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# THE NATIONAL GEOGRAPHIC MAGAZINE

SEPTEMBER, 1938

Connecticut, Prodigy of Ingenuity

With 25 Illustrations and Map

LEO A. BORAH

Old and New Blend in Yankeeland

25 Natural Color Photographs

Trans-Africa Safari

With 30 Illustrations

LAWRENCE AND MARGARET THAW

Africa on Parade

14 Natural Color Photographs

LAWRENCE THAW

On the Bottom of a Pearl Lagoon

With 17 Illustrations

ROY WALDO MINER

Sea Floor Aquarelles from Tongareva

8 Paintings

ELSE BOSTELMANN

Among the Big Knot Loos of Hainan

With 29 Illustrations

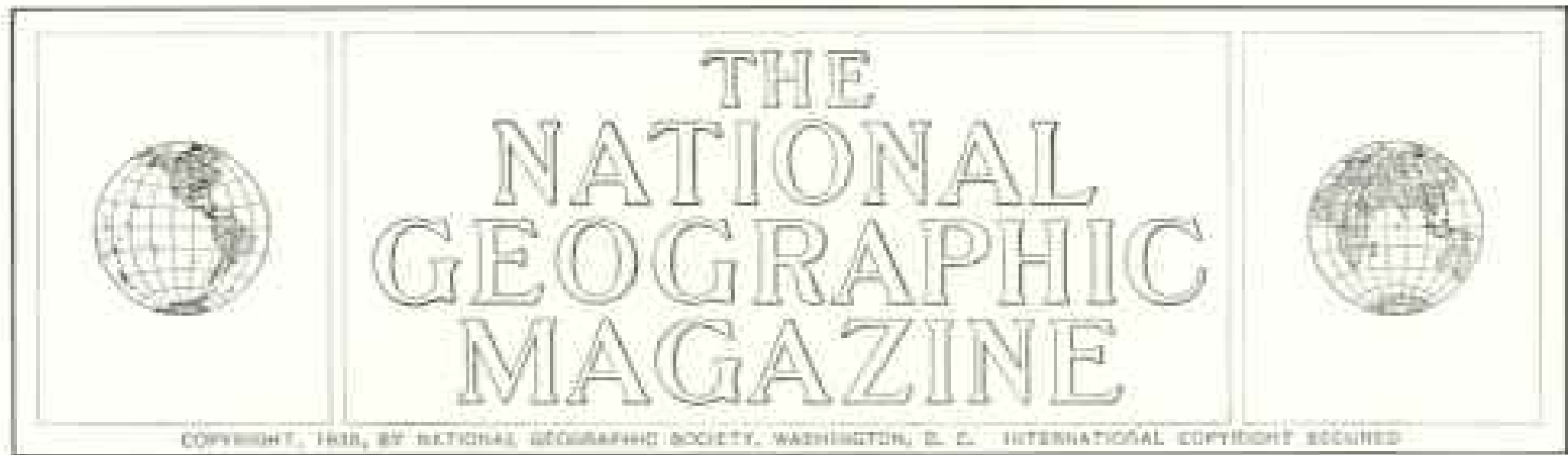
LEONARD CLARK

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## CONNECTICUT, PRODIGY OF INGENUITY

### Factories Play a Symphony of Industry Amid Colonial Scenes in the State of Steady Habits

BY LEO A. BORAH

**I**N FRONT of the State Trade School on Washington Street, Hartford, is Evelyn Beatrice Longman's statue of the Workman Inventor.

It is not a large monument, but one of remarkable significance.

Sleeves rolled up, hammer at side, fine head bowed over plans spread out on the knees, that bronze figure symbolizes enterprise, resourcefulness, and ingenuity—strikes the keynote of the industrial symphony that is Connecticut (map, pages 282-3).

#### A LAND OF MECHANICAL MARVELS

When I first saw the statue, I did not appreciate its true meaning. After going about the State for a few days and seeing some of the marvels of machine production, I began to understand the importance to the Commonwealth of the workman inventor who made these things possible.

Connecticut is amazing. To the newcomer not well trained in mechanics it is a land of sheer magic. Mark Twain's Connecticut Yankee could not have bewildered the citizens of King Arthur's Court more utterly than modern Connecticut manufacturers bewildered me.

From a Hartford plant making watch screws of the size of a dust speck hardly visible to the naked eye to an Ansonia factory that fashioned a rubber belt press weighing a half million pounds, I went in open-mouthed wonder at the miracles wrought by Yankee ingenuity.

I saw unattended machines turning out in rapidly moving, constant streams pieces of work each of which, if made by hand, would occupy a skilled craftsman for hours. Long strips of brass fed into one device came out a moment later metamorphosed into finished switches of incredible intricacy. The operators merely supplied the metal and kept the mechanism in order.

In a Hartford plant machines were carving airplane propellers out of roughly shaped slabs of an alloy metal. I walked for perhaps a hundred yards alongside the cutters, shapers, and polishers, observing the processes in two parallel rows. At the end of the line propellers from the two separate sets of machines were laid on the pans of a fine balance scale. The indicator stood at exact center! If a cigarette paper was laid on one of the propellers, the balance was destroyed.

A machine in a Waterbury plant was shearing even strips off a sheet of metal as one would trim a page of paper along a straightedge with a pair of scissors.

"Stick your finger in the notch," said the man who was showing me around the plant.

I put my hand behind me. With a laugh he thrust his own finger between the rapidly moving cutters—rubbed it back and forth. Nothing happened! The knives were set to cut eighth-inch metal; they could not touch an object as thick as a person's finger!

Spellbound, I watched Jacquard looms in Manchester weave into satin cloth lovely



Photograph by H. Anthony Stewart.

IN THE SHADOW OF THE TRAVELERS INSURANCE COMPANY OFFICE AND TOWER  
DREAMS THE OLD STATE HOUSE.

Designed in 1796 by Charles Bulfinch, and one of the finest examples of the architecture of the early Federal Period, it stands out in sharp contrast among the skyscrapers that make Hartford the insurance capital of the United States. In it met the momentous Convention of 1814 (page 284). Removal of an old post office building has opened up the front and given it space befitting its dignity. It is now fully restored.

flower designs, the patterns controlled by hundreds of hole-punched paper cards. Other looms were making silk cloth of double thickness and splitting it into two sheets of velvet by means of flying knives that moved too fast for the eye to follow.

No wonder Mark Twain's Yankee outdid the magician Merlin at tricks!

IMMIGRANTS SOON BECOME YANKEES

Why ascribe all these wonders to "Yankee" ingenuity? The 1930 census reveals that of 1,606,903 people in the State, 383,871, or 23.8 per cent, were foreign born

and that 1,039,159, about 65 per cent, were either foreign born themselves or were children of parents born overseas. The figures indicate that scions of the old Connecticut stock are decidedly in the minority.

Astute, scholarly Governor Wilbur L. Cross, formerly dean of the Graduate School at Yale University, answered the question.

"I feel just as much at home," he said, "among our newcomers—Italians, Poles, Lithuanians, Magyars, Russians, and the rest—as among the old-timers. None of them are here more than a few months



Photograph from Harry Fifield

SIX PAIRS OF TWINS IN 13 YEARS—THE RECORD OF THE HARRY FIFIELDS OF EAST THOMPSON

They are parents of 15 children, 12 of whom are now living. Father and mother hold Franklin and Eleanor, age one month. Seated on the porch edge, left to right, are Harriet and Helen, 7; Claire and Della, 9; Harry and Elizabeth, 5; Charlotte, 6, twinless. Paul and David, 2, cling to the rail, and Marguerite, 11, whose twin brother died at birth, stands beside them. The maternal grandmother, Mrs. Hattie Benson, is at the left of the picture. All the youngsters are sturdy and healthy. Neither husband nor wife was a twin, and there were no twins in either family.

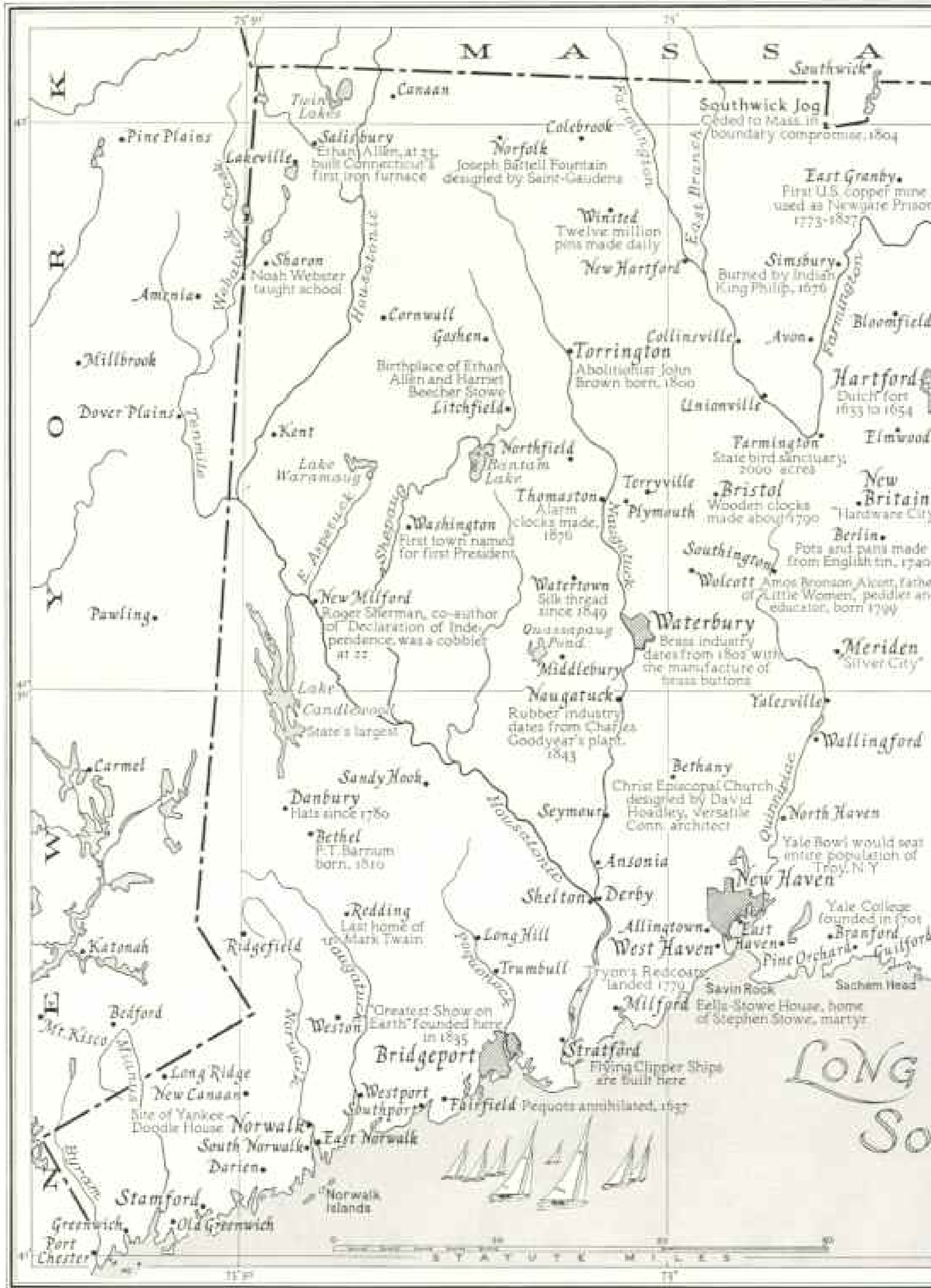
until they become real Connecticut folk.

"We don't attempt to force our ways upon them; they adapt our customs to their needs and in exchange give us some of their own. During our Tercentenary, in 1935, a group of Italians from New Britain won a parade prize with a float showing the landing of the Pilgrims!"

It must be remembered that the Reverend Thomas Hooker, leader of the earliest colonists, enunciated for the first time in America the doctrine of government only by consent of the governed. The principle

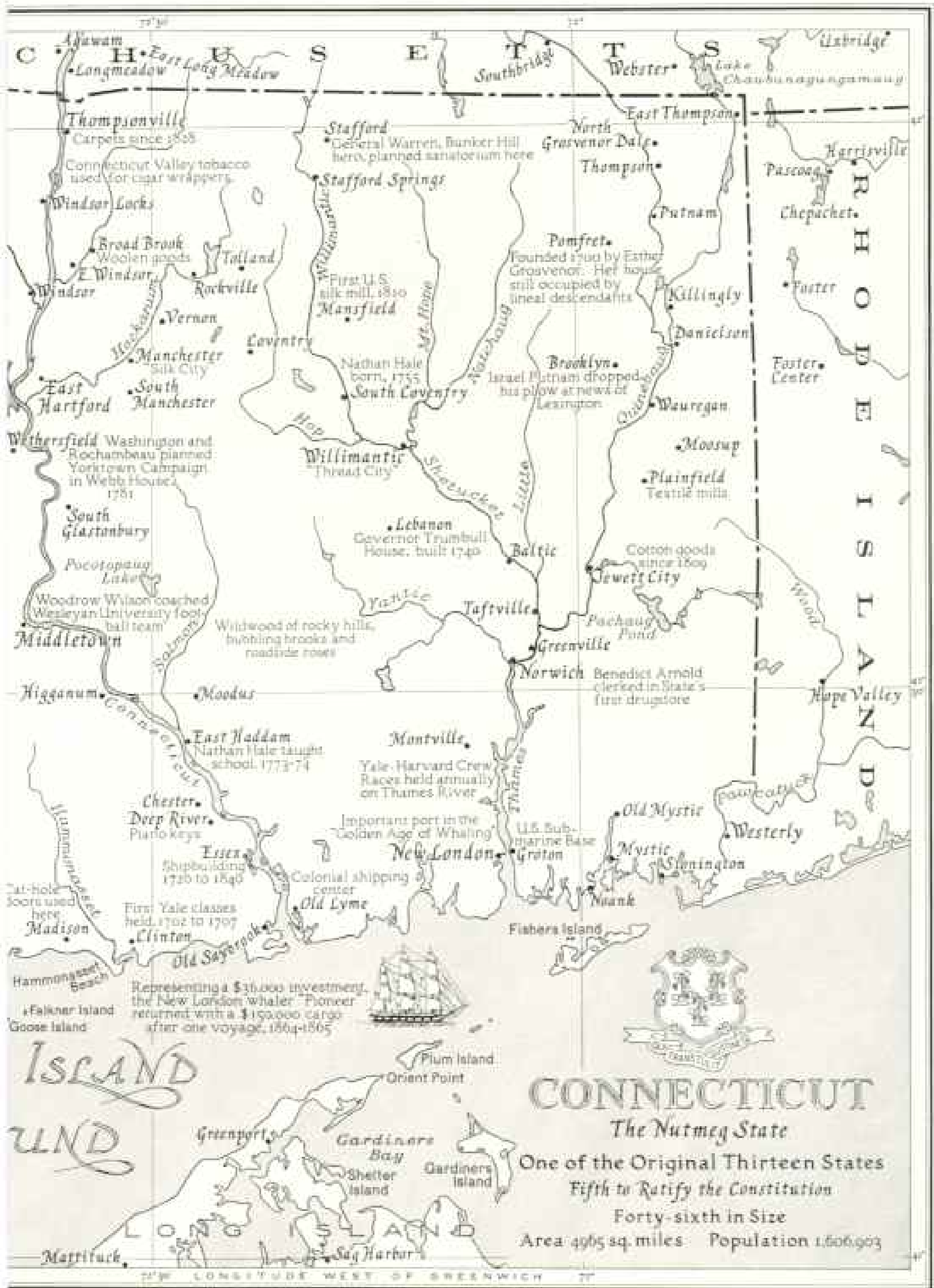
was embodied in the Fundamental Orders of 1639, thence taken into the State Constitution, "that all political power is inherent in the people, and all free governments are founded on their authority and instituted for their benefit; and that they have at all times an undeniable and indefeasible right to alter their form of government in such a manner as they may think expedient."

I rode over to Hartford from Boston one afternoon a few days before Christmas. There was a little snow on the hills, and



CONNECTICUT, THE "NUTMEG" STATE, IS STILL THE LAIR OF THE YANKEE PEDDLER

In early times the traveling merchant-manufacturer loaded his pack on his back, in saddle bags, or on a cart and carried it to his customers. Today he sends his wares to markets throughout the world.



Drawn by Newman Bunstead and Ralph E. McAtee

BOSTON POST ROAD, SKIRTING ITS SHORE, HAS BEEN A MAIN HIGHWAY FOR 300 YEARS  
 New Haven settlers blazed the trail in 1638. Ever since that time it has been a thoroughfare of empire and it is still one of the busiest commercial arteries in the United States.



Photograph by Luis Mardón

**A SEWING MACHINE OF 1850 STILL WORKS**

In the Farmington Museum is on display this A. B. Wilson-model made in Watertown and patented five years later than the original invented by Elias Howe at New Hartford. It has some features not found in the older device. Isaac Singer was another Connecticut Yankee of importance in the early development of sewing machines.

young people were skating on ponds and rivers. Looking out the car window, I saw snug farms, fine old trees, and pretty villages with pre-Revolutionary "salt-box" houses set primly around elm-bordered commons (Color Plate VII).

Though there are big silk mills in Putnam and textile factories in many of the other towns in northeastern Connecticut, they do not spoil the colonial charm that has only been deepened through three centuries. Across this pleasant land of rolling hills and swift streams, groups of

Massachusetts people tramped between 1633 and 1636 to found Hartford, Windsor, and Wethersfield. Those early settlers put upon the country a stamp of sedate tidiness that is still apparent.

I soon revised a preconceived idea of Connecticut as a humming beehive of industry with no open spaces. Though the State is smaller than all save two others in the Union, it still has wilderness areas where white-tailed deer roam and where the tender-foot can be lost as completely as in a western frontier forest.

**45 INSURANCE FIRMS  
MAKE THEIR HOMES  
IN HARTFORD**

Hartford has 70 factories employing a fifth of its 164,000 people, and making 155 different products ranging from horse-shoe nails to aircraft. With 45 life, fire, and accident companies, it is the insurance capital of America. Yet primarily it is a delightful New England home city, mindful of its heritage as the

first town and capital of one of the original thirteen colonies. A June visitor contemplating the rose gardens in Elizabeth Park or wandering about the 26 other parks and public squares forgets the tremendous manufacturing and business activity.

To visit all the historic spots in Hartford would require days. Even the most hurried visitor, however, should take time to see the exquisite old brownstone-and-brick State House designed by Charles Bulfinch in 1796 and recently restored (page 280). Behind its closed doors met the rebel-

lions Hartford Convention of 1814, seeking a curb on the powers of the Federal Government, while around the building marched a squad of soldiers firing the "Rogues March."

A tablet on the wall of the Travelers Insurance Company building, a block to the south, marks the site of the Zachary Sanford Tavern where, according to legend, on Halloween, 1687, the original Connecticut Charter was spirited away from before its would-be confiscator, the British Governor Andros, as one of the Hartford councilors fell in a "swoon" across the conference table and extinguished all the candles.

Tradition has it that the Charter was carried some distance away and hidden in a hollow in an oak tree in front of Samuel Wyllys' house. The Charter Oak stood until 1856 when it was blown down in a storm. Today visitors may read the story of the grand old tree on a granite monument erected where it stood. In the State Capitol, the Governor's chair is made of wood from the 33-foot trunk.

I paused to pay homage at the famous "Literary Lawn" where stand the homes of Samuel L. Clemens, Charles Dudley Warner, and Harriet Beecher Stowe. Purchased by the Friends of Hartford as a memorial, the Mark Twain house is now a branch of the public library. It was here that the humorist wrote several of his books, among them the inimitable *A Connecticut Yankee in King Arthur's Court*.

It was a revelation to go through one of



Photograph by Lucie Marden.

