of New Jersey and Delaware, and still lower but slightly any huge flood going into the lower Mississippi.

A perfect example of how storage dams may control floods is shown in the case of the Great Lakes and the St. Lawrence. But look at the size of the Great Lakes!

Does ice ever worry the engineers?

It certainly does, on the upper river. "Ice works like a steam shovel," said a Coast Guard officer. "It breaks up wharves, cuts down walls, smashes ferry-boats, and tears up big trees by the roots.

"Where Green River flows into the Ohio, I saw trees laid flat by the ice and stripped clean of bark.

"The Ohio ice pack above Evansville in February, 1936, was 10 to 25 feet thick. The field was 110 miles long from Owensboro, Kentucky, to Golconda, Illinois. In

bad ice years melting cakes float down the Mississippi as far as Baton Rouge."

In 1918 ice jammed the river from bank to bank at many places in its middle reaches. It tore dozens of steamers and barges loose from their moorings. Many sank and others were carried downstream in the floes. At Vicksburg, usually considered "a balmy southern city," only a 200-foot channel remained free of ice. Army engineers have dynamited ice jams in the Missouri as far north as Bismarck, North Dakota.

RIVER'S BED IS EVER CHANGING

Even when the levee system is complete, under the Government's "Adopted Plan," will all Delta lands be protected?

No; only about half. But the other half is mostly uninhabited or still in brush and swampy woods.

This big river eats at its own banks, scours deep holes here and there, and shifts its bed.

"After every big flood—when currents may scour holes 200 feet deep in spots—we find new changes in river bed, bars,



Photograph by J. Bayne Roberts

PUBLIC HEALTH OFFICERS ORDERED FORMER INHABITANTS TO "KEEP OUT" OF FLOOD-WRECKED HOMES TILL SANITATION SQUADS COULD CLEAN UP

Mud-plastered, slime-soaked rugs, beds, and other furniture littered the streets of stricken cities, as here in Paducah. Rehabilitation, with restoration of light and waterworks, is a long, costly job that must go on for months after the flood subsides.

and channels," said a pilot. A 200-year-old map shows, for example, that Bondurant Island has moved 8 or 10 miles downstream by erosion on its upper end and accretion below.

What is a revetment?

When caving banks threaten some critical point, say near a city, or engineers feel the river bottom needs patching, they carpet it with a mat, called a revetment. Once such mats were woven of willows; now, articulated concrete slabs are mostly used, or a mattress made of steel web covered with asphalt (page 788).

Do the levees run right down to the shores of the Gulf of Mexico?

No. They terminate some miles upstream where the river forks into many "passes." Two of these, South and Southwest, are the improved channels open to navigation by seagoing craft.

Grade line for levee top was first established all the way from Cairo to the Gulf in 1885. Though levees were built to this height, floods soon showed they were still too low; over and over they broke. It seemed that the higher men built the

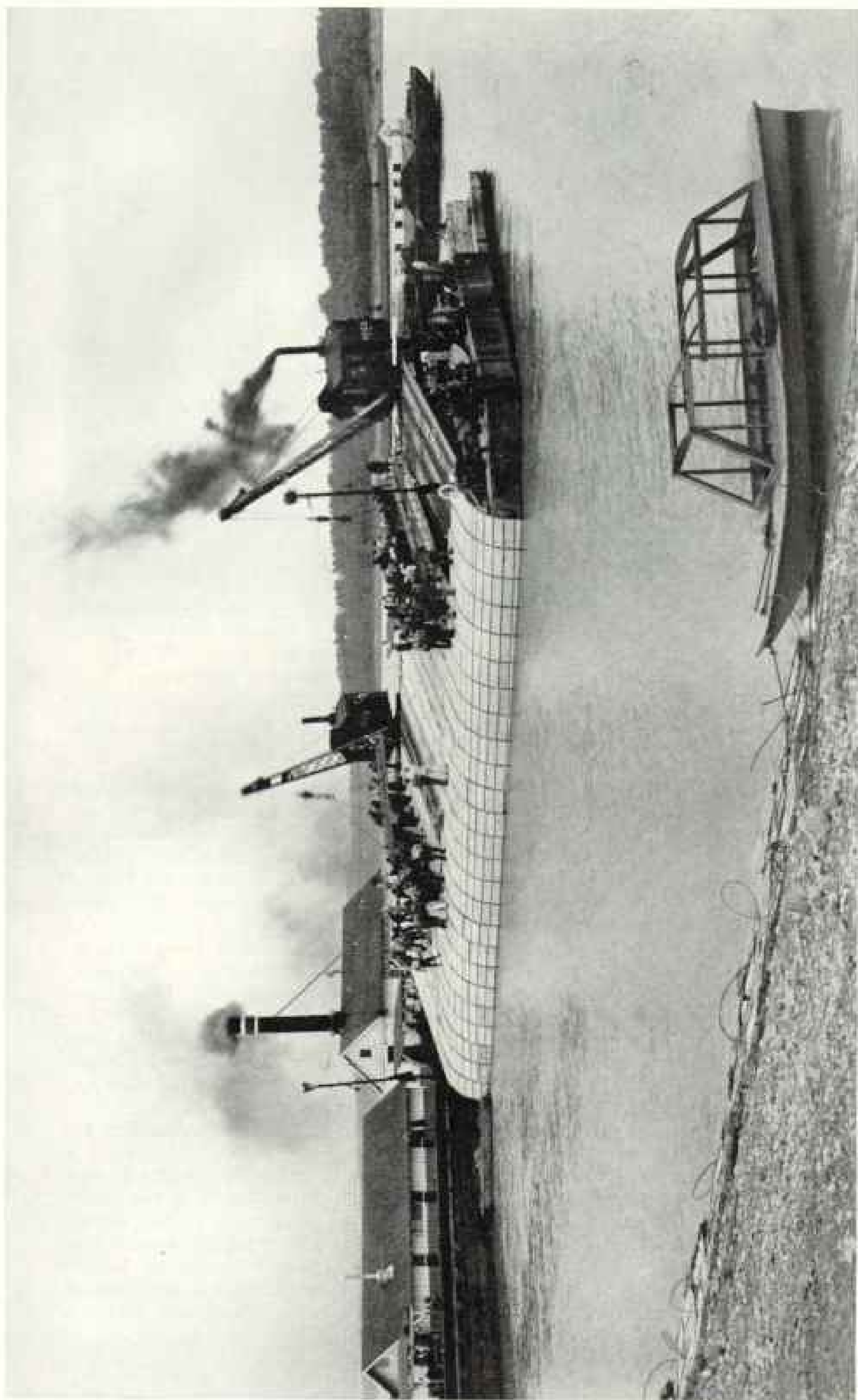
levees, the higher went the floods—with more and more levee breaks, or crevasses.

Then came 1927's flood, highest then recorded. Again levees broke, and 600,000 people were moved from flooded lands.* This led to the most thorough flood-control study the Government had yet made, and later to the adoption of a great plan for higher levees and for floodways. This plan, modified and extended in 1936, is now about half carried out.

On river reaches actually used by commerce, as from the barge-jammed Monongahela down the Ohio and Mississippi, prodigious cargoes now move.

Ohio traffic began when whites first explored its valley. During more than a century this "Belle Rivière," as the French called it, helped enormously in the settlement and growth of much of the United States. It was a busy moving water street which carried pioneer emigrants to the wilderness. Down it floated hundreds of thousands—in barges, keelboats, flatboats

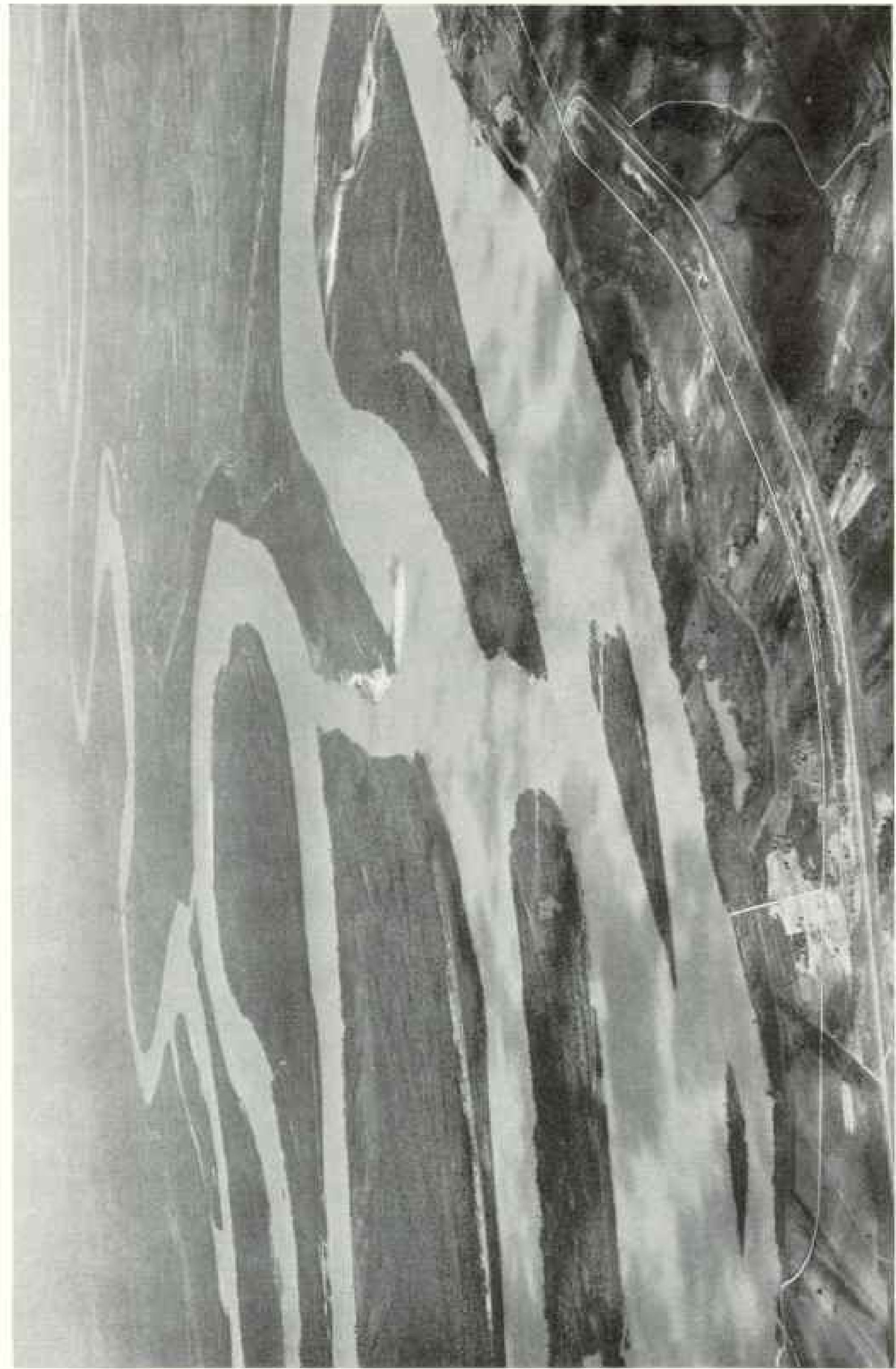
* See "The Great Mississippi Flood of 1927," by Frederick Simpich, in *THE NATIONAL GEOGRAPHIC MAGAZINE*, September, 1927.



Photograph courtesy Mississippi River Commission

LIKE A BIG RUG, THIS JOINTED CONCRETE MAT SLIPS OFF A BARGE TO LIE ON LEVEE BANKS

Known to engineers as an "articulated concrete mattress," its purpose is to protect earthen levee banks from wear and tear of moving water. Other mats, similarly laid, are made of pliable but heavy metal screen covered with an asphalt mixture; to stop grass or weeds from sprouting and making holes in such mats, salt is put under them. This scow is near Cairo, Illinois.



Photograph courtesy Mississippi River Commission

AIR VIEWS SHOW WHAT AMAZING LOOPS AND SINUOUS BENDS THE MEANDERING LOWER MISSISSIPPI MAKES

Here are the "Greenville Bends," between Mississippi and southern Arkansas. Greenville, Mississippi, at the extreme right, is protected by levees. Turpley, Leland, and Abbrook Cutoffs are seen, showing how the river channel has been straightened and shortened.



Photograph from Memphis Engineer District

HEAVY STONES HELP TO KEEP OLD MAN RIVER FROM GNAWING AWAY HIS BANKS

Men and machines along the Mississippi grade the levee banks and lay riprap paving to protect them from waves and currents. In earlier days protective mats were often made of woven willows or other small trees. Now concrete or asphalt mats are more general (page 788). This stone riprapping is being used in the Gayoso Bend revetment, 25 miles south of New Madrid, Missouri.