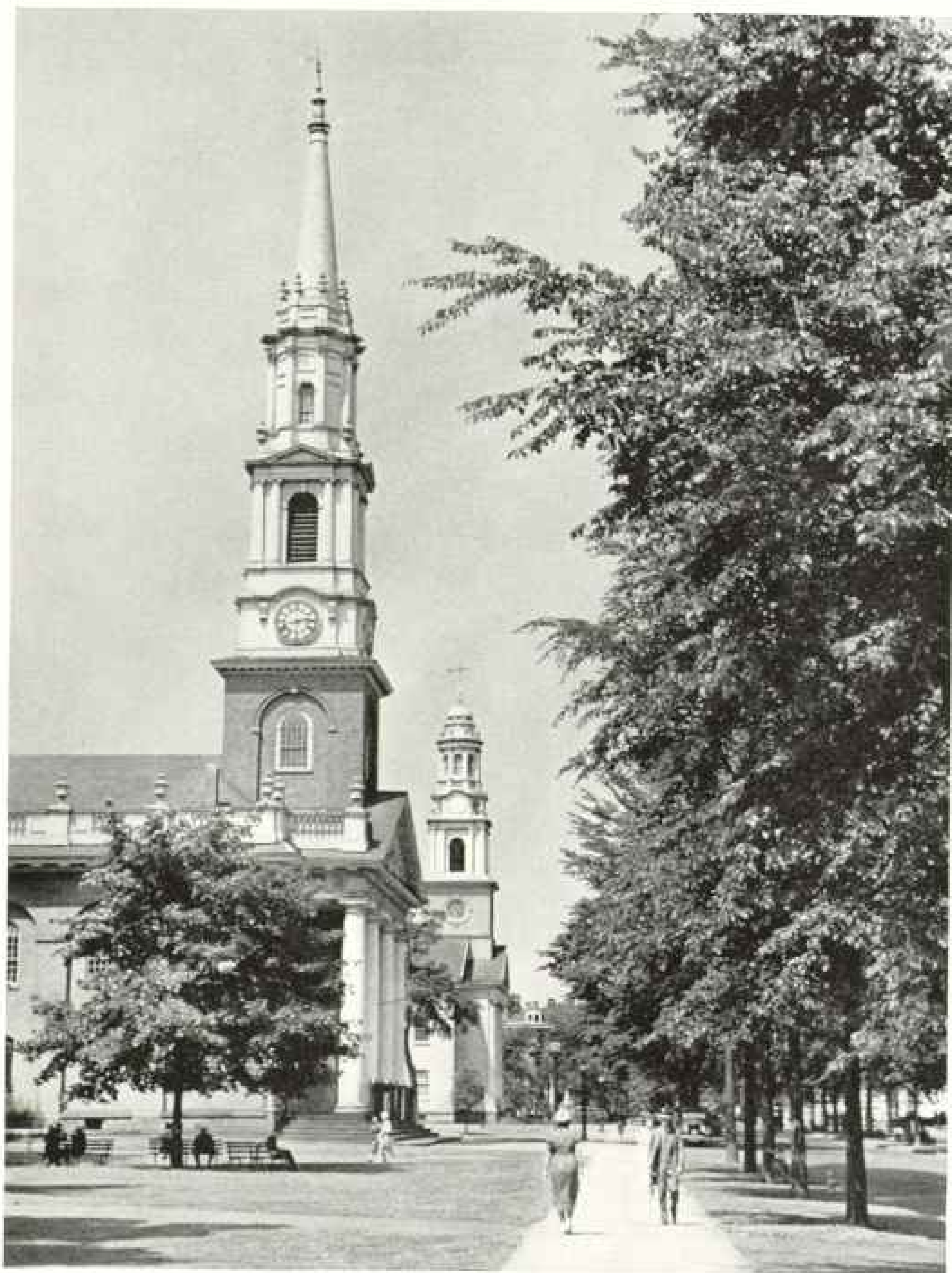
FROM WOOD OF THE CHARTER OAK THE GOVERNOR'S CHAIR WAS FASHIONED

The old tree, blown down in 1856, shielded the first document of Connecticut liberty. Today its timber supports on State occasions the executive sworn to defend that precious heritage.

the enormous insurance company buildings that dominate much of the Hartford skyline. Set in a spacious recreation park, the huge edifice of colonial design looks more like some palatial library than a place of business. The grounds provide, for employees in summer leisure hours, rustic lawn seats, shaded walks, and tennis courts. Inside the building hundreds of clerical workers go about their tasks in pleasant offices.

Experts in perfectly appointed laboratories constantly conduct experiments to devise means of protecting public health and preventing fire and accidents (Color





Photograph by Willard K. Culver.

OLD CENTER CHURCH ON NEW HAVEN GREEN STANDS OVER A BURVING GROUND

In a crypt beneath this First Church of Christ in New Haven age-defaced tombstones mark the graves of founders of the "Elm City" and its earliest (1639) Congregationalist Society. Designed by Ithiel Town, it was built in 1812-14. All Yale commencement exercises were conducted here until 1900. In memory of the custom the bell is still rung when degrees are given. United Congregational Church, beyond, was established by dissenters from the original organization. On its site stood, from 1662 to 1802, the Grammar School founded by the teacher of whom President James A. Garfield said "My definition of a university is Mark Hopkins at one end of a log and a student on the other." There is a third house of worship on the street (out of the picture, left foreground)—Trinity Episcopal, also planned by Town and erected in 1815.

Plate VIII). Such service has become an important part of the programs of many insurance companies in Hartford.

Besides restaurants there are game rooms, libraries, table tennis rooms, squash, handball, and basketball courts, a swimming pool, ballrooms, an auditorium where regular concerts are presented on a Hartford-built pipe organ.

Some idea of the extent of the insurance business in Hartford may be obtained by a glance at the figures. The 45 companies with home offices in the city have assets of two and three quarters billion dollars. They employ about 12,000 persons. Daily premiums received total nearly two millions.

From the fire-, accident-, and life-insurance center to an organization manufacturing lethal weapons is only a step in Hartford. The arms company founded by Samuel Colt, inventor of the automatic repeating revolver, is one of the largest industrial plants of the city.

It rather startled me to learn that the company now makes lipstick holders as well as firearms. Which of the two products is the more devastating?

Connecticut manufacturers refuse to be defeated by depression. When after the World War the arms company found that it had too much factory space for peacetime business, it looked about for new activities to utilize its facilities and keep its employees at work. Besides pistols and revolvers, it now produces dishwashers, safety switches, and plastic articles ranging from buttons to elaborate cases for cosmetics.

#### COLT'S REVOLVER WHITTLED FROM WOOD

Samuel Colt was a typical Connecticut workman inventor. Born in Hartford in 1814, he grew up among people who were handy with tools. At the age of twelve he began experimenting with four gun barrels tied together and revolved so that each in turn would be in position for firing. The contraption was a failure, for all four barrels fired at once.

He turned to experiments with a home-made galvanic battery, succeeded in exploding gunpowder by electricity, and frightened his playmates by attaching a waterproof cable to explosives on a log raft in Ware Pond and blowing the raft to pieces.

When he was 16, he shipped before the mast on a brig bound for India, got an idea from watching the movements of the

steering wheel, and forthwith whittled out of wood the first model of his revolver.

Upon Colt's return home, he took to the lecture platform to earn money for promotion of his invention. He toured the country as "Doctor Coult," giving amusing exhibitions with nitrous oxide—laughing gas.

#### "LAUGHING GAS" MORE THAN A JOKE

Dr. Horace Wells, a Hartford dentist, who attended one of these performances, discovered that a person to whom the gas had been administered became temporarily insensible to pain. He tried the effects of the gas on himself, having one of his own teeth pulled after inhaling the fumes. From his experiments and those of several others who were working on the same principle was born the anesthetic use of laughing gas which 15 years later soothed Civil War wounded under the surgeon's knife.

Colt kept on plodding and founded the arms company which in 1936 celebrated its hundredth anniversary. He sold revolvers to the Government for use in the War with Mexico, helped in the winning of the West by supplying frontiersmen with the "trusty six-shooter," built a tremendous business from a boy whittler's dream. Today his statue stands in Colt Park, a recreation area given to Hartford by his widow.

Going about Connecticut factories gives the newcomer a sense of unreality, a feeling that he himself is only a machine. He sees automatic devices, mechanical brains, performing functions beyond human powers. After watching an apparatus turning bars of brass inside out to make tubing, one youngster said to his guide, "Gee, have I got wheels in my head?"

A Hartford company's slide fasteners for use in surgery astonished me.

The doctor covers an incision with gauze held in place by a sheet of adhesive plaster equipped with a slide fastener. When he wishes to change the dressing, he merely zips open the plaster, attends the wound, and zips the outer covering together again. What a comfort to the patient not to have that whole sheet of adhesive pulled off every time his wound is given attention!

If shoes are fastened to a horse's hoofs with inferior nails, serious trouble may result. A bit of the metal may break loose and work up into the flesh. For this reason horseshoe nails are made of the most rigidly tested steel. The process of their manufacture is the nearest mechanical



Photograph by Fairchild Aerial Surveys, Inc.

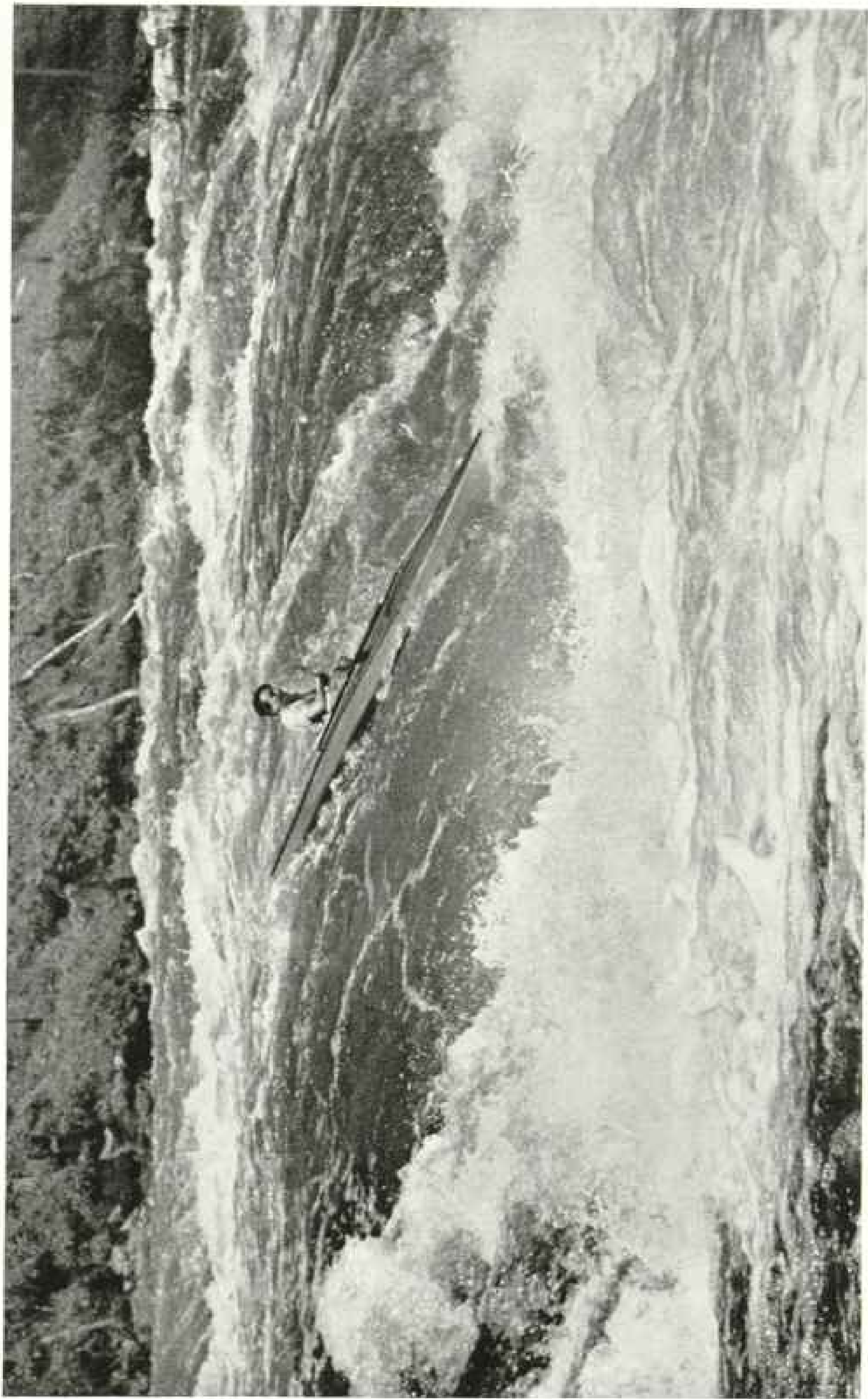
LIKE A COLONIAL PATCHWORK QUILT IS THE TOBACCO COUNTRY NEAR EAST HARTFORD

Canopies cover the fields for miles when the cigar-wrapper leaf is growing (Color Plates XI and XII). This aerial photograph, taken in midwinter when the "tents" were down, reveals the drying barns and fine groves which afford wind shelter. Connecticut established the earliest agricultural experiment station in the United States.



Photograph by Edwin L. Wislizenus

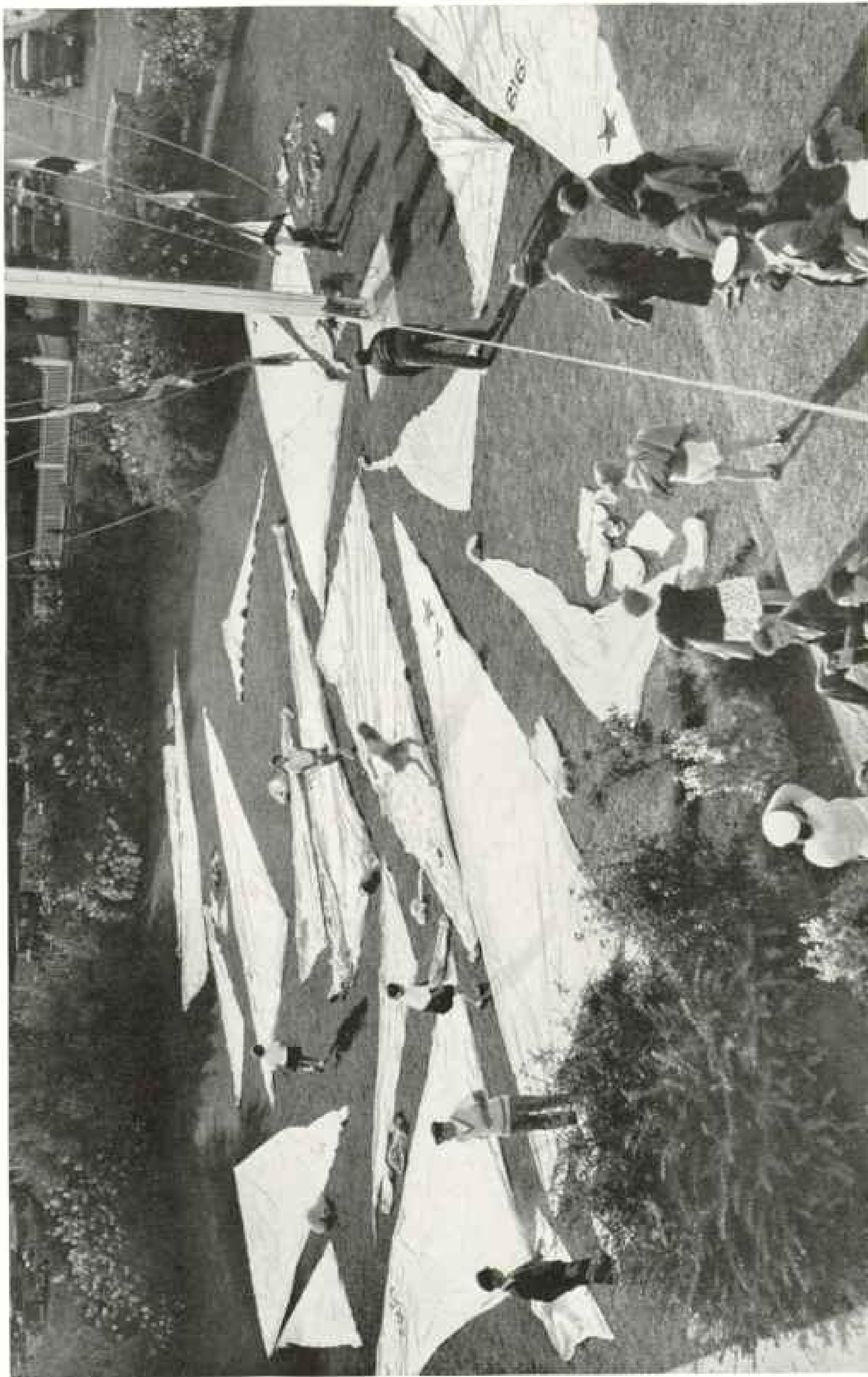
MANY OF THESE HOMES IN OLD LITCHFIELD HAVE STOOD ON THEIR FILM-SHADED LAWNS SINCE BEFORE THE AMERICAN REVOLUTION



Photograph from European Picture Service

**FOLD-BOAT ENTHUSIASTS ENJOY THRILLS ON THE ROARING UPPER HOUBATONIC**

Introduced from Europe, the sport has gained such favor that special trails bring its devotees to the rapids of this rollicking river. No one, however, dares the highest falls, 150 feet. Connecticut in summer is a joyous vacation land for yachtsmen, canoeists, cyclists (page 293), and lovers of all other outdoor sports.



Photograph by Moirin Mueseloh

GIRLS PLAYING TAG AMONG STARBOAT SAILS PROVE THEY ARE SAILORS BY NEVER STEPPING ON THE SNOWY CANVAS

During a recent World Championship Series of the International Star Class held at the Pequot Yacht Club, Southport, Connecticut, skippers spread their sails to dry on the lawn. This racing association is one of the oldest and largest such groups in the history of yachting. Its 111 fleets are distributed throughout every inhabited continent in the world from Manila, Philippine Islands, to Naples, Italy, and include a total of 1673 racing boats. All the sloops, 22.6 feet long, are exactly alike.



Photograph by Edwin L. Wishead

FIFTEEN MILLION SHOTS IN 40 YEARS FIRED BY THIS RIFLE TESTER

Gun targeting goes on constantly at the Winchester plant in New Haven. Sometimes the veteran employee has tried out 250 daily, shooting each weapon five times. With a veritable arsenal behind him and a loophole to aim through, the mild old gentleman would be a formidable antagonist to gangsters attempting to raid his stronghold.

approach to hand hammering. In a horseshoe nail factory I saw a single nail cold drawn to a length of five feet without breaking or showing a flaw.

HORSESHOE NAILS TO AIRPLANE ENGINES

Hartford has been transportation-conscious since the first steam wagon, invented there in 1797, was tried in its streets and abandoned as impractical. From the horseshoe nail factory I went to the enormous plant where are made 1,400-horsepower airplane motors (Color Plate XIV).

Efficiency in the establishment is remarkable. Into one end of a single room more than a quarter of a mile long come rough materials to pass from one machine to another until at the far end of the floor they are assembled in gleaming perfection. There is no litter, no confusion.

Fitted with propellers made in an adjoining factory, the engines are taken into a newly constructed testing building and

run at all speeds. The roar they make in action is deafening, but hardly a whisper of it is heard in the street 50 yards away.

If inclined to wonder at this, the visitor is reminded that Hiram Percy Maxim invented and manufactured his silencers in Hartford. At first he was content with making small models for firearms. Nowadays the company he founded builds noise-abatement devices for boiler rooms and all manner of factories.

Hartford shares with Bridgeport and Stamford world-wide fame for the production of office machines. Fathered by the cyclometer invented by a young Hartford electrical engineer in the "gay nineties" to measure the distance traveled on a bicycle, counting devices nowadays record not only mileage of vehicles but statistics of production in scores of factory operations.

They count customers passing through turnstiles, candy bars pouring out of automatic wrapping machines, pulse beats of



Photograph from Wide World

#### WILDWOOD TRAILS LURE THOUSANDS OF CYCLISTS OUT OF DOORS

As crowded as winter ski trains, expresses from New Haven unload summer passengers and their bicycles at Miller's Siding to begin delightful excursions among the forested hills. Mark Twain had his Connecticut Yankee mount a whole battalion on bicycles to fight for King Arthur.

business everywhere. In short, they save the world a tremendous lot of figuring. What comforts to lazy people have been supplied through the ingenuity of hard-working Connecticut Yankees!

To me, naturally, the typewriter appealed as a most interesting office machine, for I thought I knew something about it. A trip through one of the two great factories in Hartford dispelled all illusions of knowledge. Believe it or not, 1,700 separate parts go into a single standard size typewriter, and 5,000 adjustments are necessary in assembling it (Plate XIV).

The workers, many of them women, display consummate skill. In one room where girls were putting the carriages together I said to my guide, "It would take me a week to assemble one of those things."

He turned to one of the operators. "How long does it take you to finish a carriage?"

"I do three and a half an hour," she replied casually as she gave a final turn to some tiny part.

"We employ girls in this department," my companion explained, "because their fingers are more delicate than men's. They do piecework and most of them earn high wages."

#### NEW BRITAIN, "HARDWARE CAPITAL"

A drive of a half hour through pretty countryside took me from the State Capital to New Britain, the "Hardware Capital," where, statistics prove, more builders' hardware is made than in any other city in the world. In 91 establishments 16,000 men and women are employed. It would be interesting, I thought, after going through several of the factories, for a visitor to return to his home and count the New Britain products he uses daily.

With 28 nationalities represented in its population of about 70,000, New Britain is certainly cosmopolitan, but despite the proportion of foreign-born residents it is typically Connecticut in appearance and customs. Many races joined to sing carols



in municipal Christmas festivities, reminding me that the members of the ecclesiastical society which established the settlement in 1754 were themselves only a generation or two removed from overseas.

When depression was at its worst, New Britain formulated a self-help plan to build a clubhouse for the municipal golf course. Laborers were paid subsistence wages in scrip which was accepted in lieu of money by civic-minded merchants. Thus hundreds of the unemployed were given work, their self-respect was maintained, and relief funds were not needed. The clubhouse is a handsome building of field stone from the hills.

Throughout the depression not a New Britain factory passed a dividend, although disbursements were reduced.

It seems peculiarly appropriate that this sturdy Connecticut city should have been the birthplace of Elihu Burritt (1810-1879), "the learned blacksmith," who mastered many languages while working at the forge and became world-famous as the Apostle of Universal Brotherhood.

#### TOBACCO GROWN UNDER VAST CANOPIES

Connecticut, like Gaul, may be divided into three parts. The metal-working industries are concentrated in the central and west-central portion. The western part, together with a strip along the southern shoreline, is given over mostly to beautiful country homes (Color Plate IX), New York commuters having rediscovered the State. In the east and northeast are textile mills weaving cotton, wool, and silk.

The division of course is not rigid. The vast tobacco fields of the upper Connecticut Valley, where high-quality leaf for cigar wrappers is grown under acres of cloth, lie above the heart of the central industrial area (Color Plates XI and XII and page 288); and there are factories, farms, and elaborate country homes in all three sections.

The principal charm of this New England land is its unexpected changes. Out of busy factory towns the fine highways plunge suddenly into rural scenes that seem like early American paintings come to life. One soon learns that Connecticut people not only know how to manufacture useful products, but know even better how to live.

In June, when laurel glows in the woodlands and miles of roses burgeon on roadside banks, when hundreds of brooks sing

among the bowlders or form still trout pools under elm arches, when delicate Queen Anne's lace edges the forests, and ivy and climbing roses soften the walls of venerable mills and half hide stone fences, Connecticut seems enchanted.

#### WHERE HISTORY AND CLOTH WERE WOVEN

After several days among the metal industries a Hartford man and I drove eastward into the textile area. This part of the State is in a transitional stage, many of the cotton-goods manufacturers having moved their business to the Carolinas and elsewhere in the South to be nearer to sources of raw materials. Although activities are now at low ebb, efforts are under way to introduce new industries.

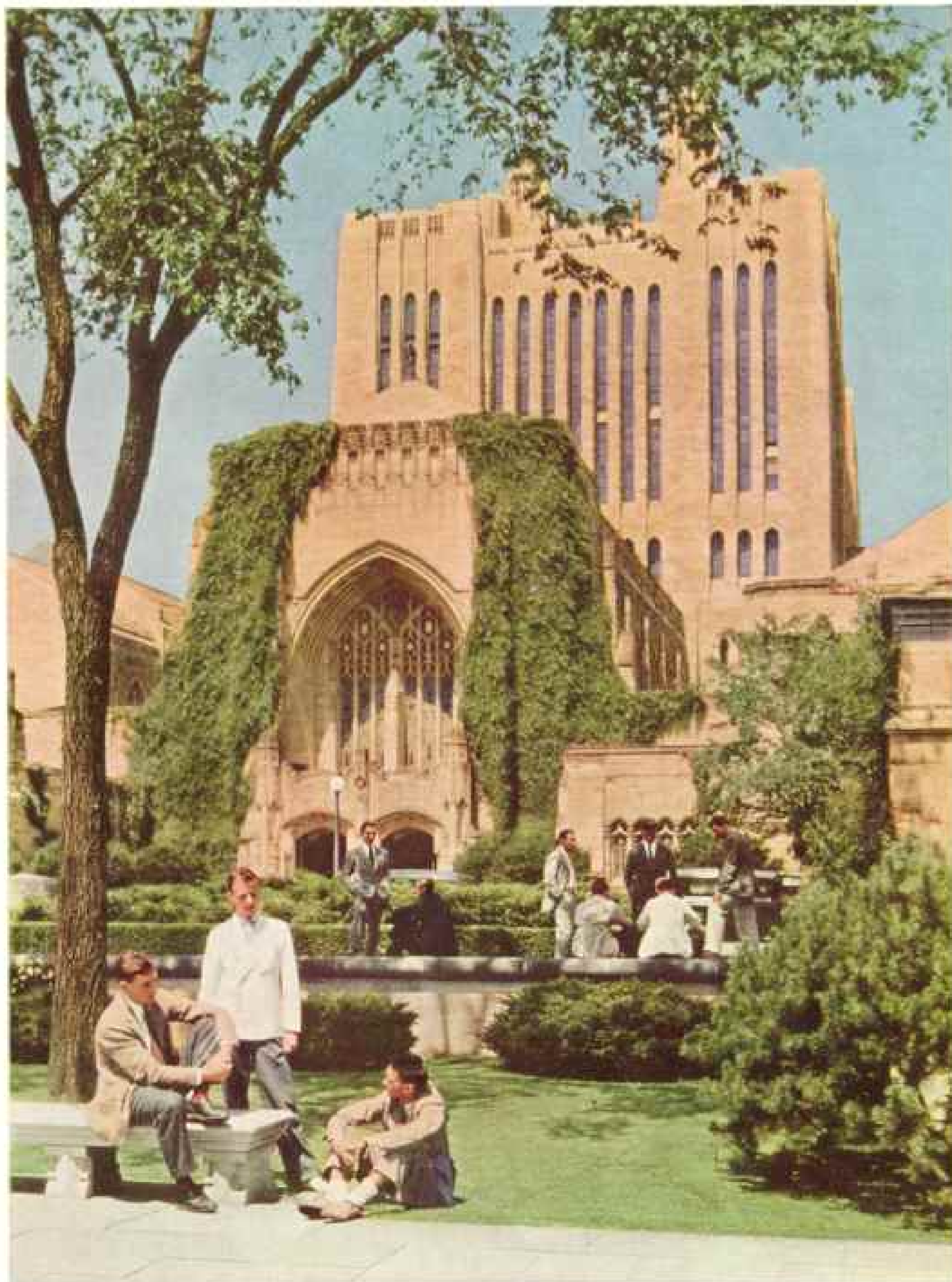
East Hartford, where Noah Webster once lived for a time, brought to mind the dictionary. How many words undreamed of by the famous lexicographer have been added to its pages to identify devices invented by the generations of Connecticut people since he compiled it!

At Manchester, the fine old colonial city built by silk, mills were in operation, and we paused to see the processes from the rooms where the raw skeins are received from China and Japan to the departments where experts examine the cloth inch by inch to detect flaws. In a studio artists were at work on color designs which later others engraved upon copper rolls to be used in the huge printing presses rumbling away in an adjoining room. Silk for print dresses goes into the presses plain, as white paper goes into newspaper presses, and comes out indelibly stamped with decorative patterns.

Beyond Manchester we rolled along past white farmhouses, across numerous little brooks and through quaint villages down to Willimantic, the "Thread City." A company began the manufacture of linen thread here in 1854 and later shifted to cotton. As early as 1706 there were saw and gristmills at the falls, and in Revolutionary times a powder mill.

We were on historic ground when we came to Brooklyn, home of General Israel Putnam. Three miles north of the village is the Putnam farm, where the doughty "Old Put" left his plow in the furrow to gallop off to war at receipt of news of the Battle of Lexington. The shingle-walled house to which he returned after the Revolution to pass his last days still stands.

## OLD AND NEW BLEND IN YANKEELAND



© National Geographic Society

Dufaycolor Photograph by Willard R. Culver

### FROM FORTY BOOKS TO A SKYSCRAPERFUL YALE LIBRARY GREW IN 237 YEARS

Eleven ministers, meeting in Branford in 1701 to discuss the founding of the Collegiate School of Connecticut, gave the first twoscore volumes. Today more than 2,500,000 are shelved in the 16-story Sterling Memorial Tower. The school opened at Saybrook in 1702 with one student, a sophomore. A few years later it was moved to New Haven and given the name of a benefactor, Elihu Yale, a governor of the East India Company. Yale intended to endow the institution, but died intestate, leaving no money for the purpose. Now the University comprises 13 collegiate schools with a total enrollment of 5,130. Beneath the elms undergraduates sing of "Old Eli."



FROM HIGH BUSHNELL PARK THE CAPITOL OVERLOOKS HARTFORD

Different from the Old State House near by, designed by Charles Bulfinch, this structure of Connecticut marble is enhanced by its setting. The J. B. Corning Memorial Fountain (right) has four Indian maidens supporting the stag-crowned upper basin and four braves crouched about the lower.



© National Geographic Society

Finlay Photographs by Luis Marden

GLOWING COALS WERE CARRIED IN THE WARMING PAN TO HEAT BEDS

When fireplaces in the Whitman House at Farmington were the only sources of warmth, sleeping rooms were frigid. The housewife took the chill off the sheets by thrusting a heater between them. Ancestors of New York's World War Governor Charles S. Whitman owned this house two centuries ago (Plate VII).

OLD AND NEW BLEND IN YANKEELAND



Finlay Photograph by J. Anthony Stewart

THE GOVERNOR'S FOOT GUARDS HOLD A REVOLUTIONARY CHARTER

Their uniforms were patterned after those of the British loemen's Coldstream Guards. Their principal duty now is to attend the State Executive on Inauguration Day. Because for years the General Assembly met in both Hartford and New Haven, there are two companies.

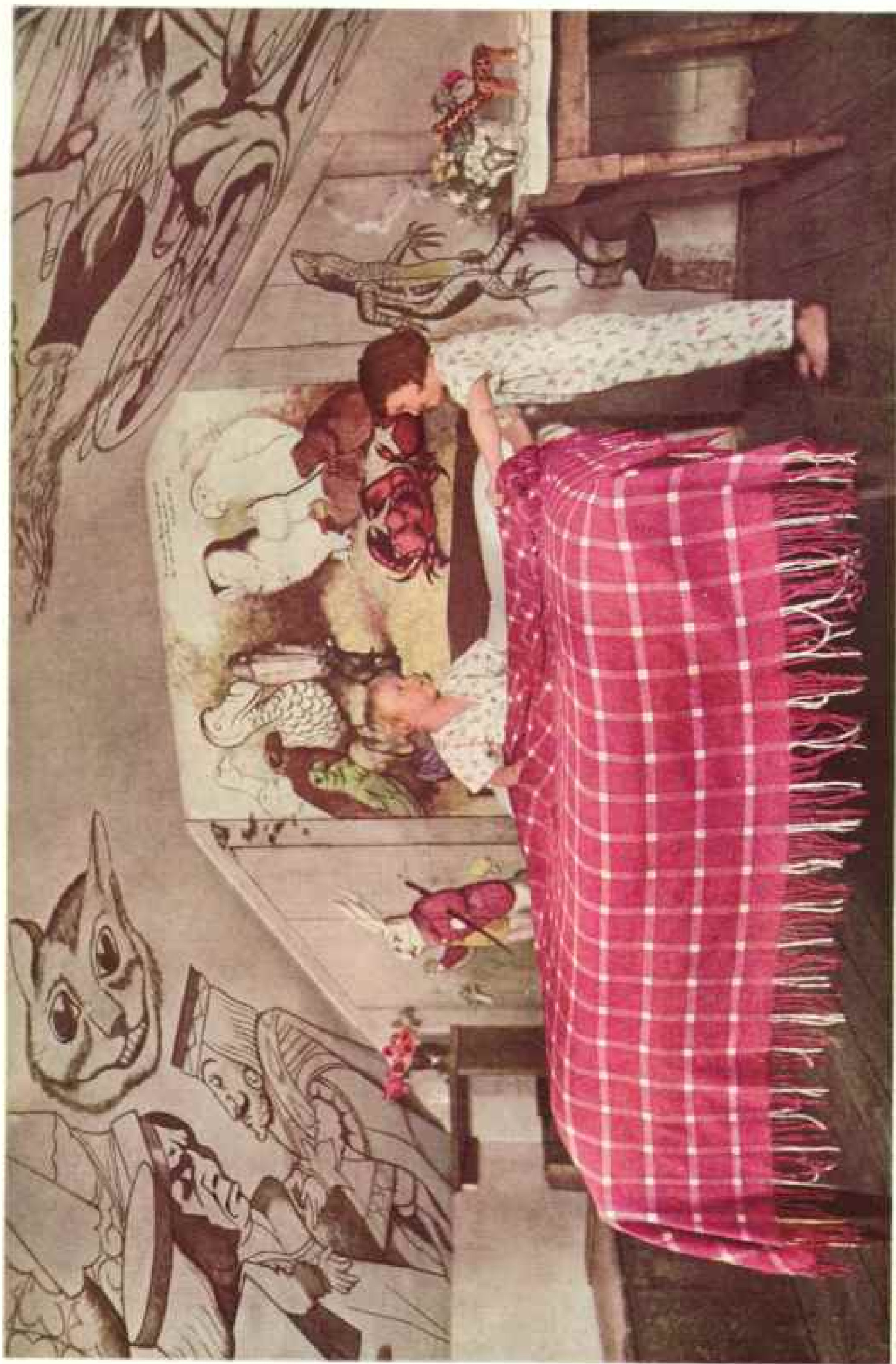


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Finlay Photograph by Edwin L. Witherd

WITH THE FIRST SNOWFALL TAFT BOYS TAKE TO THEIR SKIS

Dr. Horace D. Taft, a brother of the former President and Chief Justice of the United States, still takes an active interest in this splendid school, which he founded at Watertown in 1893. It is one of the many notable private educational institutions in Connecticut.

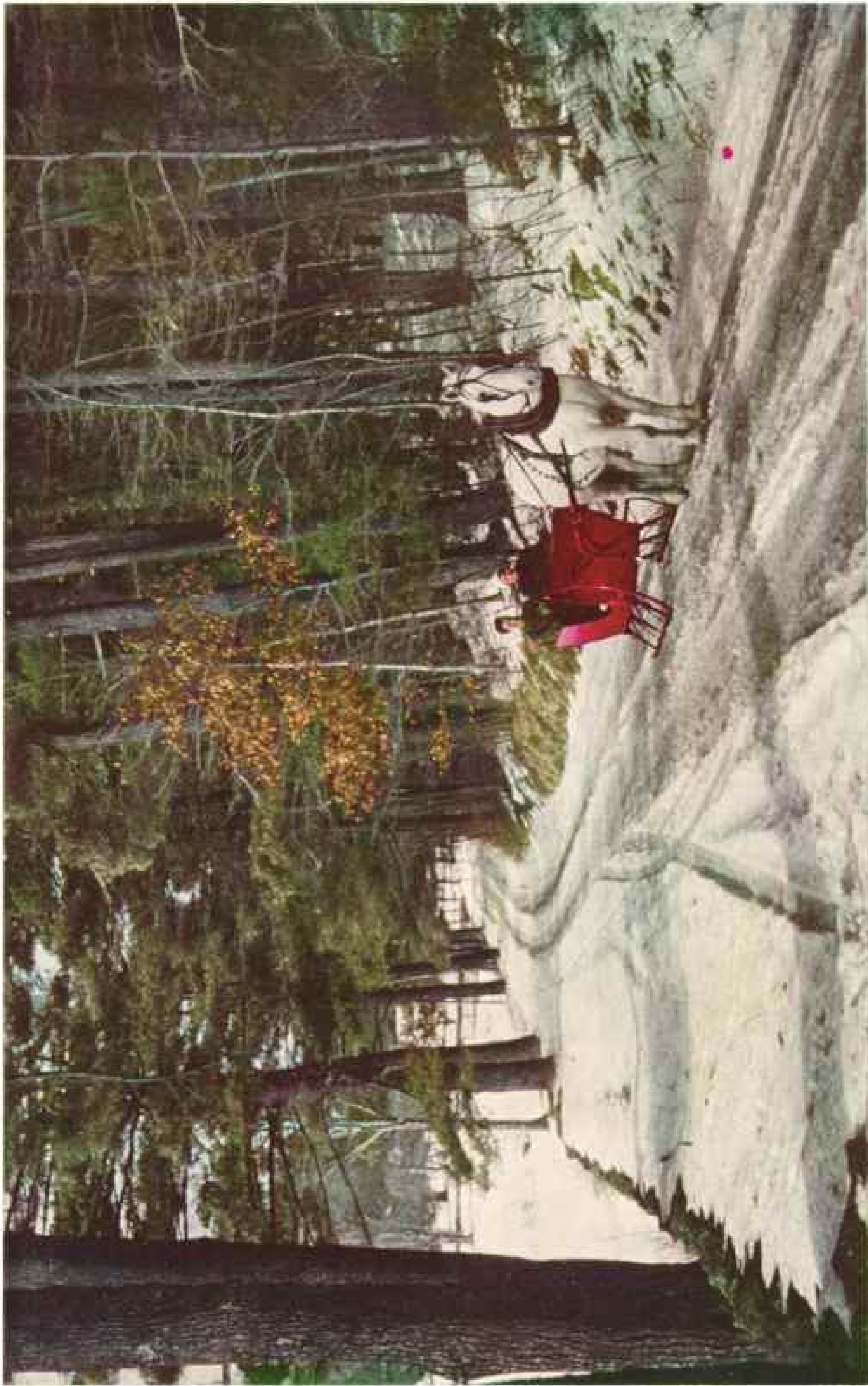


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TWO EAST HADDAM CHILDREN GO TO BED UNDER THE ROOF TO DREAM WITH ALICE IN WONDERLAND

Friday Photograph by Willard K. Carter

For artists the unspoiled "salt-box" houses built before the Revolutionary War have strong appeal (Plate VIII). W. Langdon Kiffin decorated his daughter's nursery in the ell of this lean-to with copies in color of the Tenniel illustrations for Lewis Carroll's classic of childhood.



© National Geographic Society

"OH, WHAT FUN IT IS TO RIDE IN A ONE-HOESS OPEN SLEIGHT!"

*Singie Bells, Over the River and Through the Woods*—what American youngster has not sung these old songs or shivered while reading Whittier's *Snow-Bound*? In one of the few remaining Connecticut stands of virgin timber, the Cornwall pines in the northwestern part of the State, New England, winter entices the rural dweller outdoors with his cutter for a glide over white forest roads.