U. S. Army Air Corps Photograph by Major Albert W. Stevens

OHIO RIVER WATERS ENGULFED MANY ACRES OF HOMES AND FACTORIES IN THE HARD-HIT LOUISVILLE AREA

In the foreground appears the Kentucky city's low "Point" section, with its partly submerged gasoline tanks, waterfront houses, and industrial plants. Across the swollen river is flooded Jeffersonville, Indiana. Against the approach to the railroad bridge are strewn fragments of houses, boats, and bridges, mixed with other flotsam from up the Ohio. Scores of lives were lost in this vicinity.

—carrying flintlocks, families, chickens, pigs, horses, cows, plows, spinning wheels, iron kettles, axes, saws, and animal traps.

New Orleans was long the best market for fur, corn, pork, venison hams, barrel staves, lard, bear oil, and other pioneer products of the Mississippi Valley. Coon-skin-cap men barged their cargoes down, sold raft and all for cash—then fought their way back north on foot through hostile Indians and white bandit gangs.

From Pittsburgh for New Orleans in 1811 sailed the Mississippi's first steamer. Her captain was a Nicholas J. Roosevelt. Below the falls of the Ohio this primitive boat felt the fury of New Madrid's historic earthquake. Bluffs slid into the stream; islands sank, or changed form. From Cairo down to the Arkansas River the earth rose and fell in undulations. Forests and fields sank to form Tennessee's now famous Reelfoot Lake.†

Through storm and seismic chaos the pioneer *New Orleans* held her way; between New Madrid and Vick's Plantation—now Vicksburg—then stood no other town or settlement. Yet by 1857, two to three thousand steamboats yearly were trading at new towns along the river, and tying up at noisy, congested Canal Street Dock in New Orleans.

Before railways the upper Mississippi also afforded man an economic trade route. Traffic reached its peak between 1850 and 1860, when some 1,100 steamboats reached St. Paul.

After rails came, an increasing share of traffic began to move east and west, with much ore and grain shifting from rails to Great Lakes ships. Lumber and log cargoes downstream dwindled.

The Government has spent millions working for a nine-foot channel up to the Twin Cities, and considerable traffic is now carried by oil companies, Government-operated barges, and others.

ACRES OF BARGES REPLACE THE ROMANTIC OLD PACKET BOATS

Familiar to all who love this romantic river is its Golden Age of ornate, sumptuous packet boats, the exciting race between the *Natchez* and the *Robert E. Lee*, and our literary mayonnaise over beauties in hoop skirts, slick gamblers, gallant old colonels, and banjo-playing roustabouts.

† See "Reelfoot—An Earthquake Lake," by Wilbur A. Nelson, in *THE NATIONAL GEOGRAPHIC MAGAZINE*, January, 1924.

After the Civil War, railways gradually ended all that. Then the World War, calling suddenly for every kind of transport, started us using rivers again. Uncle Sam helped, by starting his own barge lines.

Now on the Ohio, with all its locks and canals, and on the Mississippi below St. Louis, far more freight moves than ever moved in the halcyon days of packets. You might load 150 old-time packets, say, with coal or steel at Pittsburgh, and they would carry no more than one modern barge tow.

Look at the *Sprague*, a stern-wheeler now used by Standard Oil to push its barges about the lower Mississippi. On one trip the *Sprague* towed 65 barges, hauling 40,000 tons of coal. "We don't count barge units in such big loads," said a river pilot. "We just ask, 'How many acres are you towing?'"

"What kind of freight rides the rivers?" you ask.

"Everything," they say, "from beer and canned fruit to guano and gasoline."

Since our wheat exports fell off, more cargo now moves upstream than down. For St. Louis, oddly enough, the chief bulk cargo on Federal barges is coffee and sugar—which also ride as far north as Twin Cities. Southbound, with various other cargo, may come patent medicines for sale on southern plantations.

Copied from ships' papers, here are random river-cargo items: cattle, oystershells, coffee, sugar, fruits, rice, rubber, seeds, textiles, bags, cotton, logs, lumber, pulp board, cement, oil and gasoline, sulphur, ores, scrap, farm machinery, automobiles and trucks, chemicals, rock phosphate, barley, corn, wheat, coal, concrete, iron and steel products, soap and matches.

While above Cairo on the Mississippi Federal barges haul most of the freight, on the Ohio private carriers handle 95 per cent of all traffic—mostly coal, steel products, cement, oil, and similar heavy cargo. Volume runs into millions of tons.

Pittsburgh, Wheeling, Cincinnati, Louisville, Evansville, St. Louis, Memphis, Baton Rouge, New Orleans—all trade by river, even through the Intracoastal Waterway to Houston, Texas.

Birmingham benefits; it ships iron pipe, for example, down to the Gulf coast, across to and up the Mississippi to the Illinois River, and thence through the ship canal to Chicago and the Great Lakes.

Memphis, receiving up to 2,000,000 tons of goods a year at its 21 barge terminals, breaks up these cargoes and reships them by rail in seven different directions. Trucks, rails, and oil pipelines, all tie in with river craft to make our flexible transport net more accessible. Who, outside the business, knows we have about 100,000 miles of pipelines?

But in some smaller rivers Government boats that keep the channels open are about the only craft in use. The upper Missouri, for example, though long a highway for pioneer emigrants and fur traders and much used in Indian war days for transporting troops and supplies — when fights raged between Indians on the banks and soldiers on board ship — now is little used for transport.

As to the Mississippi, however, Uncle Sam looks on it as a traffic artery of national rather than local importance; and in any national view of all river improvements, many questions besides flood control and navigation must enter.

First may be the problems of power, irrigation, erosion; then, of course, pure water supply for cities and towns. Involved also is pollution from sewers, mines, and factory waste.



H. Aslette Meade Airphoto

"TURNING A SWEET WHEEL," AS PILOTS SAY, SHE DRIVES HER 17 LOADED BARGES THROUGH TURBULENT OHIO FLOODS

Since the World War, American inland waterways transportation has been enormously revived. Besides Federal barge lines operated by Uncle Sam's "Inland Waterways Corporation," many privately owned fleets are run by oil, steel, coal, and other freighting interests. Romantic and picturesque were the "floating palaces" of ante bellum days, but a single modern barge tow may carry 100 to 150 times as much freight as an old-time packet boat.

At times of low water, stagnant pools are ever a menace; storage dams, in many places, might keep such streams flowing, even in drought.

BATTLE ON A TITANIC SCALE

Local pride, politics, logrolling, all are aspects of every government. They make river works costly. No doubt, in older lands like Egypt, India, Iraq, and China—where for thousands of years men have wrestled with river problems, there has also been



© International News

ASTONISHED INLAND AMERICANS SAW LONG RAILWAY TRAINS LOADED WITH SURF-BOATS AND UNIFORMED COAST GUARDS, RUSHING TO THE FLOODS

These boats being loaded at Jersey City are part of the greatest fleet ever sent to American inland waters. Manned by plucky crews, hundreds of such craft, in January, 1937, helped to rescue the drowning and to cure for thousands of homeless, hungry victims of high water. Working in cold, rain, and darkness, these heroic blue-water men themselves were often without food or dry clothing for hours, yet remained characteristically cheerful, cracking their sailor jokes even in face of personal peril (pages 769 and 780).

waste of money. That seems inseparable from all hydraulic adventure on the titanic scale necessary in battle with big rivers.

Since 1543, when whites first saw a great Mississippi flood, infinite hours, dollars—and words—have been spent on these high waters and their control.

UNCLE SAM IS MAKING THE MISSISSIPPI BEHAVE

Cutting down forests, overgrazing, plowing up grass, and draining swamps all tend to increase local floods; their effect on super-floods in the lower Mississippi—because of incalculable water volume—must be negligible in seasons of heavy, widespread, continuous rain. But Army engineers have now proved—with their levees, their spillways and overflow basins—that they can control high water below Cairo.

There remains the huge problem of the Ohio.

All downstream—in Wheeling, Parkersburg, Huntington, Portsmouth, Cincinnati, Lawrenceburg, Jeffersonville, Louisville, Evansville, Paducah, men ask: "How can we control this river?"

"Trouble is," said an old Cincinnati water-front man, "lots of this land where houses are really always has *belonged* to the river. . . . People just keep encroaching on the river, with mills and warehouses and wharves, making it narrower and narrower. Then, when it gets high and must spread, there's no place for it to spread except up into somebody's second-story windows."

But whether with dams, flood basins, or levees—or with all these—here is another big problem for the Army engineers.

A MODERN PILGRIM'S MAP OF THE BRITISH ISLES

BY ANDREW H. BROWN

HELD by the pageantry of Coronation, the attention of all peoples has recently been focused on England, where millions of devoted subjects acclaimed their new King and Queen, George VI and Elizabeth. A decorative Modern Pilgrim's Map of the British Isles, distributed to members of the National Geographic Society with this issue of their Magazine, will be of timely usefulness to multitudes of readers pondering once again that "little world" whose "happy breed of men" has made such staggering contributions to human civilization and culture.

Particularly for English, Scottish, Welsh, and Irish members, for Australians, New Zealanders, Canadians, South Africans, and for Americans who cherish British ancestry and traditions, but also for other hosts of interested members, the new ten-color map appears at a most opportune moment.

Lavish decorative detail, including a border made up of 44 drawings of some of Britain's most famous people and places, emphasizes the amazing political, artistic, and scientific achievements of a land which is heart of an empire with more than one-fourth of the world's total population distributed over about a quarter of its habitable surface. The Isles themselves, on a total area not quite twice that of New England, support over two-fifths as many inhabitants as the whole United States.

A MAP COMBINING SCIENCE WITH ART

This unusual chart, designed by C. E. Riddiford, shows in detail an area recently pictured on a smaller scale in The Society's Map of Europe. Asia, Africa, the United States, Canada, both Polar regions, the Caribbean, the Pacific, and the World have also appeared in the important series issued to members in recent years as special supplements to their National Geographic Magazine.

The map is drawn on a conic projection, with two standard parallels, on the generous scale of 1:1,622,000. Over-all dimensions, including the border, are 36¼ inches by 29¼. "Eye appeal" has been particularly stressed in the design. Old styles of decoration have been brilliantly revived to provide suitable embellishment.

Rich baroque cartouches fill the four corners, reviving the technique of 16th- and 17th-century cartographers. They frame charming full-color scenes typical of the four geographical divisions of the Isles. The various national emblems are given a place above each scene: three lions for England, Scottish lion rampant, dragon for Wales, and the Irish harp. In the extreme corners appear the national floral emblems: rose for England, thistle for Scotland, shamrock for Ireland, and leek for Wales.