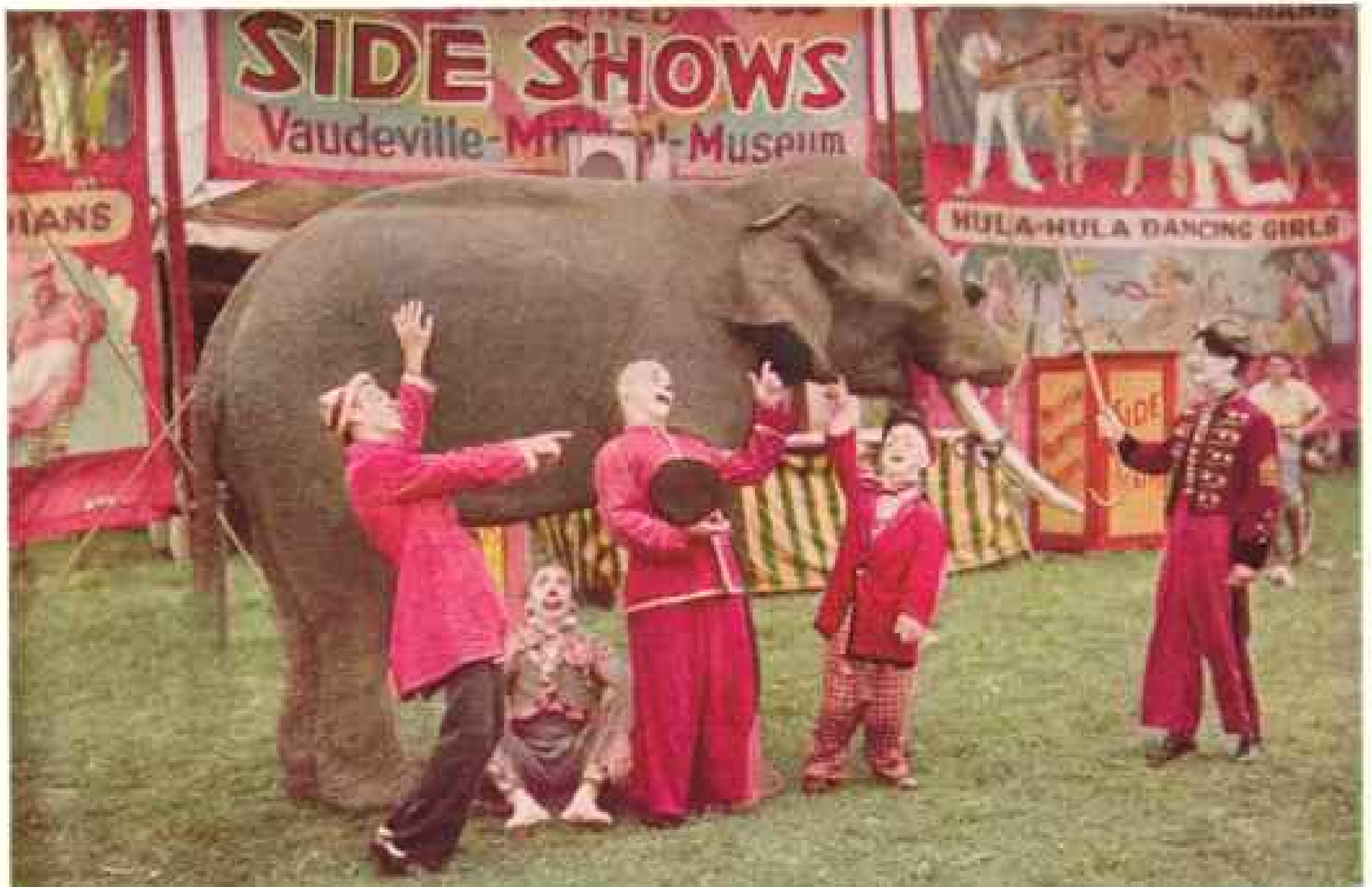
Pinby Photograph by Kitam L. Wisberl



Finlay Photograph by Luis Marden.

A NEW HARTFORD FARMER MIXES EARLY-DAY METHODS WITH MODERN

To pull his mowing machine and to do all other draft work, this breeder of fine Devon cattle employs only oxen. He keeps no horses on his place. Elsewhere in the State similar teams may be seen occasionally.



© National Geographic Society

Finlay Photograph by B. Anthony Stewart

LIKE COALS TO NEWCASTLE, THE CIRCUS COMES TO CONNECTICUT

P. T. Barnum was born at Bethel and for many years kept his menagerie in winter quarters at Bridgeport. Train passengers were often amazed to see mahout-guided elephants drawing plows.

OLD AND NEW BLEND IN YANKEELAND



Dufaycolor Photograph by Wilfred R. Calver.

THE CHIMNEY WAS BUILT FIRST AND THE "SALT-BOX" HOUSE ERECTED AROUND IT.

Thus the huge fireplaces furnished central heat. The type of dwelling, with two stories in front and one in the rear, appeared to early assessors smaller than its actual size. This one, in East Haddam, dates from about 1710 (Plate IV).



© National Geographic Society

Fidelis Photograph by Luis Marden.

WHITMAN HOUSE HAS STOOD IN FARMINGTON SINCE 1660

One of the few remaining dwellings with the second story overhanging the first, this old salt box, or lean-to, has been carefully restored as a city museum. It is furnished with colonial heirlooms (Plate II).





Dufaycolor Photograph by Willard K. Culver

WHIRW! NO WONDER THE NEIGHBORS THREATENED SUIT!

Hartford insurance companies constantly devise safeguards for public health. Here a Travelers chemist shows how he removed garlic and onion odors from the air blown out of a seasoning plant.



© National Geographic Society

Dufay Photograph by Luis Marden

EVEN THE BULLFROG IN THE POOL HAS HIS MOMENT OF BEAUTY

Wide lawns with lily ponds and beds of old-fashioned flowers set off to perfection the mellowed colonial homes in Connecticut towns and villages (Plate VII).

Reminders of the Nipmuck Indians who once inhabited northeastern Connecticut are seen in many places. At Thompson village the green was once the site of an Indian settlement. The red men are only a memory, however, for the pious early settlers virtually exterminated all the tribes.

South of Danielson we drove through rather poor farming country. The soil is rocky and many fences of stone gathered from the fields border the roads. Some of the textile mills, built of field stone, present artistic pictures beside rushing streams against the background of old trees.

On the Quinebaug River near Wauregan and Plainfield we visited a large cotton-shirting mill. The company, one of the older ones in the region, has its own village of neat white houses built and maintained as homes for its employees. The streets are paved, and electric power is furnished by the company plant.

Although business was bad, the mill was in operation for the sake of the workers who, like their fathers before them, depend upon this factory for their livelihood.

#### TRADITION LINGERS IN NORWICH

At the head of the Thames tidewater stands Norwich, mecca for famous American painters, a city of stately old homes and traditions. It was a salty seafaring town in clipper-ship days and one of its streets is named Mediterranean Lane.

While Norwich now is notable mostly for its historic associations, it was a pioneer in industrial development. Here in 1766 Christopher Leffingwell established the first paper mill in Connecticut Colony, and in 1790 Dr. John Lathrop was among the first spinners of cotton in America.

We cut back across the textile area northwest to Thompsonville, home of one of the largest carpet and rug establishments in the world. Wool, cotton, jute, and dye-stuffs—the materials for floor coverings—are brought to Thompsonville from the ends of the earth.

A side trip from Hartford to Farmington and Simsbury and back by way of Collinsville gave respite from our steady pursuance of industrial trails.

Formed by the overflow from Hartford, Wethersfield, and Windsor, Farmington is often called the "second mother" of Connecticut. Its street of old homes overlooking a river vista is one of the finest in the State. Here are the simple salt-box houses,

which, with two stories in front and one in the rear, suggest old fashioned salt boxes in shape (Color Plates II and VII); here also are the more pretentious dwellings of the seafaring period.

Simsbury, too, is a delight to the eye, a restful place of trees and stately homes on wide lawns.

Melville Chater, gifted NATIONAL GEOGRAPHIC writer, who was a resident of Torrington at the time of his death two years ago, wrote of the genesis of early Connecticut salt-box architecture:

"From the pioneer's log cabin there developed two rooms, a central hallway and a rearward lean-to. Chimneys of logs, laid crisscross, called for that early policeman known as the 'chimney watcher.' And though by day the pioneer's child could see but little through windowpanes of oiled paper, by night from the fireside settle, in that rude cabin whose every hinge, latch, bolt, or nail was hand-wrought, he could peer up that great, cavernous chimney and behold the stars."

Collinsville is the machete town. Back in 1846 when trim ships from Connecticut were scouring the seven seas, two young ax makers found good profit in selling their wares to the sailors for barter with natives of far lands. The sailors suggested that large knives, like corn knives, would attract their South American customers, and the ax makers began to turn out machetes.

Today these Collinsville knives are used in Central and South American jungles by Indians who never saw a white man, never heard of Connecticut.

#### THE LAIR OF THE YANKEE PEDDLER

On our return from Collinsville we set out for a journey into the lair of the Yankee peddler, the clock, brass, sewing machine, silverware, and tin plate area.

Peripatetic salesmen who loaded their packs here and wandered far and wide to tempt housewives to buy "Yankee notions" accomplished by house-to-house promotion almost as much for the development of Connecticut industry as their inventive neighbors who manufactured the goods.

Although the peddlers were calumniated by taunts about purveying "wooden nutmegs" and their homeland consequently was nicknamed the "Nutmeg State," they did Connecticut and the rest of America an unforgettable service.



Photograph by Willard R. Culver

NATHAN HALE TAUGHT HERE IN 1773

Overlooking the Connecticut above East Haddam, still stands the schoolhouse where the Revolutionary martyr was master before he marched away to war and to death as a spy. As every young American knows, it was he whose last words were, "I only regret that I have but one life to lose for my country."

The first town on our itinerary was Bristol, where clockmaking has been a principal industry since Gideon Roberts opened his little shop there in 1790. It was Eli Terry of East Windsor who first applied the system of interchangeable parts to clock manufacture, and his pupil, Chauncey Jerome of Bristol, who carried the method to supreme heights.

About 1840 Jerome, finding his American market nearing the saturation point, sent a consignment of clocks to England. His invoice on the goods was so low that Liverpool customs authorities promptly seized the whole lot, charging Jerome with undervaluation. The penalty was confiscation of the shipment by payment of the invoice price plus 10 per cent. Jerome received the customs official's draft and shipped another lot of clocks. Again he was paid the invoice price with the added 10 per cent.

He was in high glee, for the British Government was a perfect cash customer, buy-

ing at 10 per cent over the invoice and charging no commission for selling. He sent over a whole shipload. At this the customs authorities awoke to the fact that a Connecticut Yankee could actually make clocks at a tenth of the English cost.

CONNECTICUT FATHERED TIME

Eli Terry, Chauncey Jerome, Joseph Ives, and Seth Thomas flooded the world with Connecticut clocks. Ives developed the rolled-brass process, which cheapened and accelerated manufacture, and by 1855 Bristol, Plymouth, Winsted, and New Haven were producing more than 400,000 brass timepieces a year.

The peddler, the story goes, always started out with one more clock than he expected to sell. On the return journey he would exchange the extra clock for any faulty one he had sold, repair the one taken back, and exchange it for the next bad one. Many peddlers made their own wares.



Photograph by Edwin L. Wisford.

FOR LEGAL NOTICES, CONSULT THE SIGNPOST ON THE GREEN

In Waterbury, the "Brass City," as in many other old Connecticut towns and villages, survives the custom of posting official bulletins in the public square where "he who runs may read."

To Terryville, Thomaston, and Plymouth we drove, and down to Waterbury, the "Brass City," seeing clock factories wherever we paused (Plate XV). What a reveille the world would know if all the alarm clocks manufactured in these Connecticut cities were to ring at once!

Waterbury is a permanent monument to Connecticut resourcefulness and courage. In colonial times the settlers there found that the land of the Naugatuck Valley was not fertile enough for profitable farming. They began to make buttons, at first of horn and ivory, and later of brass. Thus to meet the dire need of a means of livelihood was born one of the major industries of Connecticut.

So many articles are made of brass in Waterbury factories—from clock wheels to giant pipes for the engine rooms of ocean liners—that a thick volume would be needed to list their names.

"Is there anything you can't do with brass or copper?" I asked the statistician of one of the large companies.

"We can handle almost any order within reason," he replied. "If you should come to us with a model of an invention, no matter how intricate, we could build a machine to make it for you automatically. The cost of manufacture would be cheap, but we should have to ask you to pay for the machine tools. That would be expensive."

"Machine tools"—there lies the secret of Connecticut wonder-working. They seem to have human intelligence.

In Connecticut factories everywhere corps of inventors are employed to do nothing but invent—new machine tools, new labor-saving devices, new processes of manufacture.

SILVERWARE FOR A NATION

From the "Brass City" we went on to the "Silver City"—Meriden, the home of the largest silverware manufacturing establishment in the world. More than 50 per cent of the plate and sterling produced in the United States is made in Connecticut. There are factories in many of the cities—Wallingford, Bridgeport, Middletown,



Photograph by A. V. Swadby

"BUNDLING" OR COURTING IN BED DEPIED COLD BUT OBEYED ALL PROPRIETIES

Thus in old New England houses when winter raged and only a grate fire supplied warmth, a young swain might "sit up" comfortably with his lady in the frigid living room. Both were fully clothed, and a centerboard between them met the demands of strict decorum. Members of the cast of the costume comedy, "The Pursuit of Happiness," posed for this photograph.



Photograph by Edwin L. Weisheit

FOR MORE THAN 64 YEARS CHARLES M. TAYLOR HAS WORKED AT THE SAME JOB

He is a hand burnisher employed in the International Silver Company plant at Meriden. Though now 82, he is at his duties every day putting the final touches on elaborate pieces of plated or sterling hollow ware. The task he performs is a finishing operation requiring exquisite craftsmanship.



Photograph by Willard R. Culver.

HICKORY BURNING IN THE GRATE HEATED THE HOUSE, BAKED THE BREAD, AND SMOKED THE WINTER STORE OF HAMS

In this East Haddam home the "smokehouse" is built in the chimney above the fireplace, and the oven is placed to the right of the flames. The time-and-fuel-saving device has given good service since about 1710 and is still in use (Color Plate VII). Every autumn in the early days the householder would butcher enough hogs to supply cured meat to feed his family for several months. Cooking was done by means of spits turned by hand over metal pans which caught the drippings.

New Haven, New Milford, but Meriden is the silver capital (page 306).

We went through some of the plants; examined the piled slabs of copper and zinc alloy, "German silver," which is the base of plated ware; watched some of those slabs rolled to proper thickness, cut like cooky dough into pieces of proper size and outline for spoons, knives, forks, and hollow ware; saw the pieces stamped and shaped, and finally immersed in large vats of acid with anodes of pure silver and plated by electrolysis.

By a clever process the plating is made extra thick on such parts as the backs of spoon bowls where wear is likely to be greatest.

#### MUSEUMS YIELD SILVERWARE DESIGNS

Silver designers will search museums for months to find unique patterns for tableware. Once the designs are perfected, they are transferred to the machines and duplicated by the million—true artistry in mass production.

Sterling, we learned, is not quite pure silver but an alloy of 925 parts silver and 75 parts copper. Without the copper it would be too soft for use.

Asa and William Rogers were the silverware pioneers in Connecticut. Their original factory still stands in Meriden.

From silver to tin we proceeded as we moved on from Meriden to Berlin. Early records show that 10,000 boxes of tin plate yearly were converted into pots and pans and sold throughout the United States by Yankee peddlers. Berlin still makes tinware, vast quantities of it, as well as structural steel products, paper goods, bricks, and metal buckles.

It was in Berlin in 1799 that Simion North began work on a Government order for pistols, using a system of interchangeable parts similar to that employed the previous year by Eli Whitney at New Haven. Whitney is generally credited with introducing the method into Connecticut, but North was not far behind him.

#### HOW A CONNECTICUT INDUSTRY IS BORN

After our swing around the metal-working triangle, we left large industries behind and struck out to the west and north where ever-surprising Connecticut presents an entirely different face.

My companion suggested a stop at a trim little factory beside the highway near

Northfield. Here, he promised, he would show me something new.

The proprietor of the establishment greeted us cordially and took us around the plant. He was bending and cutting glass to make clock faces, light reflectors, and a score of other glass commodities. Nothing unusual in that, I thought, as we came back to his office; but I changed my opinion when he told his story:

"My wife and I had a 150-acre farm near here. We couldn't make much off it in the summer, and in winter there was nothing for us to do. So we made up our minds to start manufacturing something.

"A glass man with a little shop in town had failed, and we bought his equipment and moved it out to our shed room.

"Neither of us knew anything about bending glass, but we soon learned. We set up a little furnace and a wheezy old engine in the shed and put an oil tank in the attic so that we had gravity fuel feed.

"That was the beginning. We did all the work ourselves and made and sold some clock faces. When business got better we moved the plant out to the barn. Things went pretty well for a couple of years; then one day, just after we had come home from our first vacation, the barn factory burned down.

"Well, there was a thousand dollars insurance, and the bank lent us some more. I went to Pittsburgh and talked some plate-glass people into selling me sheets of glass on time. Then I built a little factory and started all over again.

"Last year we did \$150,000 gross business and we gave work to about fifty of our neighbors. Of course we could expand faster—bring in a lot of foreigners; but we don't like to risk it. We'd rather train our neighbors from the farms. It's a kind of friendly neighborhood company."

The mention of "foreigners" struck me as odd, for the man himself was a German immigrant only a few years ago.

Since the earliest settlement, Connecticut factories have been started in similar ways. Some one conceived an idea and began making a product in the back room of his home. If the idea was sound, the business grew. Several of the largest manufacturing companies in the State are still owned by the men who started them.

Torrington has been living on needles and pins for many decades, for it is the needle-manufacturing center of Connecti-



Photograph by Luis Marden.

#### OLD ROAD SIGNS ARE MORE ARTISTIC THAN THE NEW

At Norfolk and elsewhere in the wooded hill country the motorist may take his directions from wayside boards quaintly decorated with paintings of dogs, rabbits, and deer. If confused, he can obtain concise and explicit information from patrolmen famed for their courtesy.

cut. Besides needles it produces brass goods, machine tools, hardware, sporting goods, and cloth for uniforms.

A few miles northeast at New Hartford, Elias Howe, in 1845, invented the sewing machine.

#### CONNECTICUT'S "WILD WEST"

The countryside in this part of Connecticut is lovely. There is considerable agriculture, and fine apple orchards may be seen along the highways. As we drove on up to Lakeville in the northwest corner, we saw iceboats skimming along on glassy lakes, passed gracious country homes, and followed smooth roads that wind among mountainous hills as rugged and unspoiled as the wilderness lover could wish.

In spring and summer these hills are covered with mountain laurel, the State flower, and in autumn the maples paint the scene with brilliant hues.

Lakeville still has the water-filled workings where blast furnaces made munitions

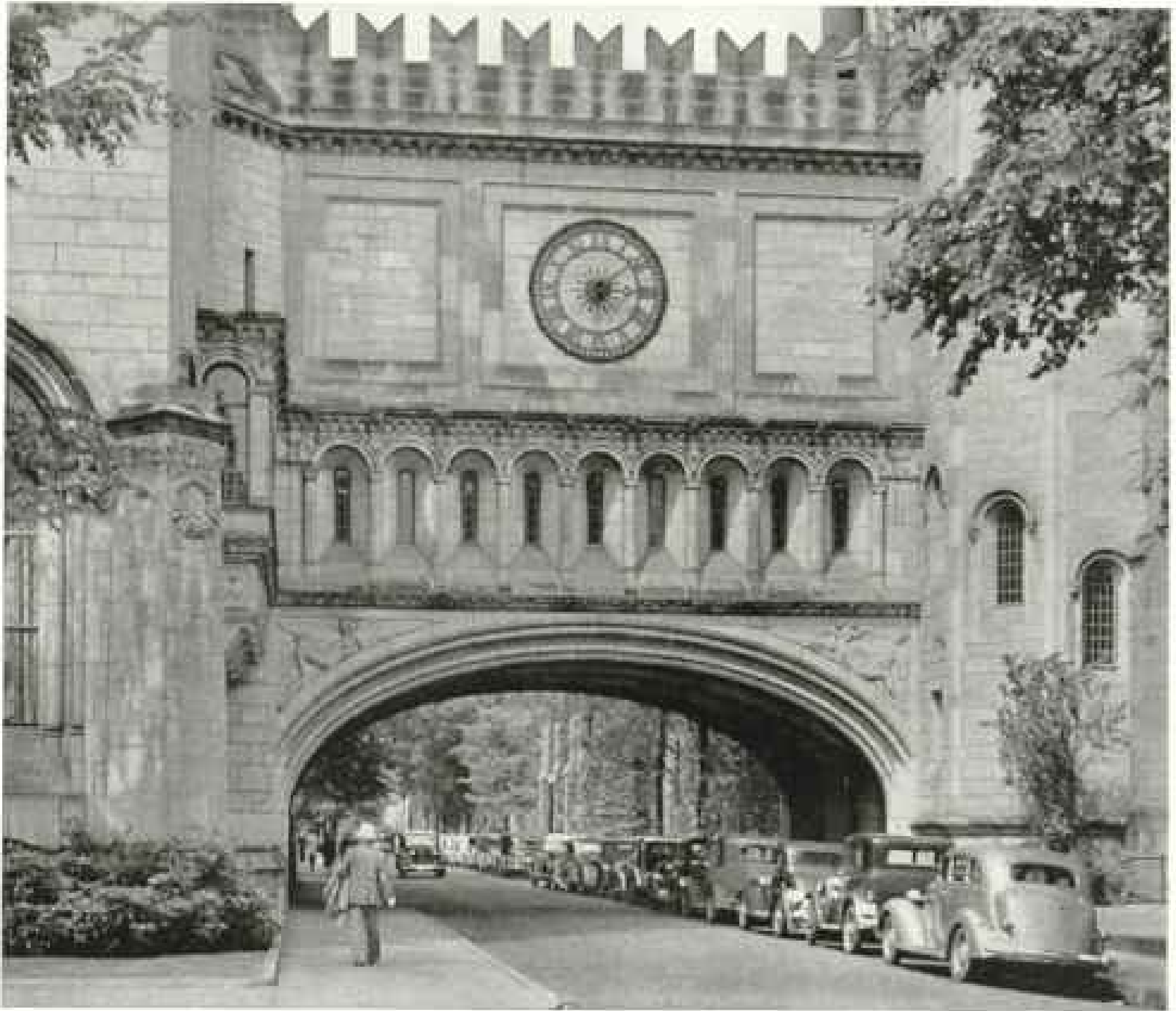
for Washington's army. It was so remote then as to be safe from British scouting parties. Today it is remote enough to lure the motorist far off the beaten trails.

Down the western border of the State we followed a winding highway from Cornwall (Color Plate V) along the Housatonic to Kent, home of a boys' preparatory school that sends its rowing crews to compete with the oarsmen of Eton in England. Connecticut is justly famous for its private schools.

Dashing waterfalls here and there along the way bring to mind the thought that only 22 other States have more water power than tiny Connecticut. Near New Milford lies artificial Candlewood Lake, created for power, the largest lake in the State.

Out of the broken hill country we came to Danbury, hatter to millions. Hats have been made here since 1780, when Zedok Benedict opened a shop on the site of the present postoffice. He employed three men and turned out three hats a day. Now Danbury has thousands of hatters and





Photograph by Willard R. Culver.

HIGH STREET PASSES THROUGH THE YALE COLLEGE OF FINE ARTS IN NEW HAVEN.

When the University acquired land on both sides of the thoroughfare and desired to construct a building across it, closing the road to traffic, city officials opposed the plan. A compromise caused the erection of this graceful arch at the corner of Chapel Street, connecting the Gallery with Street Hall.

reckons its annual output in millions of dozens (page 316).

In Revolutionary days, Danbury was the victim of Tryon's raid. The British general destroyed the town on April 26, 1777.

Our way now led down into the southwestern corner of Connecticut, that "lip" of the State which has become virtually a suburb of New York City. Among the earliest to be settled, the shore towns are rife with memories of Revolutionary times, and splendid examples of early colonial homes are to be seen on every hand.

Bays, rocky inlets, and river mouths are dotted with white sails, for the region is far famed as a yachtsman's paradise. There are bathing beaches, shore resorts, and luxurious country estates, and, in the midst of all this beauty, factories humming the motif of Connecticut.

Even at Greenwich, "Gateway to New England" and homeland for New York commuters, industry is not forgotten. Presses of one of the largest printing companies in the world rumble day and night in a magnificent plant set in landscaped grounds, and busy factories turn out vacuum cleaners.

At Stamford we saw exquisite country homes (Color Plate IX), yacht clubs, fashionable boarding schools, the rugged gorge of the Mianus River—and a lock and household-hardware factory that occupies a tract of 25 acres!

Linus Yale in 1848 revolutionized lock manufacture. Before his time locks were operated by enormous keys that went through the doors. The Yale invention introduced a cylindrical "plug" which was turned by means of five pins controlled by



Photograph by Luis Mardon

A LOCK THAT SAW SERVICE IN CRUSADER TIMES IS SEEN BESIDE A MODERN YALE LOCK

The Yale and Towne Manufacturing Company in Stamford has a unique display of the old and new. The wooden device at the left, of Egyptian pattern and workmanship, was doing duty in Jerusalem at the time when Christian knights were fighting in the Holy Land. On the right is a large model of an up-to-date Yale cylinder door lock and in front of it an actual working lock of this type. Some ancient keys alongside those used for the small lock carry out the idea of contrast.

a small key. This arrangement permitted more than 32,000 variations and made the locks virtually pick proof.

There are shipyards at the harbor outlet, and plants elsewhere in the business district making leather cloth, postage meters, canceling machines, septic tanks, bronze paint, motors, roller bearings, and oil-burning equipment. Despite this manufacturing activity, summer passengers on the railroad that skirts the shore from Stamford to New Haven look out car windows to a right-of-way bordered with roses.

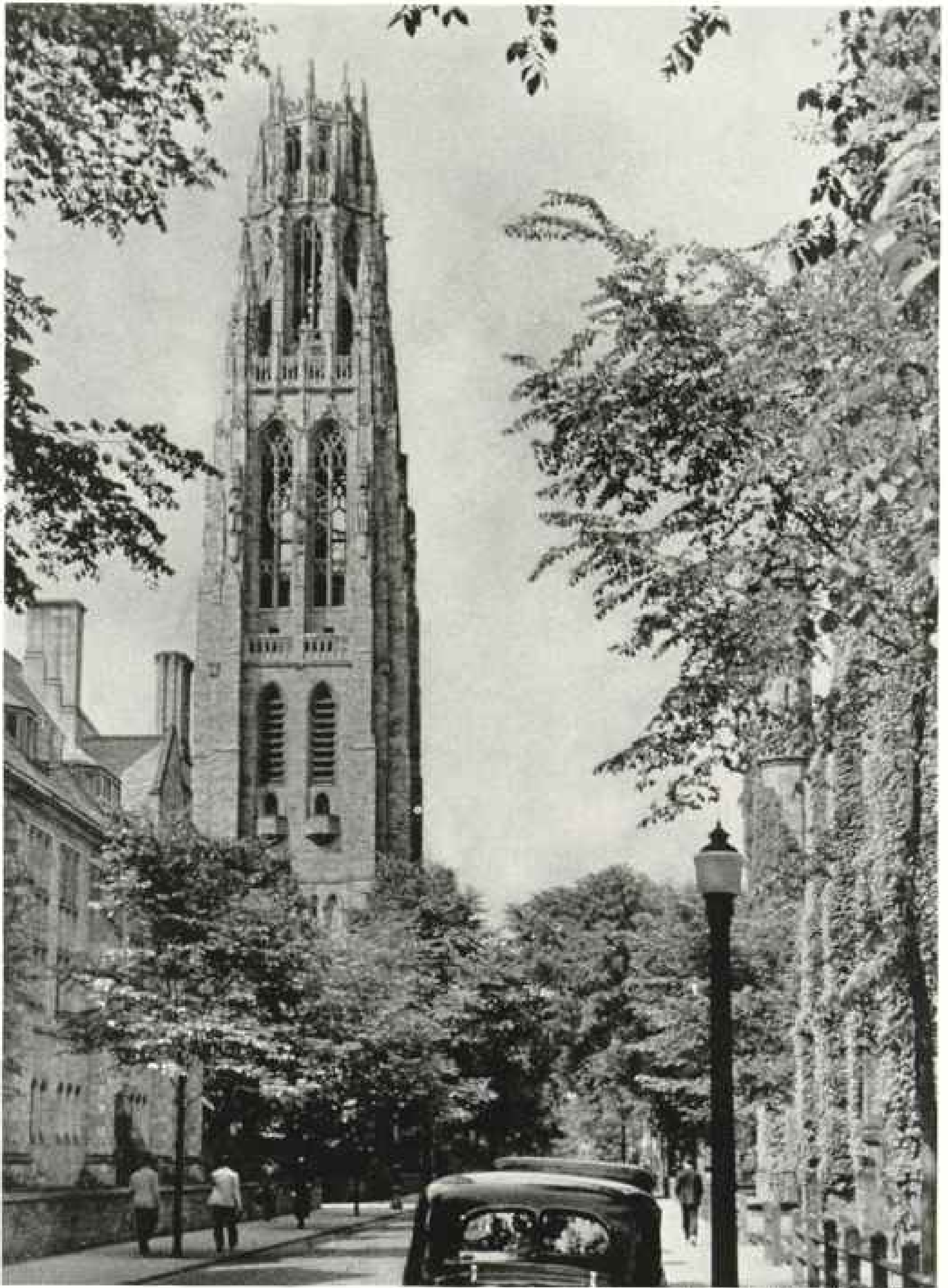
Norwalk has 120 industries, not more than six producing the same kinds of products. In a shop on Main Street in South Norwalk was fashioned the first derby hat made in America, and hat manufacture,

carried on in six factories, is today the leading business. Norwalk stoneware pottery was known in the dawn of the nineteenth century wherever Connecticut sailing vessels put into port, and an oyster industry established in early times is still important.

Besides hats and pottery, this busy city makes woven name tapes, expansion bolts, tires, corsets, builders' hardware, handbags, dress goods, and scores of other commodities; yet it is distinguished for fine homes, parks, and playgrounds.

BRIDGEPORT, INDUSTRIAL GIANT

Producing almost every imaginable kind of manufactured goods from carbon paper to munitions of war, Bridgeport is the industrial giant of Connecticut. Elias Howe



Photograph by Willard R. Culver

#### HARKNESS TOWER DOMINATES YALE MEMORIAL QUADRANGLE

Built in memory of Charles W. Harkness, class of '83, this magnificent "singing tower" stands on High Street. It shows the influence of European Gothic models, particularly St. Botolph's in Boston, England, and the *Tour de Beurre* of Rouen Cathedral. In its 237 years Yale has been notable for its faculty of scientific scholars: William Howard Taft, former President and Chief Justice of the United States and for 13 years a trustee of the National Geographic Society, was a Yale alumnus and teacher.

established his first sewing machine factory here not long after securing his basic patents in 1845. Wheeler and Wilson moved here from Watertown in 1856, and later sold out to the company which now turns out 2,000,000 machines a year. Father of the present company was Isaac Singer, who patented his invention in 1851.

The ancestor of the modern Dictaphone made its appearance in Bridgeport in 1888 when Dr. Alexander Graham Bell and Charles S. Tainter rented one of its factories to produce the first practical dictating machine, a device based on Dr. Bell's voice-transmission principles.

At the Sikorsky plant was built the huge Hornet-powered S-42 that blazed the trail across the Pacific. The plant, in Stratford, just outside of Bridgeport, now makes the Pan American clippers that carry passengers, mail, and freight across the Caribbean and to South America. Bridgeport shares with Hartford the aircraft business in Connecticut.

Typewriters and other office machines, toys, rubber goods, hardware, sporting goods, machine tools, chemicals, plastics—the list of Bridgeport industries reads like a manufacturers' guide.

Notwithstanding its concentrated manufacturing, Bridgeport is often called the "Park City," for it has one of the finest park systems in the East. P. T. Barnum, the showman, made it his home and was closely connected with its activities until his death in 1891. To the city he gave land for Seaside Park, a public playground of 210 acres. A 40-foot shaft in Mountain Grove Cemetery is crowned by a life-size figure of Barnum's famous dwarf, "General Tom Thumb," and a statue of Barnum himself overlooks the road from the sea wall of his park.

#### YANKEE GRIT CONQUERS DEPRESSION

On the Housatonic River northeast of Bridgeport are the twin cities of Derby and Shelton. They interested us particularly because of the novel manner in which they met adversity.

When depression caused several of the largest manufacturing companies to cease operations and leave their factories vacant and their workmen unemployed, the business men of the two cities pooled resources and by renting factory space to numerous small new industries soon had everybody back at work. How typical of Connecticut!

Stratford, virtually a suburb of Bridgeport, has the first Episcopal church in Connecticut, the church established in 1723 through the efforts of the Reverend Samuel Johnson, who later became the first president of King's College (Columbia University) in New York.

At Milford, headquarters of the historical society are in the Eells-Stowe House (1689), where Captain Stephen Stowe, "the martyr," and his wife Freelove Baldwin gave shelter on a stormy New Year's night, 1777, to a shipload of Americans landed near by, ill and half clad, from a British prison ship. Smallpox broke out among the rescued prisoners and 49 of them and Captain Stowe succumbed to the disease. Freelove Baldwin gave her husband and four sons to the cause of liberty.

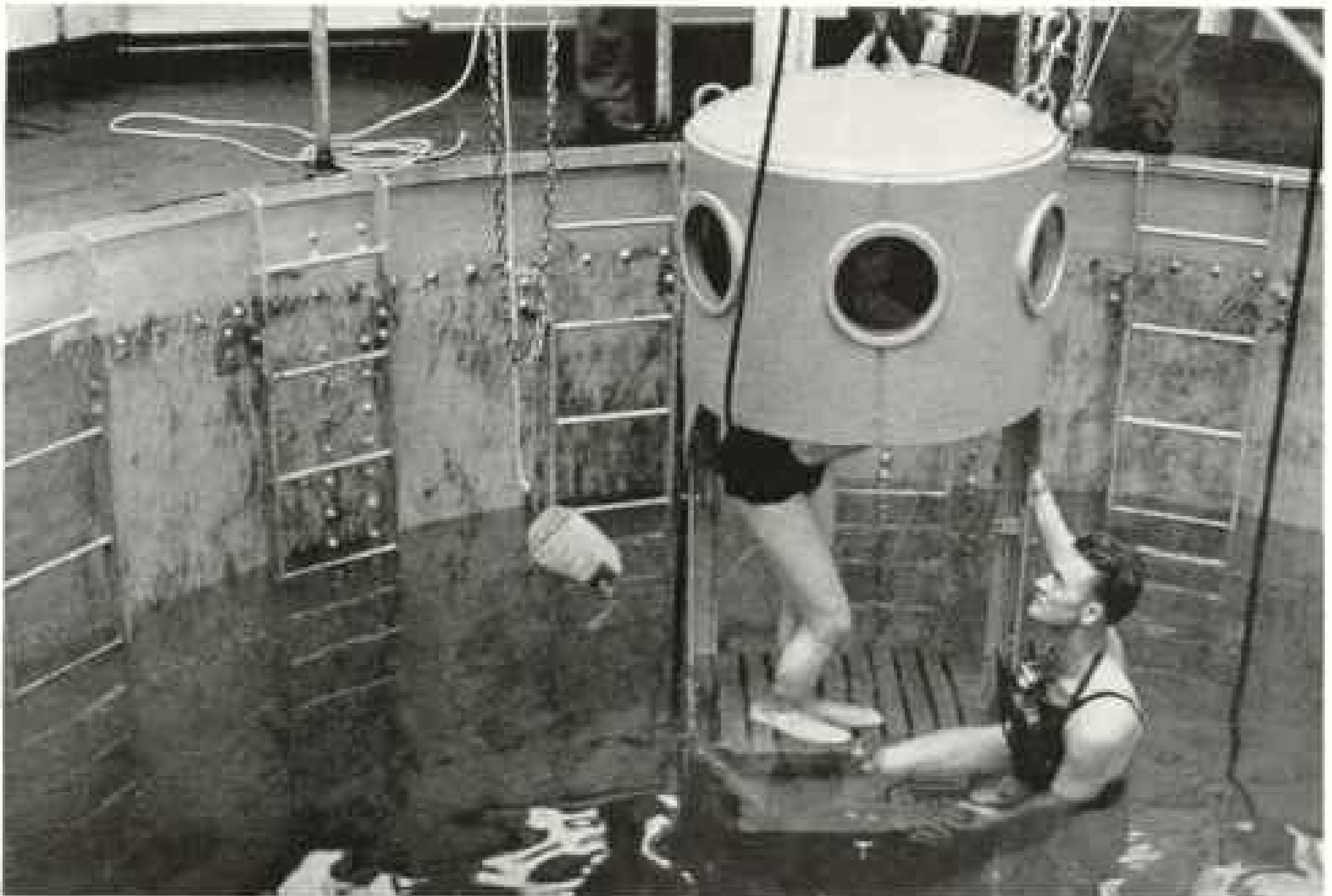
#### ELMS AND IVY OF NEW HAVEN

New Haven presents a bewildering complexity of historic memories, culture, and modern manufacturing. Among its early leaders were John Davenport, who dreamed of a theocratic State built around a great university, and James Pierpont, under whom Yale was actually established. Davenport's dream bore fruit for a time, and New Haven functioned as a separate political commonwealth for 14 years before it united with Connecticut. Pierpont's ideal was more enduring: Yale, since the time of its first rector, Abraham Pierson, has ministered to the educational needs of students for almost two and a half centuries.

Crowded on all sides by the modern business district, the University has no large campus, but its classic schools are built around elm-shaded courts that are as delightful as unexpected (Color Plate I). Architecture ranges from ivy-covered, red-brick buildings of early colonial style to towers of Gothic splendor. Whether old or new, all these colleges of Yale seem steeped in tradition (pages 310, 312).

Opposite Skull and Bones fraternity stands Whitman Memorial Gate, erected in honor of the Reverend Samuel Whitman, of Farmington, one of the first fellows of Yale and an ancestor of former Governor Charles S. Whitman of New York (Plate II).

It was a Yale man, Eli Whitney, who probably had more to do with the beginning of manufacturing in Connecticut than any other person. Upon his graduation he went to the South where he had been offered a position as tutor in a wealthy fam-



Photograph by Luis Marden

TO LEARN TO USE THE "SUBMARINE PARACHUTE" STUDENTS GO DOWN IN A DIVING BELL.

In this vital part of training at the New London Submarine Base, each man wears a "lung" strapped on his chest. The beginners are submerged to 18 feet in the tower (opposite page). They then fit on the nose and mouth pieces and breathe steadily of the oxygen supply as they step out from beneath the bell. A rope equipped with toggles or knots and supported at the top by a lighted buoy or float is shot to the surface. Up this life line they climb slowly to the surface, successively gripping the knots with arms and legs, to prevent sudden change of pressure which might cause death.

ily, but he found the position had been filled before his arrival. Turning his talents to mechanics, he invented the cotton gin to take the seed out of the fluff.

The world profited immeasurably by that invention, but not Whitney. After years of litigation with patent violators, he despaired of receiving the rewards to which he was entitled and set up a factory near New Haven to make guns.

#### GUN-MAKING REVOLUTIONIZED

Although he had no factory and no previous experience at gun manufacture, he did not hesitate to accept in 1798 a Government contract for 10,000 muskets at \$13.40 each, 4,000 to be delivered the first year and the remainder one year later.