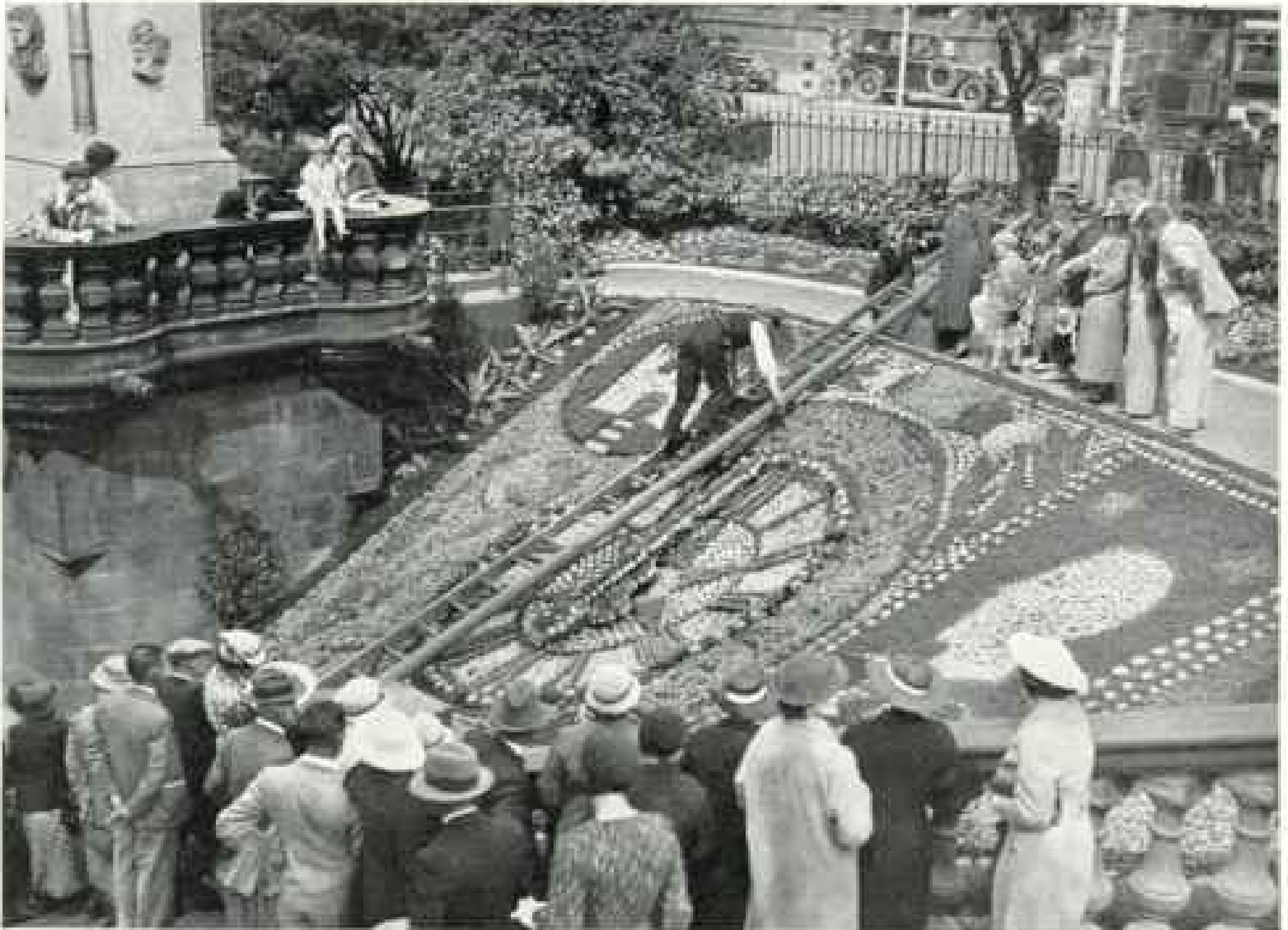
Prominent in the upper right-hand quadrant is the title and legend cartouche, spotlighting the full title in a decorated box. Below a drawing of the King and Queen and the Royal Arms, a detailed legend provides a key for the intelligent use of the map. Appropriate symbols direct the reader to cathedral towns, interesting churches and abbeys, places with castles, picturesque villages, famous mansions, battlefields, lighthouses, racing centers, radio stations, and ancient monuments.

GUIDE TO THE AMERICAN SHRINELAND

Places which may be grouped under the collective title of the American Shrineland are shown in sienna red. Many localities in the British Isles having an intimate connection with American history are thus brought to the attention of American readers and others interested in the interrelation of the United States and the Old World land from which the Nation sprang.

Coats of arms of chief cities of the five countries contained within the Isles are distributed at intervals around the border. That of London (the first city not only of England, but also of the United Kingdom and the Empire) is centered at the top. The right border bears coats of arms of Edinburgh (for Scotland) and Cardiff (for Wales), while those of Belfast (for Northern Ireland) and Dublin (for the Irish Free State) are spaced along the left edge.

Forty-four pictures, alternately of British figures and scenes characteristic of the five countries, are interspersed between heraldic emblems of the border. Here are shown such historic personalities as Elizabeth, Cromwell, Shakespeare, Darwin, and Watt, and such notable sights as Killarney,



© Scottish Pictorial Press

A GARDENER KEEPS EDINBURGH'S FLORAL CLOCK IN TRIM

This decorative timepiece actually keeps time. Underground mechanism turns the two hands around a ten-foot dial formed of growing flowers and tiny shrubs. Here strollers in Princes Street Gardens pause to watch the gardener at work.

Stonehenge, Canterbury, Big Ben, and Abbotsford.

A compass rose; a scale indicated by a big pair of dividers; drawings of liners and fishing smacks on the sea; waves, clouds, and angel-head "blowers" are additional decorative details that beautify the map.

NORSE VOYAGERS KNEW ENGLAND

Norse voyagers, observing the lush greenness of the English coast, named it *Engeland*, according to one theory, meaning, in their tongue, meadowland. But most authorities believe England takes its name rather from "Angle-land"—land of the Angles, who emigrated there from the Continent chiefly in the fifth and sixth centuries. A genial Dutchman later described the same territory as "a pleasant island off the coast of Holland." Today, at the hub of the world's land hemisphere, gigantic little Great Britain occupies a dominant position in world culture, statesmanship, and trade.

Earliest inhabitants left archeological puzzles for modern minds. Prehistoric civi-

lizations built monuments which today's scientists date in the end of the Stone Age and the beginning of the Bronze. The linteled monoliths of Stonehenge are familiar, at least in picture, to everyone; only a few of Avebury Circle's huge unhewn megaliths remain erect. Pre-Roman Britain is largely prehistoric Britain, a period about which chroniclers still must theorize.

Monumental evidences of Rome's four-and-a-half-century dominance, from B. C. 55 to A. D. 410, are numerous. Motorists now roar along straight stretches that follow old Roman roads. Well-preserved relics are certain sections of Hadrian's 73-mile Roman Wall, which once formed an unbroken barricade from Bowness to Wallsend across the top of England.

In 410, the year after the Goths sacked Rome, Honorius left England with the last of the legions, warning natives to "look to their own defences." Leaderless now, the people could not resist Saxon invasion.

At tiny Ebbsfleet, on the Strait of Dover, landed the Jutish chieftains, Hengist and Horsa, forerunners of Germanic hordes.

Native Britons, lacking Roman discipline, resisted vainly, and conquerors and conquered merged. At Ebsfleet also landed Saint Augustine and his little band of missionaries a century and a half later, to spread the seeds of Christian fervor that afterward took tangible form in glorious medieval religious architecture.

Generations of struggle and adaptation were climaxed in 1066 at Battle with Saxon Harold's defeat by William the Conqueror and his Normans at the Battle of Hastings. The Conquest wedded Norman culture to Saxon strength. The offspring was modern Britain—the Britain of friendly, charming villages clustered in parklike countryside and heathery moorlands, the Britain of cathedrals and castles, cottages and manor houses, wild glens and genial dales, rocky coasts and hoary mountain peaks—the Britain that our Modern Pilgrim seeks. Guidebooks star and double-star the places he "must see." And then only half the story is told.

PILGRIMS STILL "WEND" TO CANTERBURY

"From every shires end of Engeland, to Canterbury they wend," said Chaucer, in *The Canterbury Tales*, of his very human pilgrims. Today they come "from every shires end" of the earth to the "capital" of the English Church, seat of the Archbishop of Canterbury, Primate of All England. With the "triumphant dominance" of its soaring central tower, Canterbury Cathedral, on one of the main routes between London and Dover, is the goal of many a Modern Pilgrim.

Other cathedrals lift their splendid spires above thatch and timber of the older-inhabited England of the south and east: Salisbury, pure Early English and externally perhaps most satisfying of all; Winchester, among all the world's churches exceeded in length only by St. Peter's in Rome; Wells, comparatively small but exceptionally beautiful, encrusted with rich sculptures; varied Ely, dominating the Fen Country "like a great solitary ship at sea"; Peterborough, with its noble nave and magnificently arched west front; hill-topping, towering Lincoln, outstanding for harmonious integration of masses and detail; York Minster, with perfectly matched towers and lustrous stained glass; and sturdy old Durham of the awe-inspiring Norman nave.

Symbols on this map also lead our pil-

grim to interesting churches and abbeys. Over in the valley of the Wye lie the romantic ruins of Tintern Abbey, associated with Wordsworth's *Lines Composed A Few Miles Above Tintern Abbey*—verses that gave English poetry a new start. Up in Lancashire's Vale of Deadly Nightshade, iron-mining, castle-building abbots erected Furness Abbey, whose ruins of rose-red sandstone include two remarkable effigies of Norman knights in armor.

Cistercian monks of Yorkshire founded Fountains Abbey in 1132. Today, the ruins of the warming house, refectory, and a vaulted 100-yard-long cellarium cluster around the roofless church in grass-carpeted, shady grounds. So perfect is the Abbey of Hexham, in Northumberland, that it has been called "the textbook of Early English architecture."

Close to the border of Wales, land of the double "l," Llanthony Abbey was founded in 1108, but the lonely monks moved soon to Gloucester, having "no mind to sing to the wolves."

Scotland has Sweetheart Abbey, named from the wish of the founder, the widow of John Baliol, that her husband's heart be buried with her. Only a few miles separate Melrose, Jedburgh, and Dryburgh Abbeys—all underlined on pilgrimage itineraries. Among profuse carvings in Roslin Chapel, near Edinburgh, are those on the "Prentice Pillar," supposedly chiseled by an apprentice during the absence of his master, who slew him in a fit of jealousy when he returned.

Ireland's ninth-century round towers were mostly built near abbeys and monasteries, apparently as watchtowers. Entrances were usually six or eight feet above the ground and ladders took the place of stairs within. Antrim has the greatest of them, nearly a hundred feet high. Monasterboice, with its sculptured Celtic cross, is one of many historic abbeys in St. Patrick's island.

"SPLENDOR FALLS ON CASTLE WALLS"

Castles! The centuries roll back as our modern pilgrimage leads us beneath medieval walls that speak of King Arthur and his Table Round, of Shakespeare's kings reciting eloquent iambs from gloomy battlements, of great Elizabeth playing cat-and-mouse with Mary Queen of Scots, of the whole glowing pageant of British history.

In England there are Windsor, near London, chief residence of the sovereigns of England for more than 850 years; St. Michael's Mount, in Cornwall, a smaller version of famed Mont St. Michel across the Channel; wild Tintagel, where legend says King Arthur was born; 12th-century Ludlow Castle, where Milton's masque of *Comus* was first performed in 1634; Kenilworth, the splendid medieval fortress that gave its name to one of Sir Walter Scott's great novels; feudal Warwick, "the most princely seat within these midland parts of the realm," with its armor, paintings, and cedars in the park.*

In Wales: grim Conway, most perfect of Welsh ruins; Caernarvon, where the first Prince of Wales is said to have been born, "today probably the most complete medieval fortress in the world"; Harlech, whose defence in 1408 is commemorated by the stirring song *The March of the Men of Harlech*; imposing Pembroke, which withstood a month's battering from Cromwell's cannon but capitulated when its water supply was cut off.

Scotland has Balmoral, the King's Highland home, beloved of Queen Victoria; Skye's Dunvegan, seat of the clan Macleod, protected by a Fairy Flag, "surrounded on three sides by water and on four by ghosts"; Glamis, the family seat of Britain's new Queen Elizabeth, and traditionally the scene of Duncan's murder by ambitious Macbeth; battlemented Cawdor, near Nairn, another of Macbeth's strongholds, with a mantelpiece carving that antedates the introduction of tobacco to Britain, yet shows monkeys smoking pipes; Edinburgh Castle, where James Sixth of Scotland, First of England, was born to unite warring nations; and high Stirling, set between shining loops of the River Forth and the "great brotherhood of Highland peaks" to the north.

LAND OF BLARNEY AND BANSHEE

And in Ireland: Blarney, where the gift of cajolery comes to him who kisses the Blarney Stone; ragged Dunluce, haunted by the baneful banshee; and Kilcolman Castle, where Spenser wrote the first three books of *The Faerie Queene*.

With charming villages and handsome cities the British Isles are surfeited. Ox-

ford and Cambridge, exhibiting the perfection of medieval architecture and possessing Britain's most influential universities, are almost as basic as London for the briefest tour.

The patchwork of England's fields and forests, the wild glens of Wales and Scotland, and the green pastures of Ireland are studded with eye-filling clusters of cottages. There are dozens of "best" villages. Who that has seen them can forget Bishop Burton, Castle Combe, Finchingfield, Clovelly, Polperro, Broadway, Lynton, Lower Slaughter, West Wycombe? For each of these there are a dozen more, just, or almost, as fine.

WHERE EXCALIBUR WAS HURLED

But places neither of particular scenic nor historic fame have other interest that makes them milestones on our modern pilgrimage. Dozmare Pool, in Cornwall, is the lake into which Sir Bedivere is supposed to have thrown King Arthur's sword, Excalibur.

During four centuries of border warfare, Berwick-on-Tweed changed hands between England and Scotland 13 times. Finally ceded to England in 1482, it was declared a neutral county, but now it is considered part of Northumberland.

Objects placed in the Dropping Well at Knaresborough, near Harrogate, turn to stone. Parasols, sponges, Teddy bears, gloves, hats, or other articles hung to soak may be reclaimed a year later—perfectly petrified by the dripping, calcifying waters.