Months went by, and all that Whitney had done was to build a plant, using not only the money advanced him but all he could borrow from friends and business associates. After a while his creditors became so unpleasant that he avoided meet-

ing them on the streets and finally the Government officials became uneasy about advancing so much money without receiving a single gun.

Whitney answered his critics by one of the most dramatic acts in industrial history. Like a Yankee peddler with his packs, he carried to the new Capital at Washington unassembled parts for ten guns. These parts he placed in piles, each of a sort, on a table before War Department officials, and proceeded to pick up the pieces indiscriminately and build ten guns before their very eyes. He proved that the parts were interchangeable!

His method revolutionized arms manufacture. Before that time muskets had been made by hand, and when a part was broken it had been necessary to send the weapon back to a gunsmith to have a new part made. Now broken parts could be replaced by machine-made duplicates which would fit and which could be carried in supply wagons behind armies on the march.

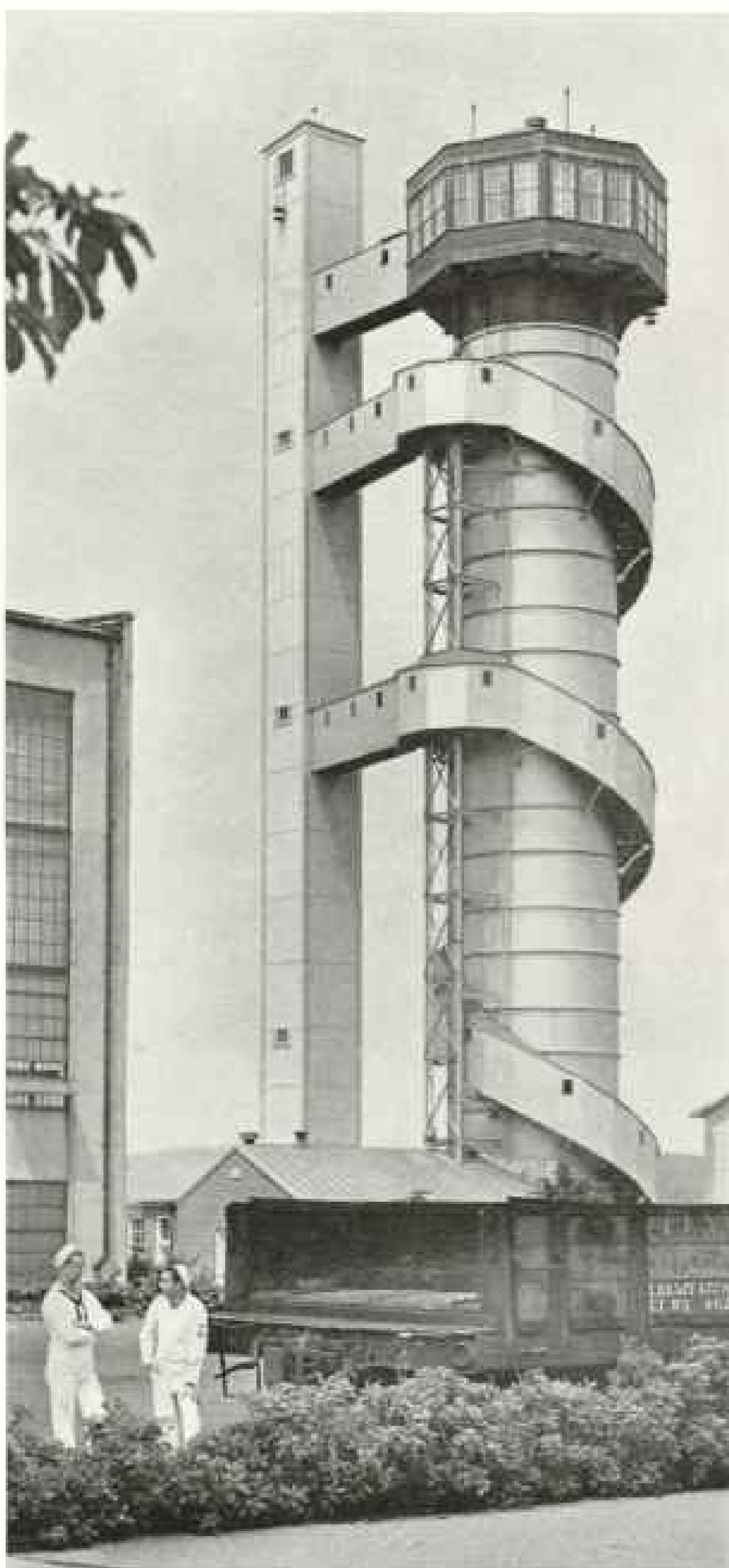
Another New Haven genius who did the world a remarkable service was Charles Goodyear. In 1846 he was a penniless inventor, frequenter of pawnshops, a social outcast because his family went in need while he put every cent he could obtain into frantic experiments with a sticky gum that was considered worthless for economic use.

His triumph was an accident. In cooking a pot of sulphur-cured rubber, he spilled some of the mixture on the hot stove. It charred but did not melt! He had discovered the process of vulcanizing rubber!

A large repeating-arms factory and numerous rubber plants in New Haven today are mighty monuments to the skill and courage of Whitney and Goodyear. These men are only two of a long line of inventors, scientists, educators, divines, soldiers, and writers who have contributed to the renown of their home city.

To visit a tenth of the industries of New Haven would be a long task. We sought the novel in a large toy factory (Color Plate XV), for the season was Christmas, and the machines were whirring overtime to fill orders for gifts. As we watched the machines turn out all manner of materials for playtime structural and scientific work, we sensed a manifestation of Connecticut ingenuity perpetuating itself. Thousands of children will play with those toys. Who can say what world-changing ideas they will develop?

East of New Haven we followed the shore highway, a part of the famous Boston Post Road, through quaint villages, past country homes, beach resorts, and a multitude of inns and wayside stands offering lobster and other sea food (Color Plate XII).



Photograph by Luis Marden

HERE MEN LEARN TO ESCAPE FROM A SUNKEN  
SUBMARINE

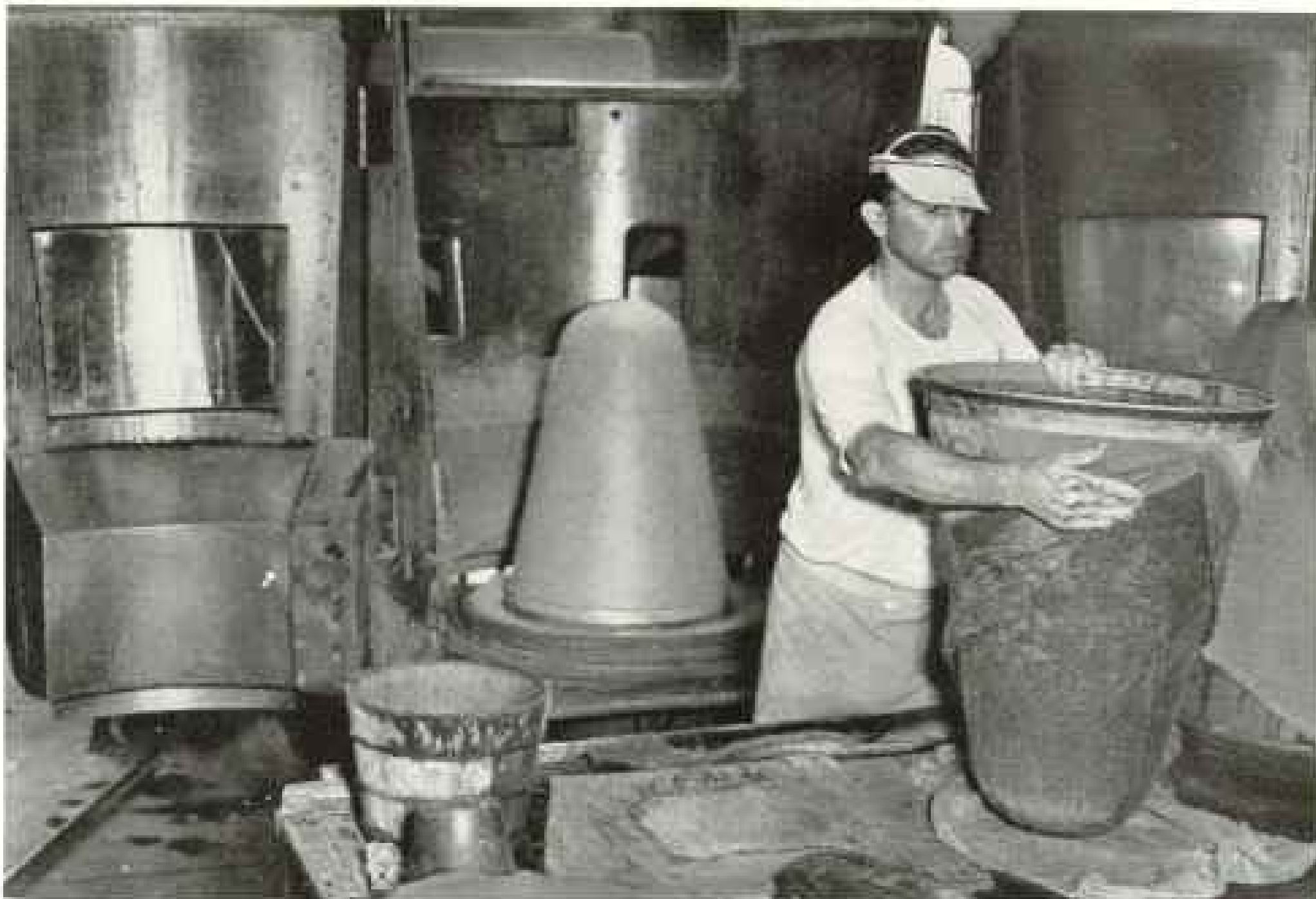
The tower is filled with water. Beginners in the study of escape technique are first submerged 18 feet to the top level of the spiral runway which encircles the tower and affords observers opportunity to follow the training exercises (opposite page). Fundamentals learned, they go down to the second level, 50 feet, and as a final test climb the "submarine parachute" from the bottom, 100 feet to the surface. The shaft at the left is an elevator.



Photograph by B. Anthony Stewart

IF MR. CROW HAD THE STRENGTH, HE WOULD PULL THAT TOOTH!

Anything white attracts this pot; here he goes after one of his owner's front teeth. The bird is a familiar character at the Shade Swamp Game Sanctuary near Farmington.



Photograph by Luis Marden

HATS IN THE FIRST STAGE ARE LARGE ENOUGH FOR A GIANT

Fine particles of fur are drawn together by vacuum upon a central cone to form a conical felt bag which later is shrunk and shaped to the desired size and style. This factory is one of many in Danbury. Norwalk is also noted for its makers of headgear (page 309).



Photograph by Willard R. Culver

**JAMES LORD PRATT WORKS AT THE FORGE SET UP BY HIS SEVENTH GREAT GRANDFATHER**

In 1678 Pratt's Village Smithy was established on this spot in Essex and for eight generations it has been owned and operated by the same family, having been handed down from father to son. The present proprietor is the last of his line, for he has no children. He draws "from his head" chalk designs for his reproductions of antiques (page 318).

In old Clinton venerable trees crowd so close to the highway that their trunks are fitted with white and black board stripes lest motorists strike them in night driving. A large Clinton establishment makes nationally known facial creams and lotions, but even this ultramodern industry does not change the early-colonial appearance of the town. Those white and black stripes protect not only careless motorists but grand old elms and oaks!

What tales of derring-do the Boston Post Road could tell if it could speak! Skirting the shore from Stamford to New London, it bound together the earliest settlements of the Connecticut coast. For three hundred years it has been one of the most heavily traveled roads in America. Puritan soldiers marched over it in the Pequot wars. It became the King's Highway later, the principal way to New Haven, and by 1673 was known as the Boston Post Road.

Over it in 1775 galloped Ebenezer Hurd on his last ride to carry to Connecticut folk news of the Battle of Lexington. Today it is the main artery between New York and Boston.

Beyond the Connecticut River, widening toward the Sound, we came to Old Lyme, beloved of artists, who flock to its friendly shelter to paint pictures of its salt-box houses and bask in the soft sea air. It was once a bustling center of shipbuilding and shipping, with a sea captain in almost every house; but now it dreams in the quiet of a beautiful old age.

**AN OLD WHALING PORT NOW BUILDS SUBMARINES**

New London was the chief port of Connecticut for more than a century. In the days of wooden ships its whaling fleet sailed the seven seas, but the last of those vessels went out of commission in 1909.



The ships are gone, but the saltiness of sailor life remains. Here are the U. S. submarine base and the U. S. Coast Guard Academy (Color Plate X). I quote Melville Chater's comments on the Academy:

"Upon arrival at that complex of handsome buildings over the Thames, from what his future lingo will describe as 'Oshkosh and points west,' the underclassman is forthwith initiated into the salutary fact that he knows nothing, but yet may, by the grace of God and his superiors,

"With the aid of nine swab-rules and the twelve holy regulations of the salute, his feet are led into wisdom's path. He learns that the Coast Guard service means a lot of things, from functioning as part of the Navy in wartime, to saving life and property, destroying derelicts, assisting vessels in distress; from the prevention of smuggling and the protection of Alaskan wild life, to flood relief, ice patrolling, and annual cruises northward for marine surveys."

On the Thames at New London is the course of the Yale-Harvard boat race. Here in June I had the pleasure of riding in the observation train along the shore to see the two varsity crews in a fine struggle. This year was a sad one for Yale; the Harvard crews, varsity, junior varsity, and freshman swept the river. But Yale was not downcast. There is always another year.

An important New London industry is the electric boat company which manufactures submarines.

Besides electric boats, New London now manufactures silk, bed comfortables, collapsible tubes, and machinery. There are fine old houses, a summer colony, and the Connecticut College for Women.

From New London we turned northwest and drove through delightful country of tree-clad hills and rushing brooks up to Middletown, seat of Wesleyan University, founded in 1831, one of the oldest sectarian colleges in the United States. The newcomer would hardly suspect as he goes along the shaded streets that Middletown, too, is a manufacturing center. Yet here are made noiseless typewriters, metal pumps, marine hardware, silk, dress shields, rubber goods, and silverware.

#### EIGHT GENERATIONS HAVE HAMMERED AT THE SAME FORGE

Down the Connecticut River, chief artery of trade for the early settlers, we drove to East Haddam to see the little schoolhouse

where Nathan Hale taught (page 304). What a hero, whose only regret as he stepped under the gallows at New York was that he had only one life to lose for his country!

Our survey of Connecticut was to end on a quiet note, yet a note in perfect tune with the industrial symphony. It was at Essex, once a famous shipbuilding center, now a quiet village of old homes like Old Lyme and Clinton, that we visited Pratt's Village Smithy (page 317).

The proprietor handed me his letterhead. At the top, to the right of a picture of the shop, I read the words, "General Jobbing, Horse Shoeing, Antique Reproductions," and on the left, "James Lord Pratt, Proprietor, Successor to Edwin—1870, Elias—1827, John—1811, Asa—1756, Lieutenant John—1744, John, Jr.—1726, John Pratt—1678. Founded on this spot 1678."

Pratt's Village Smithy has been handed down from father to son for eight generations, and it has been operated exactly where it now stands for 260 years! The present proprietor is the last of his line, for he has no children.

#### THE SPIRIT OF CONNECTICUT

At the forge fed by wood from a pile beside the door some of his helpers were heating bars of iron and bending them into ornamental shapes to repair the back of an antique bench.

"We do a lot of this," he told us. "Folks nowadays like old-fashioned things like hand-hammered hinges and door handles."

He pointed to a rough design sketched in chalk on a wooden slab just outside the door. "There's a pattern for a set of andirons," he said. "I drew it so's the boys would have something to go by."

"Suppose the rain washes it out?" I inquired.

"There's no worry." He tapped his head. "It's all up here."

All in a workman's head! That is the answer.

Industry, thrift, ingenuity, a spirit of friendly helpfulness, courage undaunted, and an abiding love of home and country—these are the qualities that have built the State of Steady Habits. As "the world globes itself in a drop of dew," so the finest and most abiding characteristics of the true America are to be seen in this little Commonwealth. A troubled world can learn a saving lesson from Connecticut.

OLD AND NEW BLEND IN YANKEELAND

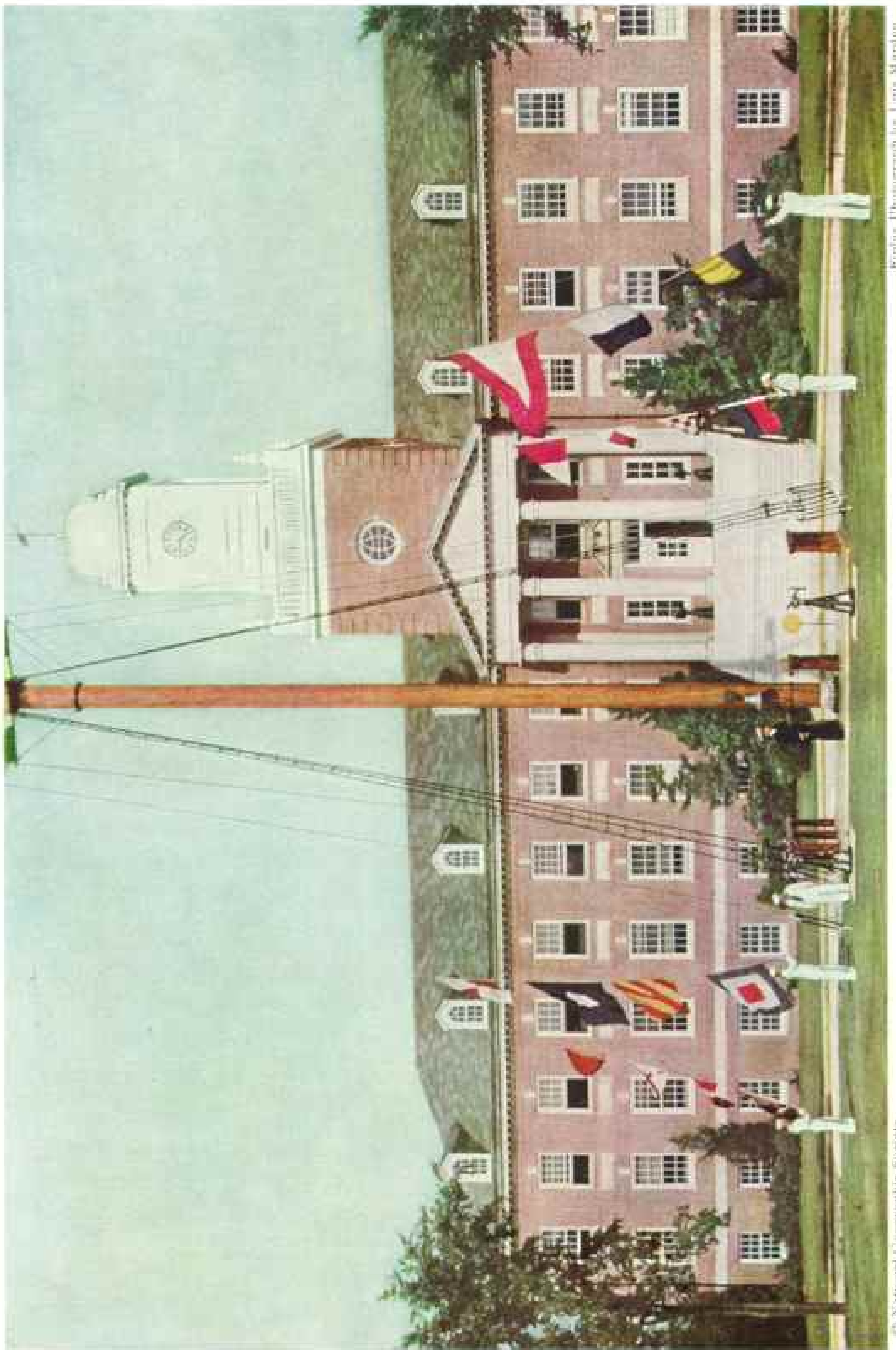


© National Geographic Society

Dufay color Photograph by Willard R. Culver

SOUTHWEST CONNECTICUT IS AN EDEN OF GRACIOUS COUNTRY HOMES

Attracted by the quiet of the green and rolling hills, New York celebrities have literally colonized the fringe of the State from Long Island Sound to the Berkshires. James J. (Gene) Tunney and his family enjoy healthy country life at Long Ridge near Stamford.

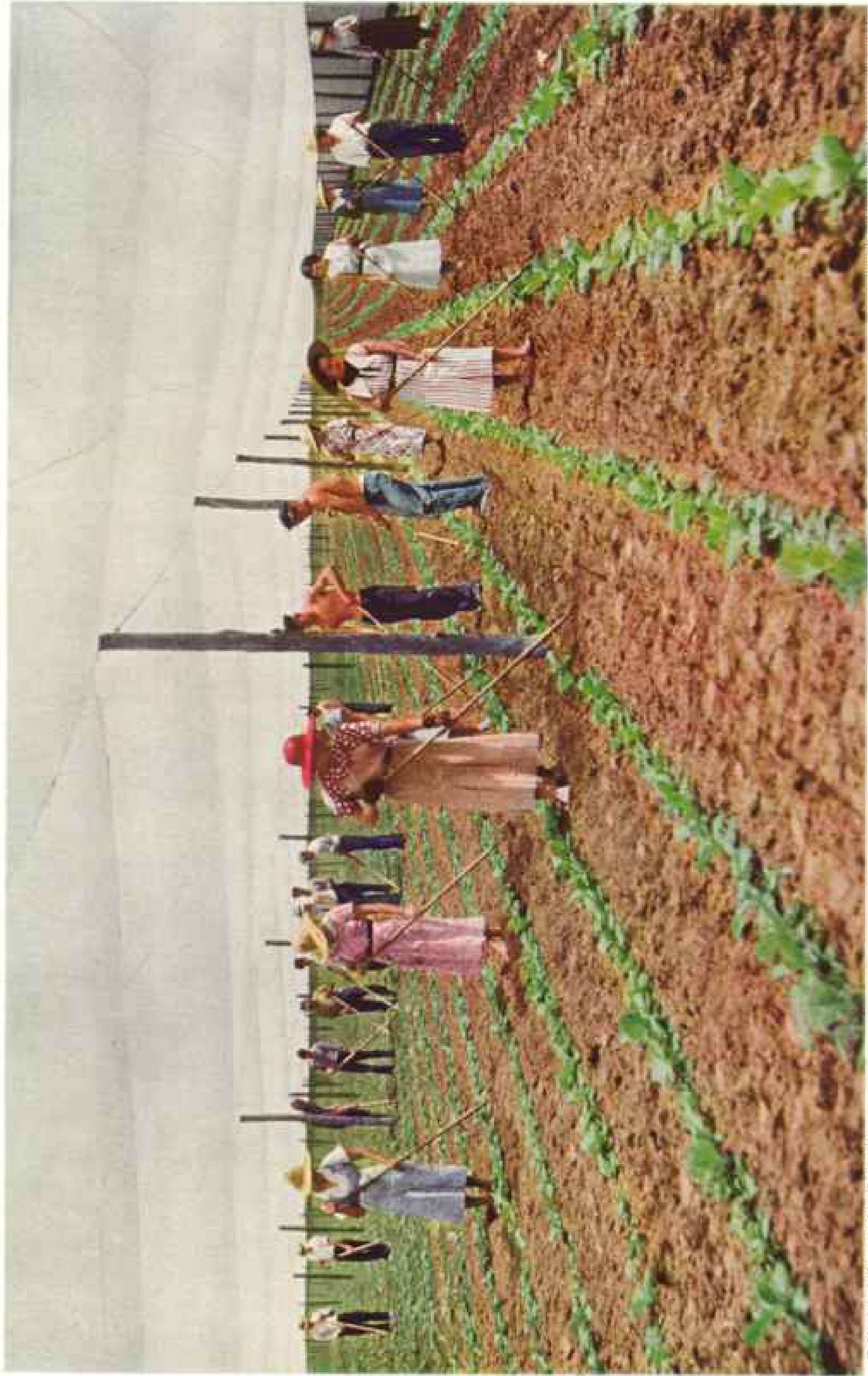


© National Geographic Society

Friday Photograph by Louis Murdin

AT THE UNITED STATES COAST GUARD ACADEMY, NEW LONDON. OFFICERS ARE TRAINED TO SAVE LIVES

Cadets who run up signal flags on the practice huliyards in front of Hamilton Hall will, after graduation, be ready to aid vessels in distress, rescue shipwreck, flood, and hurricane sufferers, enforce immigration and customs laws, and suppress smuggling.



© National Geographic Society

Finley Photograph by Lada Maerten

**ACRES OF CLOTH CANOPIES SHADE TOBACCO GROWS FOR CIGAR WRAPPERS**

In summer the Connecticut Valley is white as far as the eye can see with a succession of "big tops" stretched over the fields. The area is the world's largest producer of such tobacco. Under the tents the air is swelteringly humid (Plate XII).



Finlay Photograph by B. Anthony Stewart

SHADE-GROWN TOBACCO RISES ALMOST TO THE CHEESECLOTH CEILING

Leaves thus protected cure mild and light colored. Though high winds and hail are rare in the Connecticut Valley, they sometimes wreak havoc on the huge, frail tents (Plate XI).



© National Geographic Society

Finlay Photograph by Luis Marden

NO QUESTION THAT LOBSTERS ARE FRESH AT A POUND NEAR WESTON

They are kept in sea water pumped up from the Sound 50 yards away. The customer picks out the wriggling one he fancies and watches it boiled, broiled or baked to order.

OLD AND NEW BLEND IN YANKEELAND



Finlay Photograph by B. Anthony Stewart

THOUSANDS ENJOY FREE BATHING AS GUESTS OF CONNECTICUT

Operated by the State, popular Hammonasset Beach on Long Island Sound provides visitors with tenting areas, bathhouses, and dining pavilions.



© National Geographic Society

Finlay Photograph by Willard R. Culver

CHILDREN BRING A TOUCH OF SICILY TO PINE ORCHARD

At the annual Fourth of July parade in this shore resort, these youngsters won a prize with their gaily bedecked pony and bright peasant costumes.



Finlay Photograph by Louis Muesler

AT HARTFORD IS THE AERONAUTICAL CENTER OF THE EAST

Propellers of incredibly perfect balance, Wasp and Hornet engines, and other aircraft equipment are manufactured in Connecticut's capital city. The United States Government buys most of the products of the several plants.



© National Geographic Society

Finlay Photograph by Edwin L. Washford

BEFORE SHIPMENT EVERY MACHINE MUST PLEASE EXPERTS

Hundreds of typewriters are made daily in two large factories in Hartford. The standard model contains 1,700 parts, the portable about 1,300. Each adjustment is checked for absolute precision.



Finlay Photograph by Edwin L. Wisbeck

WATERBURY WAKES THE WORLD

Every day thousands of alarm clocks are turned out in the "Brass City." These bright-hued time-pieces, faces decorated with Mickey Mouse and other fancies, are a far cry from the costly wooden-works models of early days.



© National Geographic Society

Finlay Photograph by Luis Martin

YOUNG AMERICA BUILDS DREAMS WITH NEW HAVEN TOYS

In one of the largest factories in the city, Connecticut ingenuity solves the entertainment problem for the boy mechanic, chemist, or electrician, turning out ever-new and more fascinating devices.





© National Geographic Society  
Three-Color Photograph by Willard R. Calver  
GILBERT STUART'S ORIGINAL PORTRAIT OF WASHINGTON HANGS IN THE STATE LIBRARY BUILDING AT HARTFORD

## TRANS-AFRICA SAFARI

### A Motor Caravan Rolls Across Sahara and Jungle Through Realms of Dusky Potentates and the Land of Big-Lipped Women

BY LAWRENCE COPLEY THAW AND MARGARET STOUT THAW

*With Illustrations from Photographs by Mr. Thaw*

FOR six months we drove, pushed, pulled, forded, and ferried our motorized caravan over an erratic 11,000-mile course reaching down from the Mediterranean across the Sahara to the Atlantic, then across equatorial Africa almost to the Indian Ocean.

The six months of safari took 13 months of preparation, before our party of four whites and eleven native servants were loaded—together with seven tons of equipment—into two trucks and a light car, in front of the St. George Hotel in Algiers.

Finally the last interminable Algerian customs form was filled in; Major G. H. Anderson, our white hunter, had bailed the last of our native boys out of the calaboose, where a spending spree had landed most of them; and Tom Hogan, our camera man, had checked over our formidable array of photographic apparatus. After more than a year of paper work and headaches we were ready and bade farewell to polyglot Algiers.

For the first 200 miles south of Algiers, across the Atlas Mountains and as far as Laghouat, we had excellent roads. Shortly thereafter they began to deteriorate. A hundred miles farther on they had degenerated into tracks. This they continued to be, with the fortitude of the moribund, for another hundred miles or so, and then gave up the unequal struggle with the ever-shifting Sahara sands. From here on we progressed by guess and God and compass.

We had truly left all civilization behind and our hearts beat high (map, page 330).

#### TRAGEDY RIDES A TRUCK

Our spirits fell with a thud, the third night out, when one of our heavy trucks went into a ditch, toppling over with a terrifying crash. Three of our boys, who had been sitting on top, jumped clear; but the fourth, our cook, Saïdi, was crushed and two days later died.

Saddened, we continued on our way. As

far as the eye could reach, there was nothing but a flat expanse of sand and an occasional pile of rocks.

We camped each night at sunset, pitching our tents in the sand, and ate our tinned food by lantern light at a dinner table set under the stars. Dead tired, we would be asleep by nine o'clock, to awaken before daylight and start on just as that most beautiful thing in the world, dawn in the desert, was breaking.

After Ghardaïa we entered the country of rolling sand dunes skirting the Great Western Erg, a difficult area to cross in cars. We paused a few days to rest at the lovely oasis of El Goléa (page 328), and continued on to the desert fortress of In Salah.

#### ICE FROM OIL REFRIGERATORS

Lonely In Salah lies in the heart of hundreds of miles of drifting dunes. Parts of the fort's walls are completely engulfed by the ever-moving talcum powderlike sand. Here we were royally entertained by the four Foreign Legion officers who command the garrison of this French outpost; with the aid of our kerosene-operated refrigerators, we served them the first iced drinks they had tasted in months.

Fifty miles south of In Salah the country changed. We crossed the vast plain of rocks, flat and gradually rising, with fewer and fewer large sand dunes but plenty of soft drifted sand to impede our progress. If the drifts were very wide, we sought a way around them; if small, we took them by rushes. When one of the heavy trucks—weighing over six and one-half tons with its load, and speeded up to 35 or 40 miles an hour—hit a drift, it was as if someone had suddenly applied the brakes.

We learned to stop immediately, if we didn't quite make it. Any attempt to continue, or to back up, once momentum had been lost, meant only digging ourselves in deeper. We had to shovel the sand from in front of all four wheels, let most of the



GASOLINE AS WELL AS WATER FLOWS AT THE OASIS OF EL GOLÉA

Built of concrete, in conventional style, the filling station would not be out of place in an American or European city. Mileage signs are in kilometers; Tombouctou (Timbuktu) lying 1,425 miles away, across the sand "ocean." At this desert garden spot, 450 miles south of Algiers, wells keep alive cypress trees and other vegetation. Thirty Europeans and 400 Arabs, nearly all traders, transact business with travelers. One of the most important personages is the camel butcher.

air out of the rear tires to give them greater traction, and place wire grids in front of the wheels. Then, with good luck and a lot of shoving, we got through.

Thanksgiving Day found us a thousand miles south of Algiers, in the black basaltic foothills of the Ahaggar, or Hoggar, Mountains, that little-known range which rises out of the midst of the Sahara to more than 9,000 feet.

#### DELUGE IN THE DESERT

Picking our way between Gargantuan boulders, we entered the mountains themselves through deep gorges, perfect setting for a Wagnerian opera.

Suddenly it began to rain. It rains only once every two or three years in the middle of the Sahara; but when it does the elements certainly make up for lost time. In a few moments the dry watercourse at the bottom of the gorge along which we were traveling was a raging torrent, three or four feet deep, which merrily bounced along boulders as big as our heads.

Just as our light car was crossing the

stream the flood descended. There was a terrifying rush of muddy water and a rattle of stones against the sides of the stalled car. Our first thought was for the camera equipment. We yelled to the boys, who had stopped the trucks on higher ground, to throw a rope. This we quickly fastened to the car and, using it as a life line, the boys slowly bore the cameras and films to safety.

The rushing waters threatened to carry the car away any minute. Faithful Mwinyi-faki took Peggy in his arms and started for shore. The load was too much. He slipped and both of them went under, but quick hands hauled them to the bank. With a truck we slowly pulled the light car from its perilous position to higher ground.

#### SNOW OVER SAHARA

Fortunately, the rain stopped as suddenly as it had begun. Had it continued, the entire gorge would have filled; and, while we might have scrambled up the rocky slope, the cars and all equipment would have gone.

We reached Fort Laperrine (Tamanrasset), in the heart of the Ahaggar, just at



AKHAMOUK, KING OF THE DESERT TUAREGS, "CHIATS" WITH MRS. TILAW BY SIGNS

The veiled ruler of a vast desert realm entertained the authors at a bountiful luncheon in a large but exceedingly low and stuffy tent, made of gazelle skin (page 330). He ordered his followers to dance for his guests. Variations in rhythm were ordered by drumbeating. Camels took part, keeping time to the weird music like circus horses. Ice cubes and radio mystified the potentate.

dusk. It stands at an altitude of over a mile, and on every side towered massive peaks sprinkled with snow. In the west the sun was setting in a riot of color that only the desert traveler knows. The mountains shaded from fiery red to deep purple, and in a sky of deepest Mediterranean blue an orange full moon rose majestically.

We were now in the country of the Tuaregs, those strange, wild wanderers of the Sahara. Probably descendants of Berbers driven into the desert by the Arab invasion of North Africa in the 11th century, they have as their domain a million and a half square miles of the Sahara, nearly half the area of the continental United States. Though some serve under the French flag (Plate I) most of them have a fierce hatred of foreigners.

We were fortunate in locating the Amenokal, or king of the Tuaregs, not over 100 miles from Fort Laperrine. As we hoped to spend several days filming these people, we sent a messenger ahead on a racing camel to announce our coming and bear appropriate presents of tea and sugar. The Commandant of the fort courteously sent along

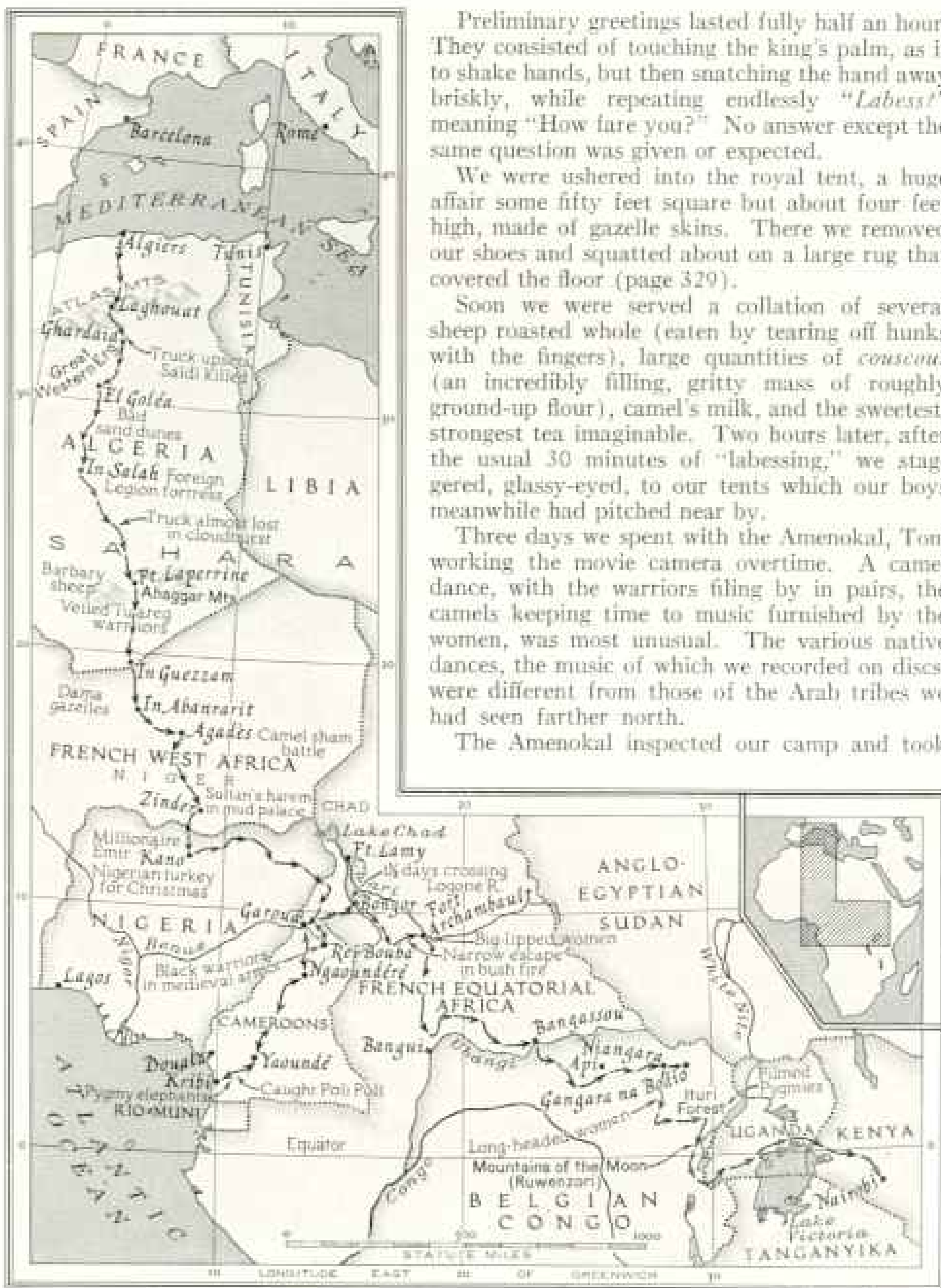
with us a file of soldiers and two French officers—just in case!

Seven hours of hard going brought us to Amenokal Akhamouk's camp, a collection of low camel-skin tents, pitched in the shelter of a large sand dune dwarfed by a 9,000-foot mountain of tumbled stone immediately behind it. Approaching this movable capital, we heard the dull booming of drums and a weird wailing, a chant of welcome.

#### THE COURT OF VEILED MEN

As we stopped, a stately group of twenty chiefs, the Amenokal in the middle, advanced to welcome us. All were swathed in dark purple flowing robes, with black turbans extending down to their eyebrows. Black veils covered their faces, so that only coal-black eyes could be seen, giving them an unpleasantly ferocious expression.

These veils, rarely removed, are worn only by the men, the women not covering the face at all (Plate II). The men carried slender steel spears, short but razor-keen daggers strapped to the forearm, swords of Roman design, and large camel-skin shields.



Drawn by Newman Dumstead.

#### ON SAFARI—FROM ALGIERS TO NAIROBI OVER DESERT AND JUNGLE

From Laghouat to Zinder the route of the Thaw expedition led over desert; from Zinder to the Atlantic, and across the waistline of the continent, difficult paths wound through the swamps and jungles of Nigeria, the Cameroons, French Equatorial Africa, the Belgian Congo, and Uganda. When the motor caravan reached its goal at Nairobi, Kenya, the speedometer of the light car in which the authors traveled registered 11,516 miles, which included numerous side trips; those on the two trucks which carried supplies and equipment showed 7,800, a figure close to the true road distance. The inset shows the area covered—two thick slices of Africa, north to south, then west to east.

Preliminary greetings lasted fully half an hour. They consisted of touching the king's palm, as if to shake hands, but then snatching the hand away briskly, while repeating endlessly "*Labess!*" meaning "How fare you?" No answer except the same question was given or expected.