In the parish churchyard of Llangollen, in Wales, lie buried the "Ladies of Llangollen." Eccentric Lady Eleanor Butler and Sarah Ponsonby, swearing eternal friendship, left Ireland in 1776 and came to Llangollen to devote their lives to "celibacy and the knitting of blue stockings."⁷

Still shown to visitors is the Royal Hotel room at Portree, Isle of Skye, where Bonnie Prince Charlie, the Young Pretender, said farewell to Flora Macdonald, the Hebridean beauty who had befriended him during his ill-fated 1745 rebellion. Disguised as her maid, in flowered linen gown and quilted petticoat, he had fled with her to Skye after his disastrous defeat at Culloden Moor.

Under Culbin Sands, beside the Moray Firth, is buried a village which was suddenly overwhelmed in a great sandstorm of 1694. Dunes, many of them 100 feet high,

* See "Warwick Castle, Stage for Old England's Pageantry," NATIONAL GEOGRAPHIC MAGAZINE, July, 1936.



Photograph from Philip D. Goudreau

DIGNITY MUST BE DISCARDED WHEN YOU KISS THE BLARNEY STONE

Iron bars and the firm grip of an attendant make it possible to bend backward and downward to perform the feat—which is supposed to endow the kisser with the gift of smooth, cajoling speech. The wonder-working talisman is inconveniently located in the parapet of Blarney Castle in County Cork, Irish Free State. If the pilgrim slips, it is a clear drop of more than 100 feet to the ground!

today cover old house walls and 4,000 acres of land once known as the Granary of Moray. Legend says that some days before the disaster an old woman, thought to be a witch, was refused charity in the hamlet and left breathing a curse on its stony-hearted inhabitants.

A Norman castle stands at one end of the Thomond Bridge over the River Shannon at Limerick, in Ireland. At the other end is a big boulder, much chipped by souvenir-hunters—the famous Treaty Stone. Here is commemorated Patrick Sarsfield, gloomy, gallant Irish patriot, who signed the Treaty of Limerick, ending a prolonged and bloody siege of the walled city during the Jacobite wars.

"Galway . . . is the drowsiest, most magical, most Irish, of towns. The peat smoke from the houses assails your nostrils with a necromancy, and the old ache comes in your soul; and, looking westward on the ocean, the ache is satisfied, for before you

lie the three islands of Aran, in the conger-hunted, herring-wealthy sea."^{*}

The Society's new map shows all these and hundreds more, though even the ambitious Modern Pilgrim will trace only a narrow, circuitous path through the tempting maze of names.

Nature has lavished Arcadian beauties on each of the countries in the Isles. The peaceful, winding Thames, meadow-bordered or overhung with thick-trunked trees, best satisfies one pilgrim's taste. Another hungers for cloud-scraping spurs of Ben Nevis, Snowdon, or Scafell, while a third thrills to the awesome vacancy of Yorkshire or Highland moors.

Short distances separate landscapes of startling diversity. Sudden contrasts in scenery follow within a few miles going from the green plain of Solway to the pikes

^{*} See "Ireland: The Rock Whence I Was Hewn," by Donn Byrne, in *THE NATIONAL GEOGRAPHIC MAGAZINE* for March, 1927.

and fells of the Lake District, or from boggy borders of The Wash to hoary ridges of the Peak District, from the field-hemmed windings of the Wye to the steep shoulders of Wales's Brecon Beacons, from the wooded shores of the Dart to uncompromising desolation on Dartmoor, from the Yorkshire Moors to green hollows of the Dale Country, from Renfrew flatlands to the humped and folded Grampians, from the Bog of Allen to the Wicklow Mountains, or, for that matter, from London Bridge to the windy South Downs, or from Clydebank alleys to the glens of Arran.

BRITAIN AT PLAY

To satisfy the British love of sports are held Solent regattas, Gleneagles and St. Andrews golf tournaments, Melton Mowbray and Market Harborough hunts, tennis matches everywhere, Highland bird shoots and deer chases, salmon fishing on the Shannon, the Liffey, or the Spey.

Spectator sports draw multitudes: the Braemar Highland Games in the valley of the Dee; hair-raising motorcycle races on the Isle of Man; football games at Wembley; rowing races at Henley-on-Thames; international tennis matches at Wimbledon; horse-racing classics at Newmarket, Epsom, Ascot, and Aintree; test cricket matches on Lord's Cricket Ground in London.

Human mermaids and mermen splash, whoop, and sift sand through their toes at the great shore resorts of Brighton, Bournemouth, Blackpool, Scarborough, Llandudno, and Aberystwyth. ("Blackpool at play is as much one of the great sights of England as Westminster Cathedral.") Inland, Harrogate, Droitwich, and Bath offer fashion, frolic, and mineral waters potent for curing aches and ennui.

Prosperous Stratford-on-Avon, birthplace and burial place of William Shakespeare and boomed by festival performances of his plays, is naturally "Exhibit A" of poet-and-author Britain. Memories of men who dealt in the witchery of words haunt hundreds of cottages, villages, and landscapes. The Lake District will always be associated with Wordsworth, Coleridge, and Southey; Dorsetshire and the whole southwest of England with the Wessex of Thomas Hardy's novels; Box Hill and the vicinity of Dorking with George Meredith.

Warwickshire cherishes memories of George Eliot, Kent of Dickens, Shropshire of A. E. Housman and Mary Webb,

Chawton, in Hampshire, of Jane Austen, "the best of novelists." Lichfield remembers Dr. Johnson; Haworth, at the edge of bleak Yorkshire moors, is inseparable from the gifted Brontës.

In Scotland there are Abbotsford, on the Tweed, where Sir Walter Scott wrote away a gigantic debt; "Auld Ayr, wham ne'er a town surpasses, for honest men and bonnie lasses," heart of the Burns country; Kiriemuir, birthplace of Sir J. M. Barrie, and the Thrums of his tales; Fife, known to all through Robert Louis Stevenson's stirring yarns. Ireland remembers Jeremy Taylor at Ballinderry; Jonathan Swift at Kilroot, near Carrickfergus; James Joyce in Connemara. The Modern Pilgrim can hardly traverse a shire without crossing some illustrious poet's path.

ANCESTRAL HOMES OF AMERICA'S FOUNDERS

Though few of the actual founders of the United States were born abroad, most of them were of British stock. Today, racial ties of blood, tradition, and common speech bind Americans to the people and the land of their origin. In a sense, the American in Britain is "going home" when he seeks out the places (shown on the map in red) associated with the builders of his country.

Mecca of the American Shrineland pilgrimage is Sulgrave Manor, at the western extremity of the broad Midland and East Anglian area containing the most important of the "shrines." The little stone manor house (now a Washington museum) is the ancestral home of the Washington family and, therefore, of George Washington, father of our offspring democracy. In the old church at Brington are memorials to several members of the famous family, including the grandfather of John Washington, who emigrated to Virginia and became the great-great-grandfather of George.

A bronze tablet in the 13th-century church of Ecton commemorates Benjamin Franklin, whose "ancestors were born in this village." At Floore the pilgrim is guided to a thatched cottage, ancestral home of John Adams, America's first Vice President.

"In this parish for many generations lived the Lincolns, ancestors of the American Abraham Lincoln" begins an inscription in the church at Hingham, in the heart of Norfolk. William Penn, who, although

born and buried in England, founded Pennsylvania and devoted his life to America, lies in the Quakers' burial ground at Jordans, in Buckinghamshire. In 1589 at Austerfield was born Governor William Bradford, "the first American citizen of the English race who bore rule by the free choice of his brethren."

Scrooby, in Nottinghamshire, was the birthplace of William Brewster, Elder of the Pilgrim Church, and really the birthplace of the religious revolt which led to the sailing of the *Mayflower* for America. From Plymouth in Devon to Plymouth in America the tiny ship sailed in 1620 with 102 emigrants seeking freedom in the New World. On English Plymouth's Barbican, the old quay from which the crowded vessel cast off, a new memorial commemorates the fateful departure.

At Boston, in Lincolnshire, the mother town of the greater Massachusetts city, John Cotton, the "Patriarch of New England," was vicar before he emigrated to America in 1633. Also at Boston is the gloomy prison where many of the Pilgrim Fathers were confined in 1607.

Harvard House, an old half-timbered building on High Street, in Stratford-on-Avon, was the birthplace of the mother of



Photograph from Philip D. Godreau
FOR "THE SETTING OF THE WATCH" THE RIPON HORNBLOWER
"PRODUCES A WILD MOOD OF DEEP AND DISMAL MELANCHOLY"

Modern listeners in this Yorkshire market town may set their pocket watches by the sad notes, but the ceremony derives its name from the placing of a guard over the town. In lawn coat and three-cornered Dick Turpin hat, the hornblower sounds four blasts here in the market square and three before the mayor's house every night at nine. The custom is supposed to date from the days of Alfred the Great.

John Harvard, for whom Harvard University was named,

Elihu Yale, patron of Yale University, lies buried in the churchyard of Wrexham, in Wales.

BRITAIN AT WORK

London is the brain, the Midlands the heart, wires the nerves, and railways the veins of industrial, commercial, modern Britain—the Britain of smelters and sea-ports, mines, mills, and markets. Inspiring

is its efficiency; amazing are the contrasts with the old Britain which it draws.

The railroads of England, Wales, and Scotland alone would encircle the earth in the latitude of Cádiz, while their highways (in 1935) would make almost nine world-girdling loops along the same parallel.

British ports handle the world's greatest trade. British and foreign vessels bring from harbors of other countries about four-fifths of the fruits and breadstuffs consumed in Great Britain, one-half the meat, eggs, and dairy products, and one-third of the fish and vegetables. In 1935, ships carried away from Britain's shores cotton textiles, woollens, pottery and glassware, machinery, locomotives, and innumerable other iron and steel manufactures to a total value of 328,937,000 pounds sterling—more than one and a half billion dollars!

Prodigious quantities of rubber from Malaya, wheat from Canada and Australia, timber from New Zealand, gold from Africa, and cotton from India pass through British ports en route to markets of the world, making Great Britain a vast clearing house for interchange of the products of her dominions and colonies.*

More than a third of all this traffic is shipped up and down the Thames, to and from the Port of London. Through Liverpool's seven miles of docks passes about a fifth of the trade. These two ports, together with Southampton, Hull, Manchester, and Glasgow, handle more than three-fourths of Great Britain's total ocean-borne commerce.

"SHOES AND SHIPS AND SEALING WAX"

The diversity of manufactures is entertaining: King's Lynn, near The Wash, makes merry-go-rounds; lavender-water

* See "As London Tolls and Spins," by Frederick Simpich, in *THE NATIONAL GEOGRAPHIC MAGAZINE* for January, 1937.

factories bring fame to Hitchin; Worcester shops turn out gloves, porcelain, shoes; Gloucester makes wagons, matches, and toys; cakes and ale from Shrewsbury and Banbury tickle the world's palates; Coventry makes bicycles, automobiles, airplanes, sewing machines, and artificial silk by the carload.

Burton-on-Trent produces about 3,000,000 barrels of beer annually; the unsightly district called The Potteries turns out pottery and porcelain wares of all kinds, including Wedgwood, Spode, and Minton; boot-making Stafford was once toasted by one of its representatives in Parliament—"May the trade of Stafford be trod under foot by all the world!"

Slag and cinder heaps have largely replaced vegetation in the industrial Midlands and north, where clay, coal, and iron have brought wealth and smoke to Birmingham, Nottingham, Sheffield, Leeds, Bradford, and Manchester. Outside of England, the prosperity of thousands of workers and owners depends entirely on production in the mills of Glasgow in Scotland, Cardiff and Swansea in Wales, Belfast and Dublin in Ireland. "Two out of every three British steamers are either built on the Clyde or are there supplied with engines." Belfast yards launch much of the remaining tonnage.

At night, flames and sparks shooting upward from thousands of Black Country chimneys and blast furnaces create a spectacular modern Inferno. In Ripon, little more than a hundred miles away, a horn-blower observes the 1,000-year-old custom of "the setting of the watch" with four blasts sounded in the market square and three before the mayor's house (page 801).

So Britain, beloved by millions throughout the world, cherishes and preserves the old while still moving in the van of progress.

Because some members have expressed a wish to have for reference the technical findings of the National Geographic Society-U. S. Army Air Corps Stratosphere Flight of Explorer II in 1935, The Society has published these reports in a monograph. The monograph, Stratosphere Series No. 2, contains 211 photographs and diagrams and in addition a supplement, 17 by 24 inches, showing the lateral curvature of the earth. Copies may be obtained by addressing the Secretary, National Geographic Society, Washington, D. C., for \$1.50 each, postpaid in the United States and its possessions; elsewhere, 25 cents additional.

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To carry out the purposes for which it was founded forty-nine 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 smoking, 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.

The Society cooperated with Dr. William Beebe in a deep-sea exploration of undersea life off Bermuda, during which a world record depth of 1,028 feet was attained August 13, 1934, enabling observations of hitherto unknown submarine creatures.

The Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole, and contributed \$100,000 to Admiral Byrd's Antarctic Expedition.

The Society granted \$25,000, and in addition \$15,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

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.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to an officially recognized altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

TIME: *The Present*

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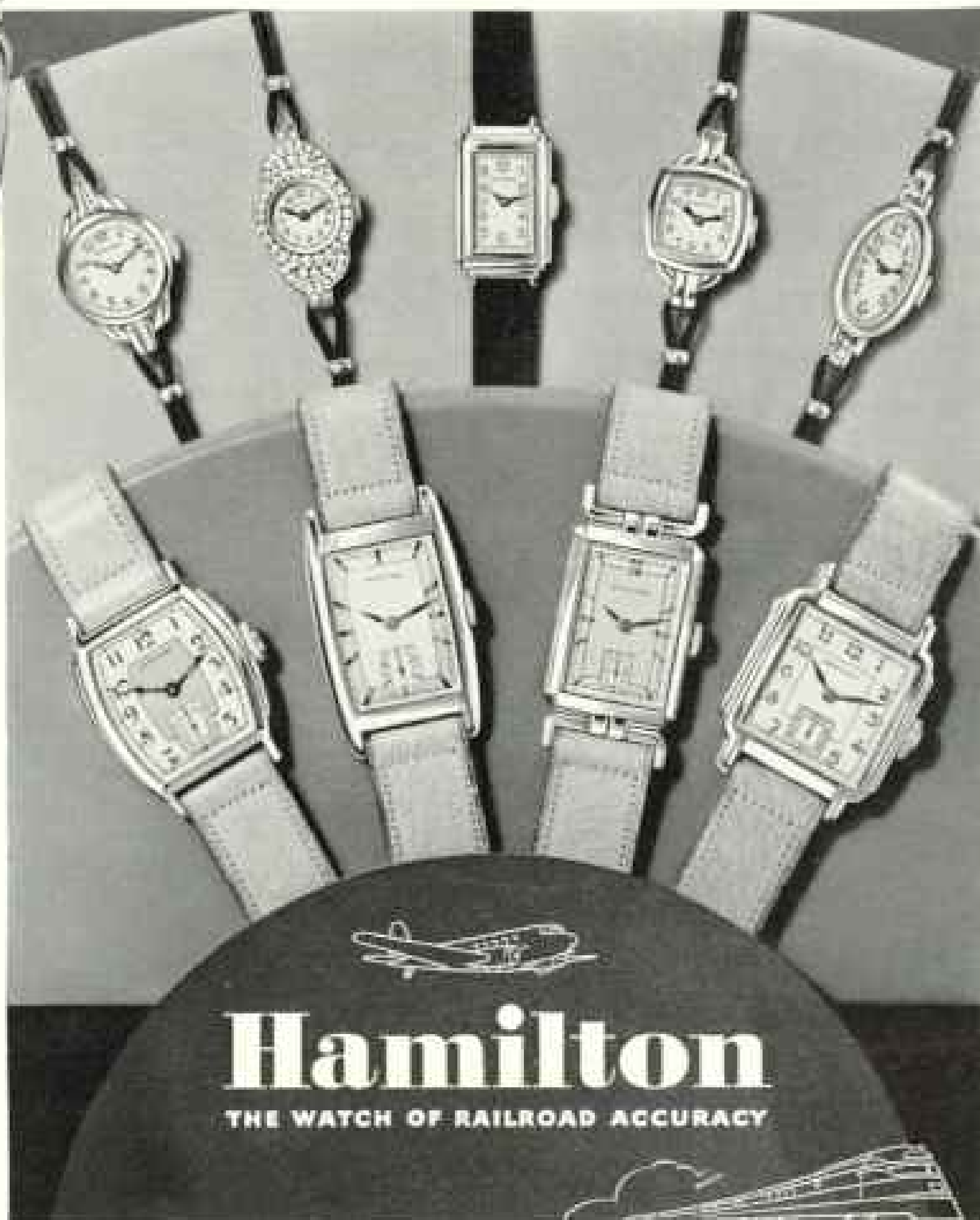
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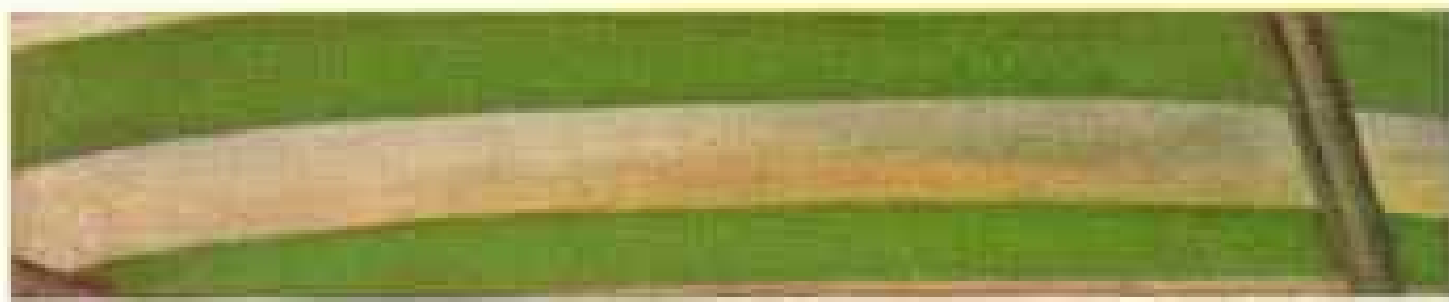
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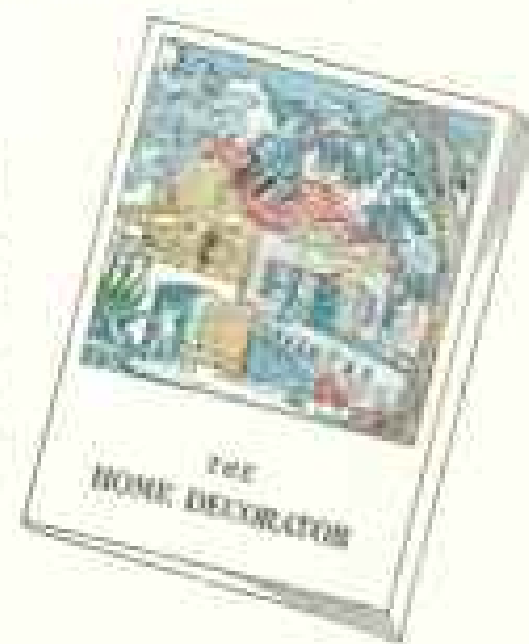
You may rest assured no one was prouder than the man who painted it! Thanks to *SWP*, he has endowed another lovely home with all its deserved beauty and charm. Once again he has made a delighted customer-friend . . . a friend he'll keep all the long extra years he knows *SWP* will last. Small wonder he acclaims this finest of exterior paints!

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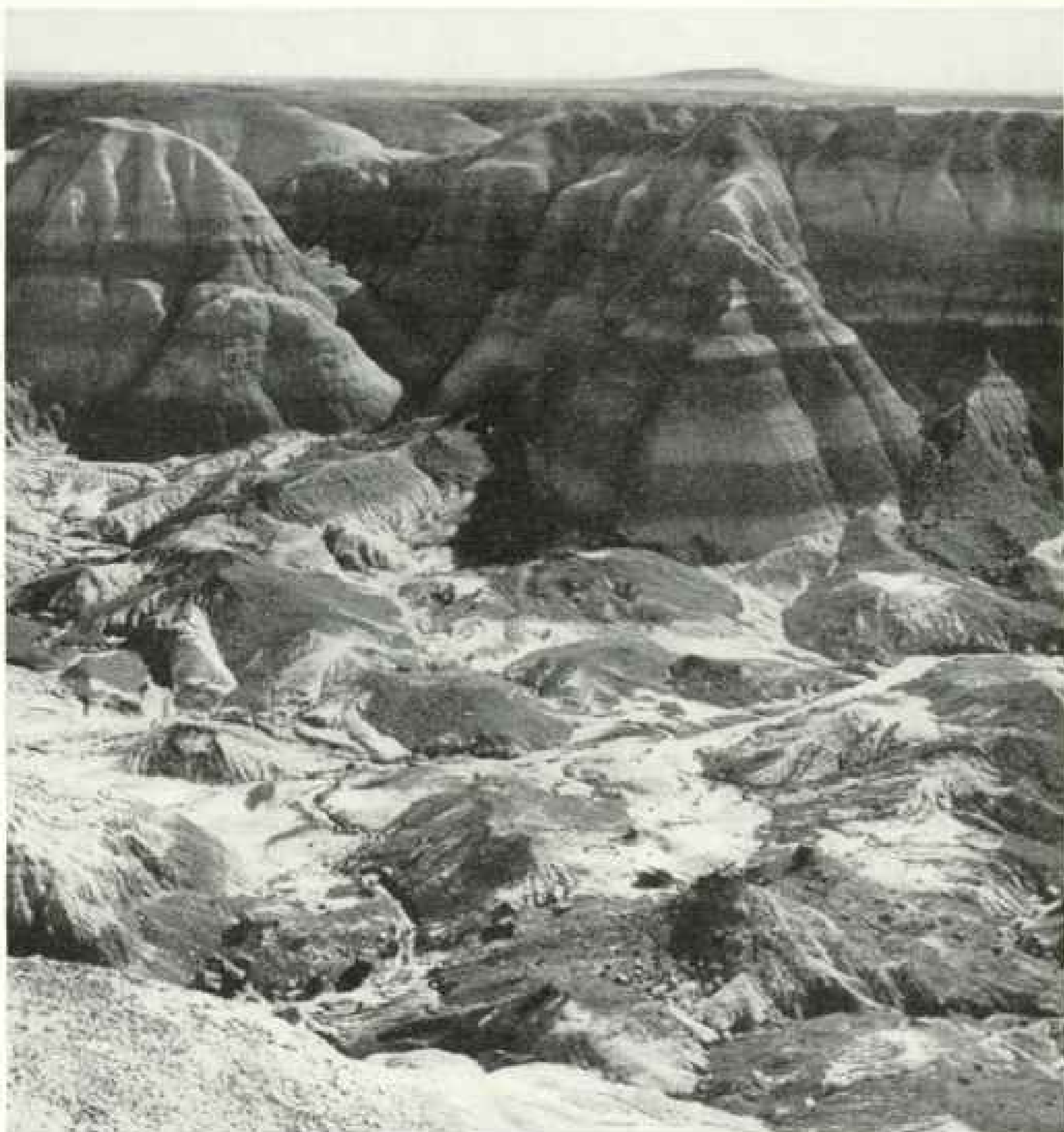


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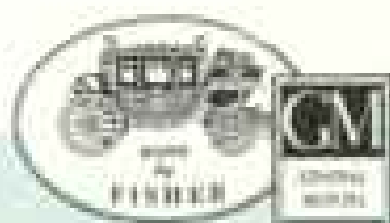
A Beauty in armor!

Despite the difference in generations, the lady in armor and this modern miss have much in common • And you can see the reason for that in the car that stands in the foreground — a new General Motors car with a new Unisteel Turret Top Body by Fisher • In this glorified steel body, the modern lady rides even more proudly secure • Overhead, there is the seamless steel Turret Top, underfoot, a solid steel floor—and on every side, steel panels, steel pillars, steel reinforcements—all fused into one luxuriously substantial solid steel unit • See it, and you'll say the new Unisteel Turret Top Body by Fisher is the automotive star of 1937. *Only* General Motors cars have it.



The inside story of Unisteel construction

*Pictured above: "Bigger and finer and safer"—
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GREATER DEPEND-ABILITY

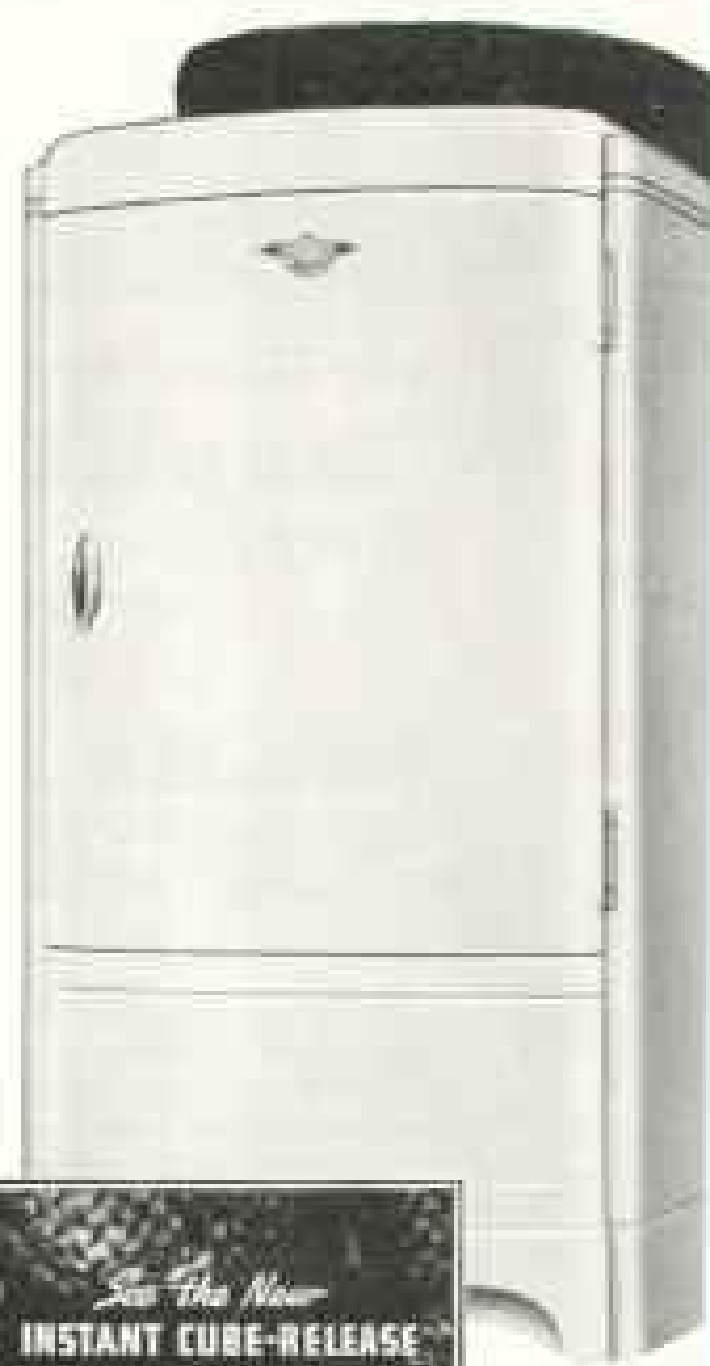
Five-Year Protection Plan, backed by General Motors, on Frigidaire's sealed-in mechanical unit. This, together with Frigidaire's Sealed Steel Cabinet, Special Sealed Insulation and Lifetime Porcelain or Durable Dulux-enxerine, all adds up to the most complete DEPEND-ABILITY ever known.

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FRIGIDAIRE DIVISION
General Motors Sales Corporation · Dayton, Ohio



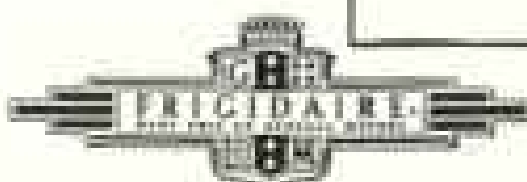
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Meter-Miser
CUTS CURRENT COST TO THE BONE

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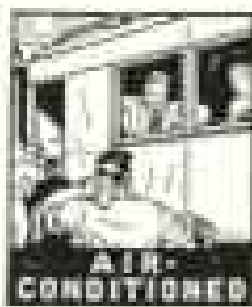
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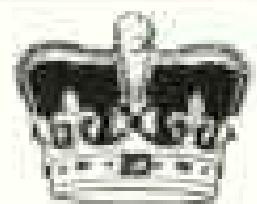
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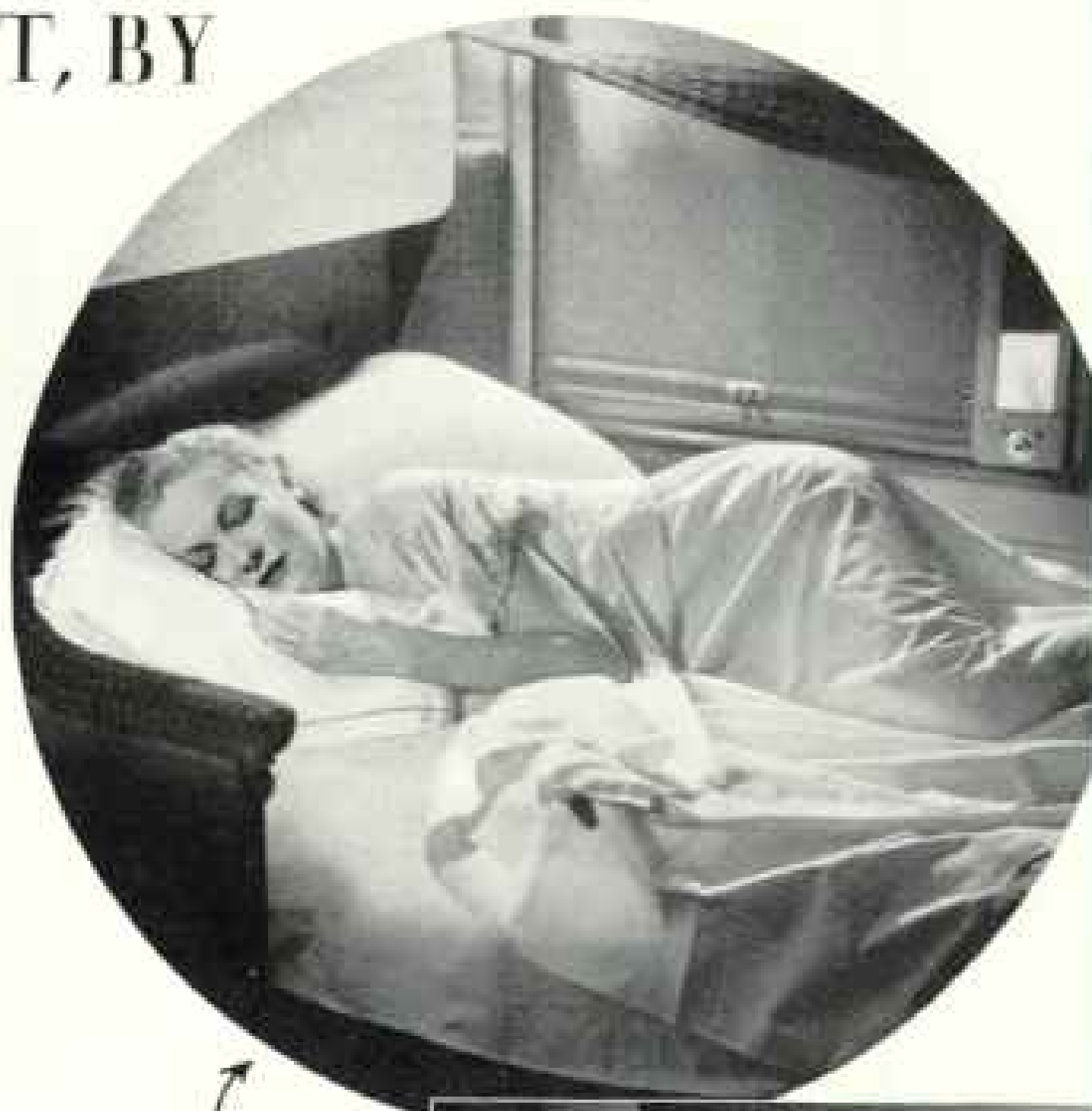
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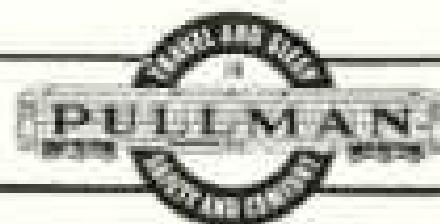


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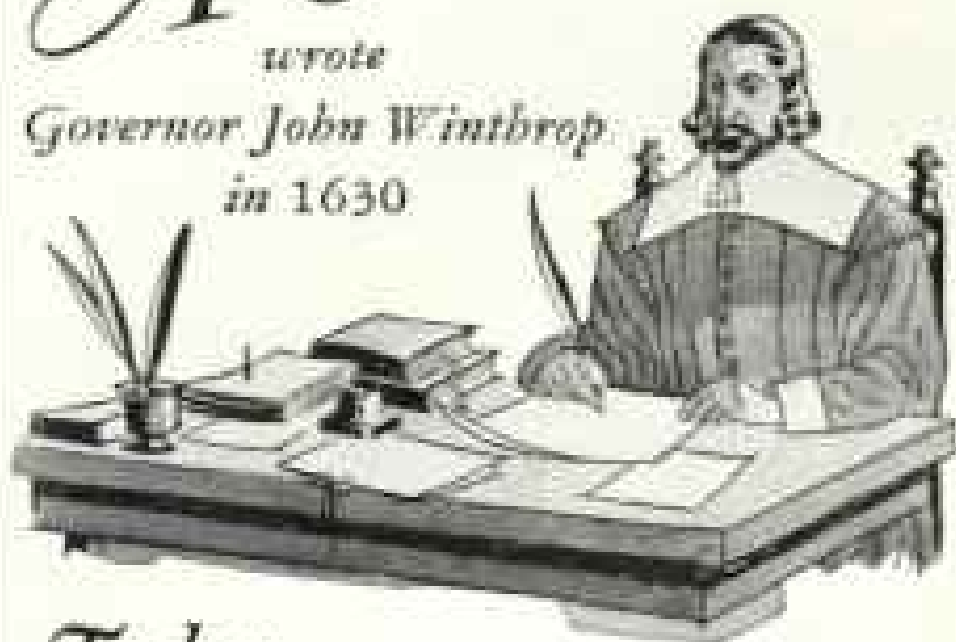
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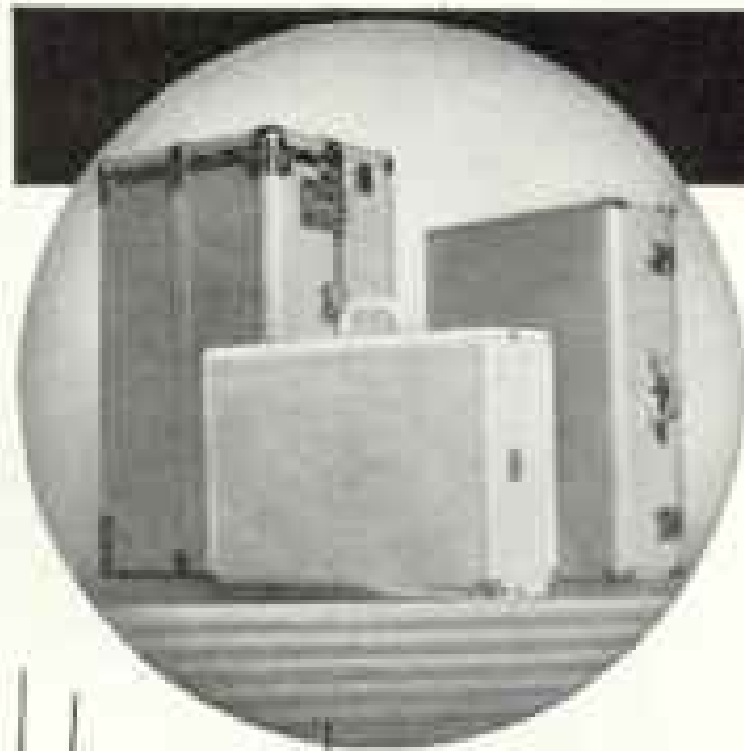
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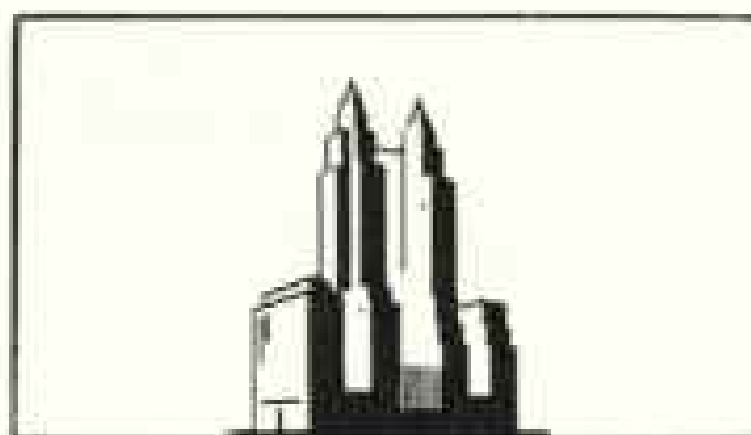
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MASSACHUSETTS

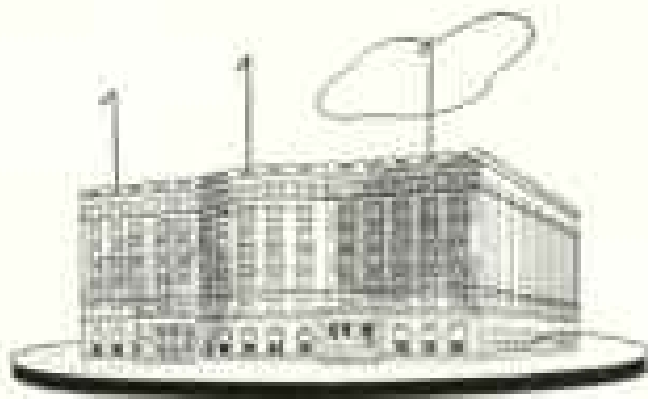
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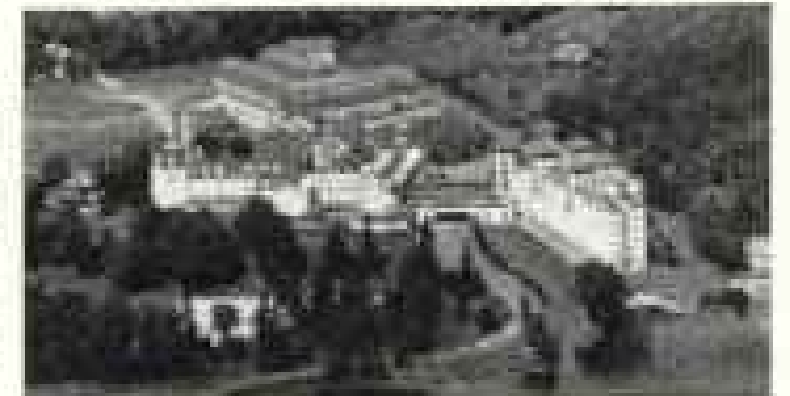
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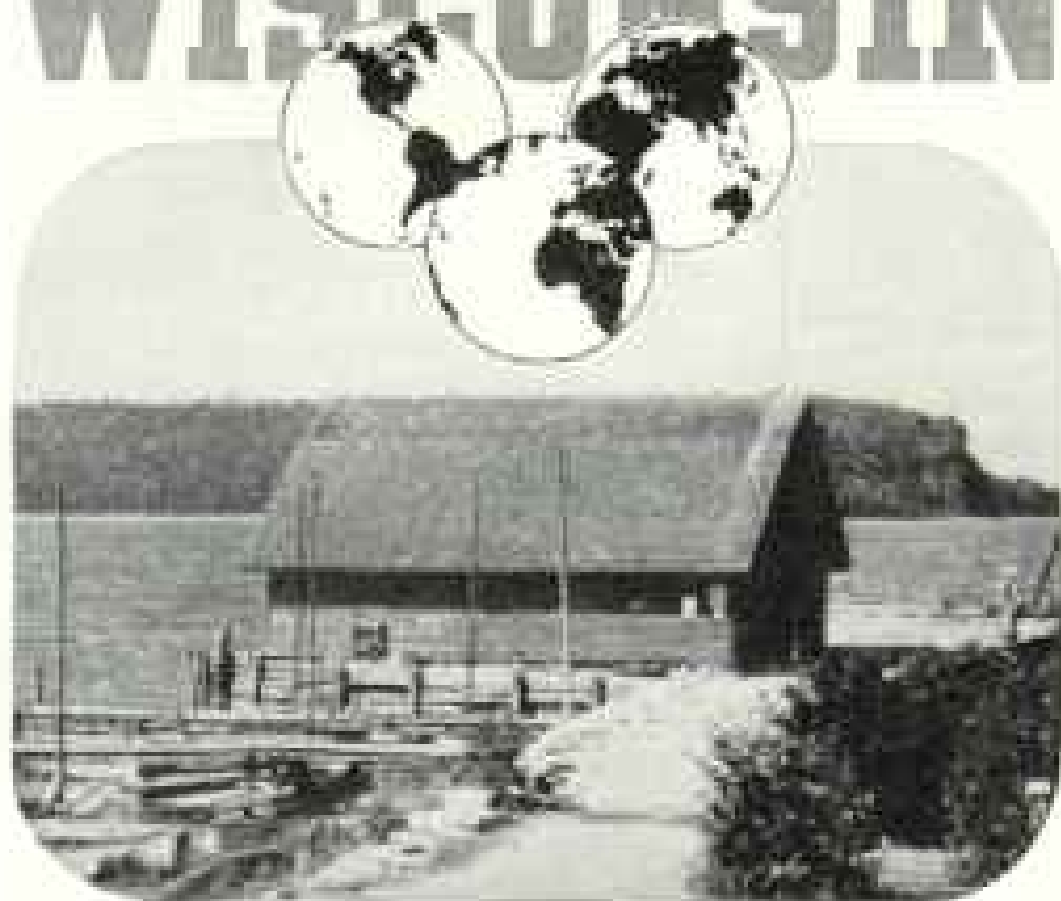
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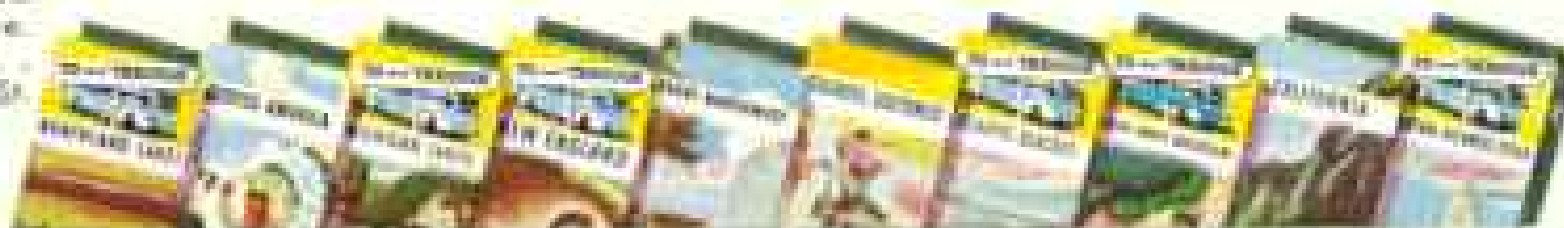
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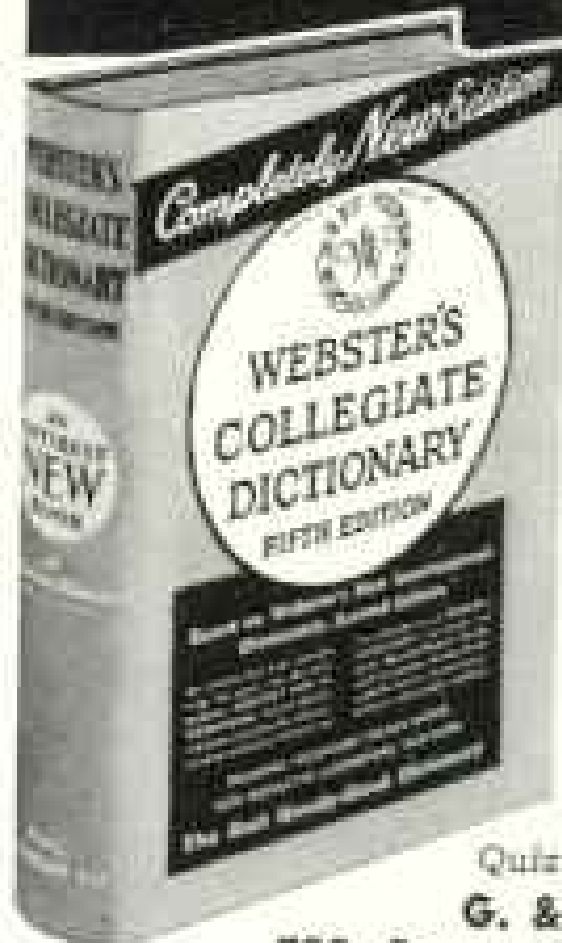
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Diabetes begins when the body can no longer produce enough insulin to make use of the sugar and starch in a normal diet. In many mild cases of the disease the doctor may prescribe a special diet only. In serious cases, the person who cannot make a sufficient supply of insulin in his own body must supplement it with other insulin.

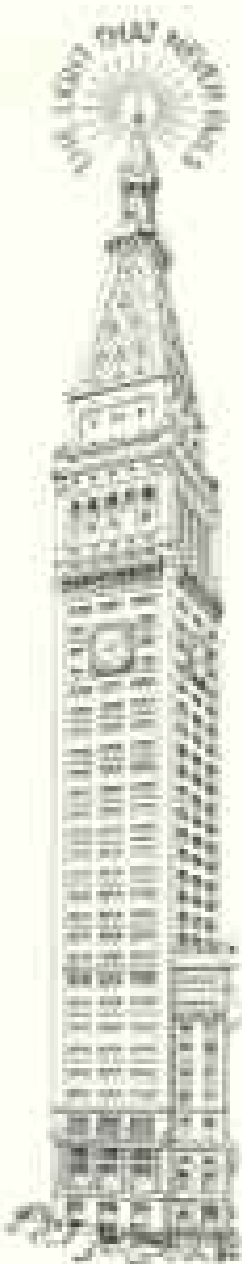
Until the great discovery of a substitute for human insulin, diabetic patients, except those with the disease in mild form, were in desperate straits. Before that, by living on a severely restricted diet, with nearly all sugar and starch removed, the end could

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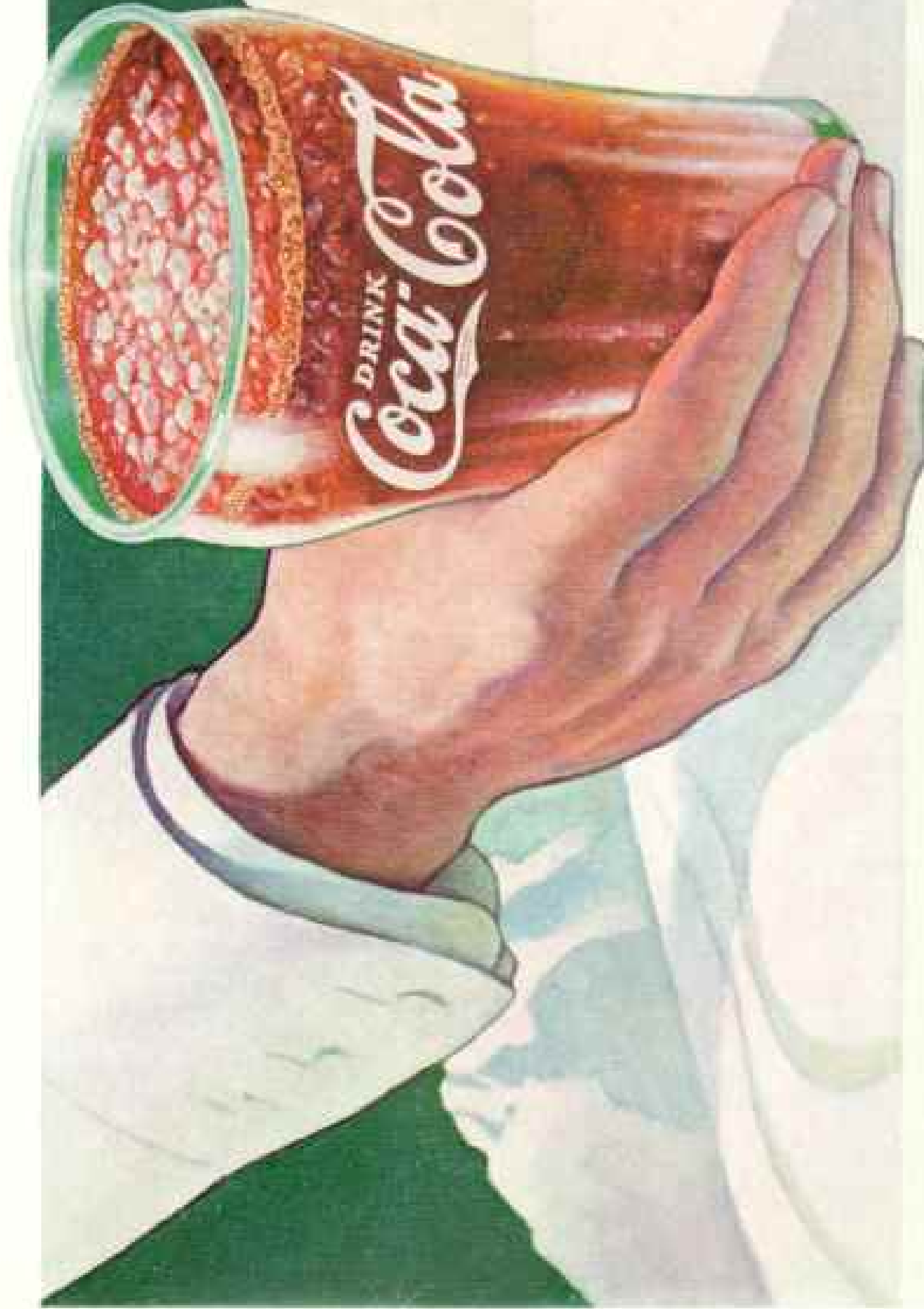
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A Close Shave

Bang! Like a thunderbolt the staccato crack of a blow-out rose above the roar of the motor. In desperation he gave the steering wheel one final, frenzied tug. The car bolted—lurched to the right—and came to a stop at the brink of a deep ditch. They were safe—yes. But after that close call no wonder Mr. E. P. Keenan will tell you that he now "believes in miracles."

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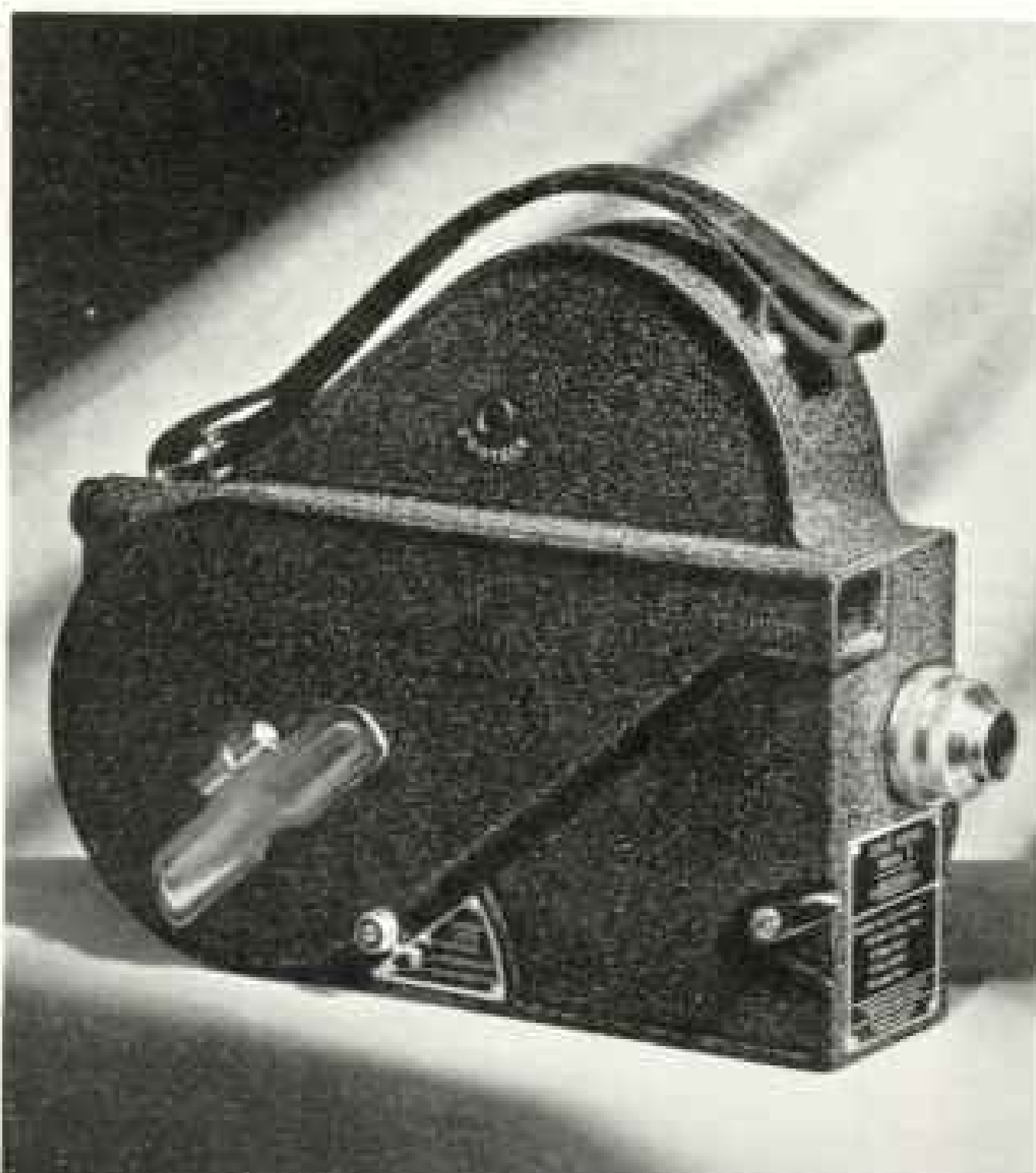
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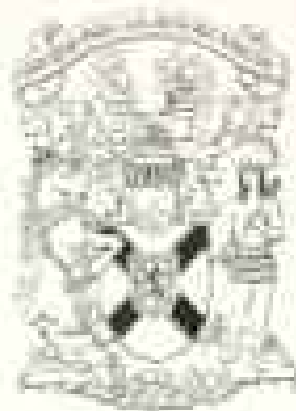
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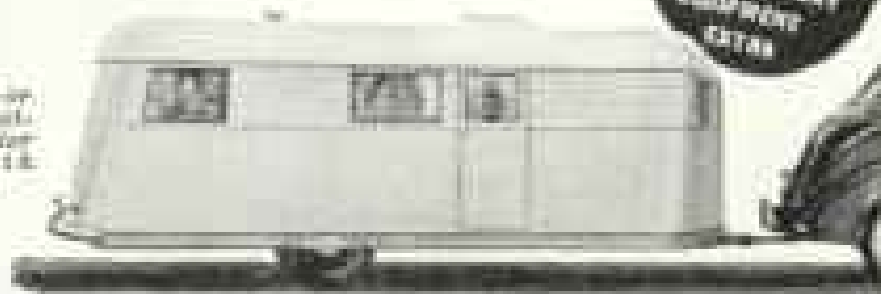
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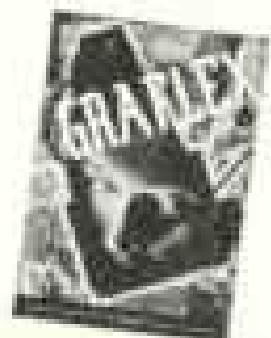
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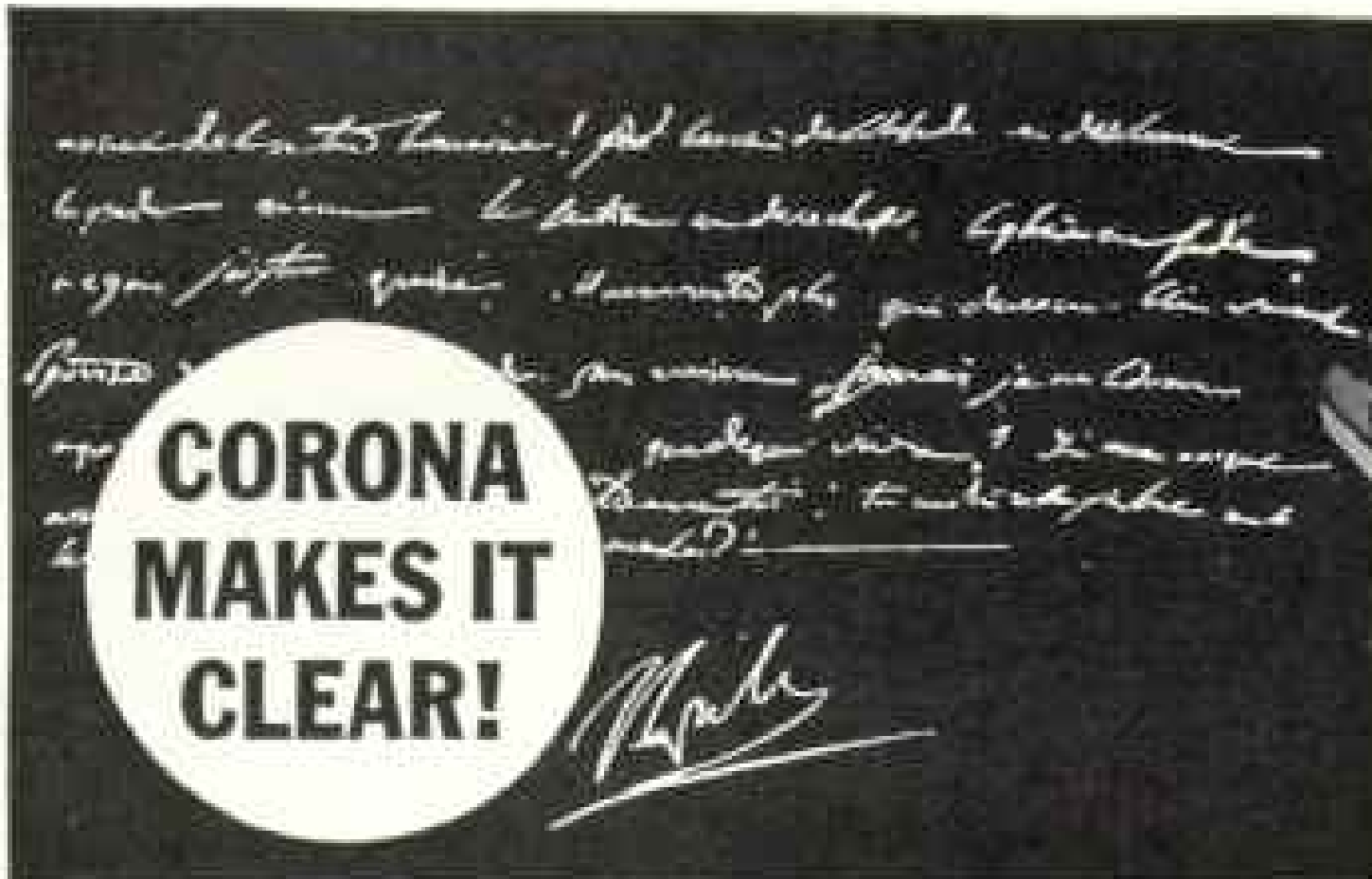
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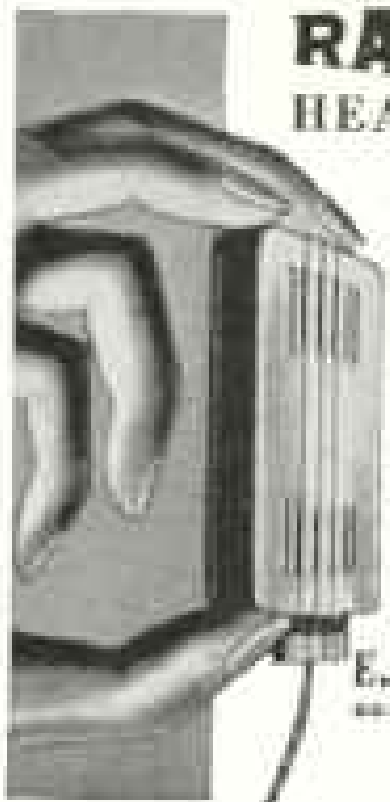
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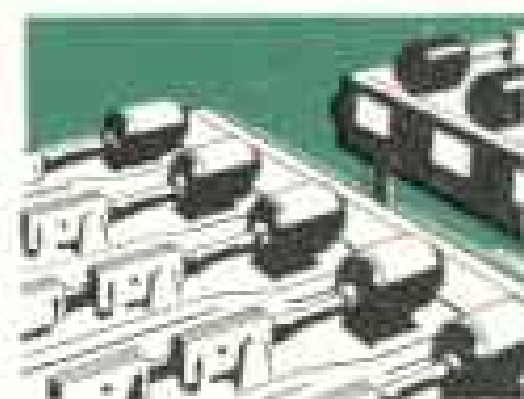
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