We were ushered into the royal tent, a huge affair some fifty feet square but about four feet high, made of gazelle skins. There we removed our shoes and squatted about on a large rug that covered the floor (page 329).

Soon we were served a collation of several sheep roasted whole (eaten by tearing off hunks with the fingers), large quantities of *couscous* (an incredibly filling, gritty mass of roughly ground-up flour), camel's milk, and the sweetest, strongest tea imaginable. Two hours later, after the usual 30 minutes of "labessing," we staggered, glassy-eyed, to our tents which our boys meanwhile had pitched near by.

Three days we spent with the Amenokal, Tom working the movie camera overtime. A camel dance, with the warriors filing by in pairs, the camels keeping time to music furnished by the women, was most unusual. The various native dances, the music of which we recorded on discs, were different from those of the Arab tribes we had seen farther north.

The Amenokal inspected our camp and took

childish delight in everything he saw. The radio thrilled him; the refrigerators and their ice cubes he could hardly leave.

When we had him make a speech into the sound-recording apparatus and immediately played it back to him, his amazement knew no bounds. He touched and fingered nearly every article in the camp, all of which Peggy insisted be scrubbed subsequently. Washing is not among the Tuareg's virtues, his waterless domain being probably responsible; and after his 30 or 40 bathless years it is best not to get to leeward of him.

#### FROM FRYING TO FREEZING

How the Tuareg, in his cotton robes, stands the extremes of desert heat and cold is a mystery. In the early afternoon, in the sun, the temperature sometimes reached 160 degrees Fahrenheit and at night it sank well below freezing.

Once, in experimental mood, we broke an egg on a sun-heated rock. It sizzled and fried. Early next morning, starting to brush our teeth, we found that water left in a container on the same rock had turned to ice.

We used anti-freeze in our cars.

A hundred miles south of Fort Laperrine we ran out of the Ahaggar Mountains. Gradually the character of the country changed. Rocks and sand dunes became interspersed with parched vegetation and game appeared. We shot several tiny Dama gazelles and had our first fresh meat (other than sheep, goat, or camel) in weeks. At In Guezzam, a small fort, we crossed the frontier that divides Algeria from French West Africa, and rolled on toward Agadès.

For centuries Agadès has stood, a trade center at the intersection of important caravan routes. The city of 3,000 huts sprawls untidily over a rolling, arid countryside and is dominated by a towering minaret.

The night after our arrival brought the new moon which signaled the end of the month of Ramadan, most sacred of Mohammedan fasts. Broadway at 42d Street on New Year's Eve is tame by comparison with the noisy celebration that lasted all night and only broke up at dawn with a pilgrimage to the cemetery for prayer.

#### CAMEL RIDERS IN DANGEROUS DUELS

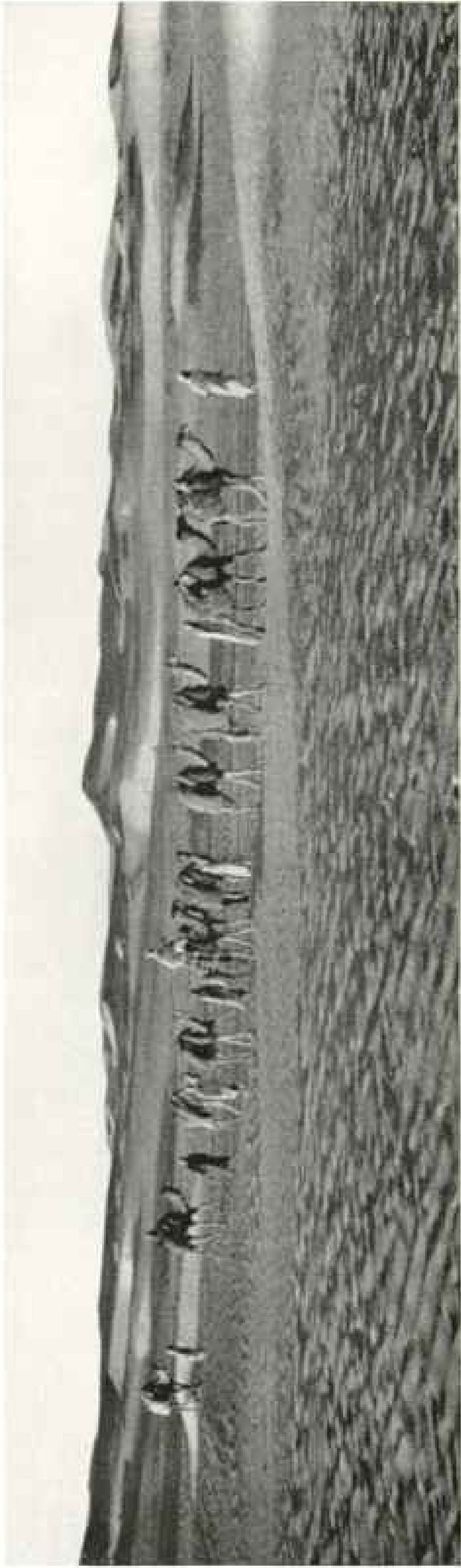
Continuing their celebration, the inhabitants that afternoon staged a sham battle, a most bloodthirsty appearing affair.

Eight white camels, magnificently matched, raced in from two sides of the

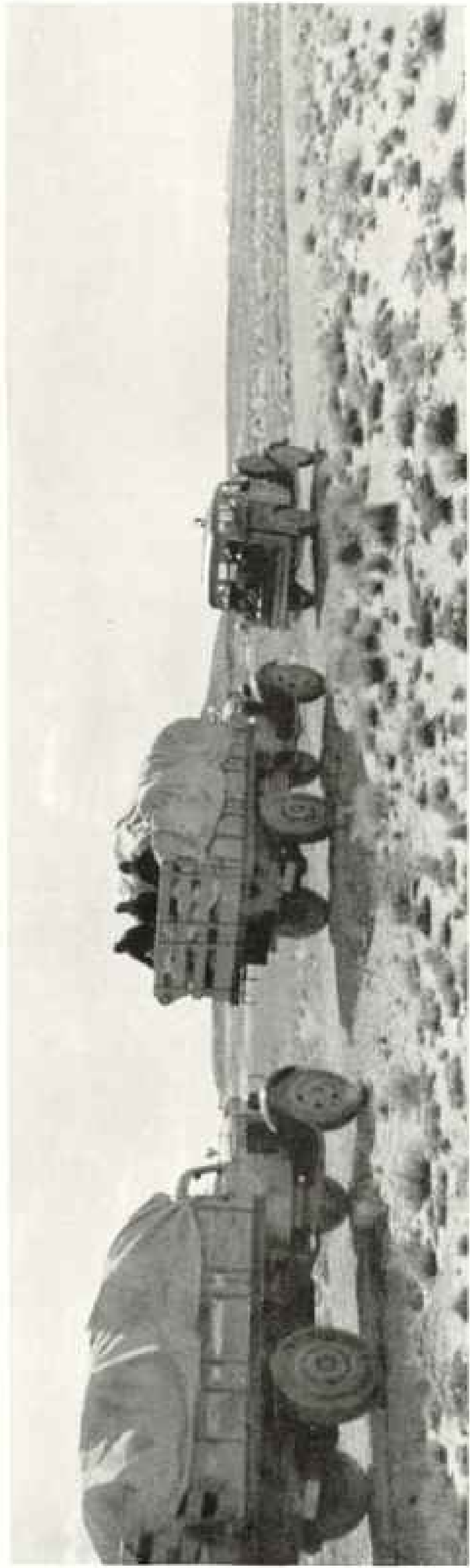


#### A STROLL, A NAP, THEN OBLIVION!

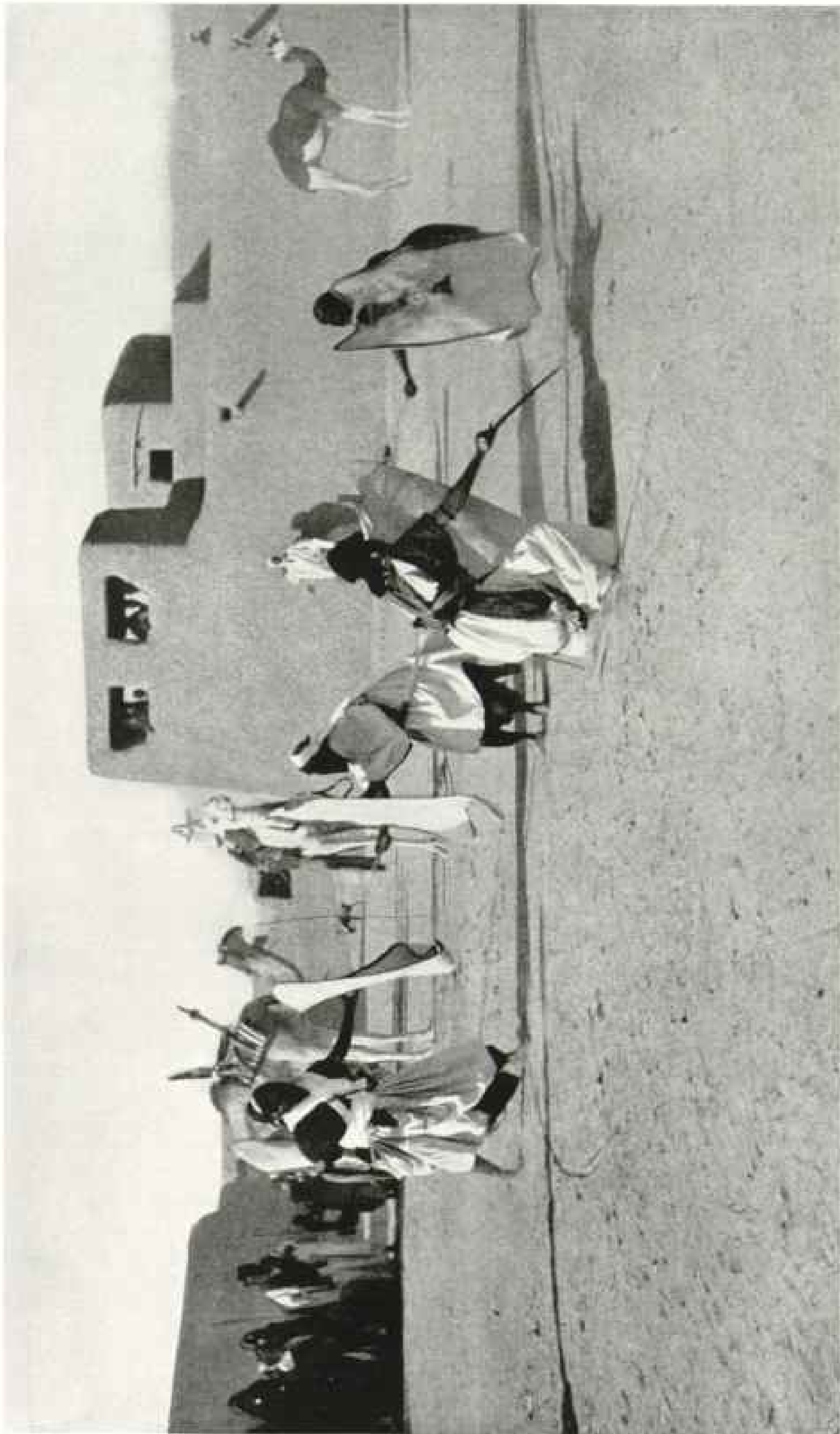
In the jungle near Kribi, the Thaw caravan acquired Poli Poli, a baby gorilla about a year old. He insisted on much attention, like a spoiled child, and begged constantly to be carried by his "nurse." The little fellow was dignified (when awake) and never up to mischief like the pet chimpanzee who joined the expedition about the same time (p. 351.)



SHIPS OF THE DESERT STILL PUSH THEIR WAY FROM OASIS TO OASIS, DESPITE COMPETITION OF TRUCKS AND BUSES  
Rolling sand dunes on the edge of the Great Western Erg form a backdrop for a familiar Sahara scene—a camel caravan.



WHERE THE ATLAS RANGE MEETS THE SAHARA, A MODERN CARAVAN STARTS ITS LONG TREK ACROSS THE SEA OF SAND



FRENZIED TUAREG DUELLERS LEAP FROM THEIR CAMELS, HURL SPEARS, THEN "FIGHT" WILDLY WITH SWORD AND SHIELD.

Battling on the ground consists largely of footwork, in which standing broad jumps, forward, backward, and to the side, predominate. Shields are made of camel hide, and the swords, quite Roman in design, are razor sharp. The sport often gets out of bounds as excitement grows among the participants, and they are apt to do each other serious injury. Duelling lasts until nightfall (page 331). In the background rises one of the buildings of Agadès, a trade center at the intersection of several important caravan routes. This city of 3,000 huts was in existence in the 15th century.





GIPTS OF LIVE CHICKENS AND DUCKS COME FROM THE SULTAN OF ZINDER.

Arriving at the southern edge of the Sahara, the authors were welcomed by the ruler of this kingdom of 20,000 Hausas (Plate II). He presented to Mrs. Thaw a fine cloak and sent servants to her tent with dates and eggs. His Highness had dispatched a troop of horsemen to escort the travelers to his court (see text below).

public square. Their riders, leaping to the ground, hurled spears and then went for each other furiously with sword and shield. Never had we heard such a noise as the clashing of the weapons and the demoniacal yells of the veiled duelists. They lashed away wildly until the light failed, when, miraculously, they were still unhurt (p. 333).

Agadès marks the southern boundary of the land of the Tuaregs. As we progressed southward we entered the country of the Hausas, of negroid stock.

Zinder, on the southern edge of the Sahara, is the most important city in the eastern part of French West Africa. The morning after our arrival, we were awakened by our boys with the news that a messenger from the Sultan was waiting to conduct us into his presence (Plate II).

A short ride in the light car brought us to the palace gates, where we found a goodly part of the royal bodyguard drawn up to receive us. Passing between a double line of cavalry, men and horses caparisoned in the most vivid hues, we were received by a venerable black who, from his silver staff, we took to be a sort of lord chamberlain.

We followed him through the palace gate into a large courtyard, Tom bobbing around with two cameras and with three of our boys as assistants, recording every detail.

At the end of the courtyard, seated on a throne and shaded from the sun by an enormous parasol held by a slave, was the Sultan. At sight of him the several hundred soldiers and nobles who followed us into the courtyard prostrated themselves. While he made a short, incomprehensible, presumably cordial speech of welcome to us in a high-pitched nasal tone, slaves were edging around the throne, laden with presents. These consisted of a fine burnoose for Peggy and a seemingly endless supply of live chickens and ducks.

#### HAREM IN A MUD PALACE

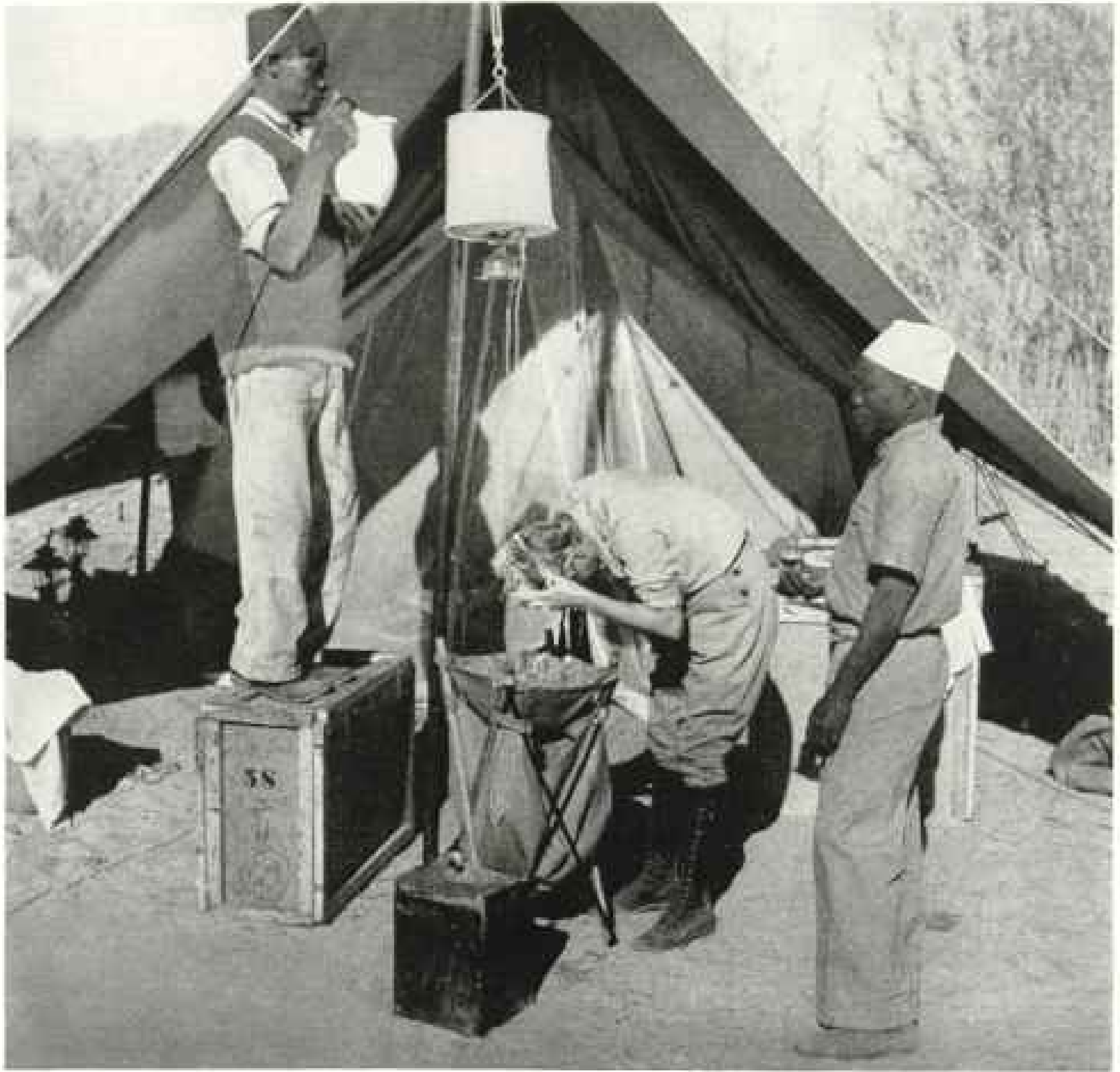
We adjourned to his apartments, in the baked-mud palace, and, with the aid of an interpreter, who spoke a little French, carried on a rather difficult conversation.

We gathered that he and his people were Mohammedans; that he had the legal four wives and some forty concubines, a small number surely for a monarch of his



LIKE AN AFRICAN WINGED MERCURY, THE EMIR OF KANO DONS OSTRICH-FEATHER SANDALS

Absolute ruler over 2,000,000 Hausas; the potentate is reputed to be one of the wealthiest chieftains in Africa. He traveled to London and was presented to King George V in 1934. In Kano, capital of northern Nigeria, dwell 80,000 natives. Nearby is a British settlement of 300, to look after Empire commerce.



THE DESERT CROSSED, MRS. THAW ENJOYS A SHAMPOO—HER FIRST IN A MONTH

Water becomes plentiful once more, after leaving Zinder, so two boys and her husband's shower bath go into action, much to the wonderment of the native assistants. Pitcher service was necessary—the shower holds only five gallons of water!

standing. As to children, he was a little vague. One judged he had not counted them recently.

The 180-mile track that led south from Zinder, over the frontier of Nigeria, to Kano, was shocking. It cracked a brake drum and completely ruined our dispositions; but Christmas was approaching and the thought of being able to spend it in the luxury of a large center cheered us on.

Kano is an amazing place. About three hundred whites live a British life here in the depths of Africa, with their cricket, polo, tennis, and a country club on the outskirts of a huge town of some 80,000 Hausas. The natives, ruled by an Emir, live much as they have for centuries, quite

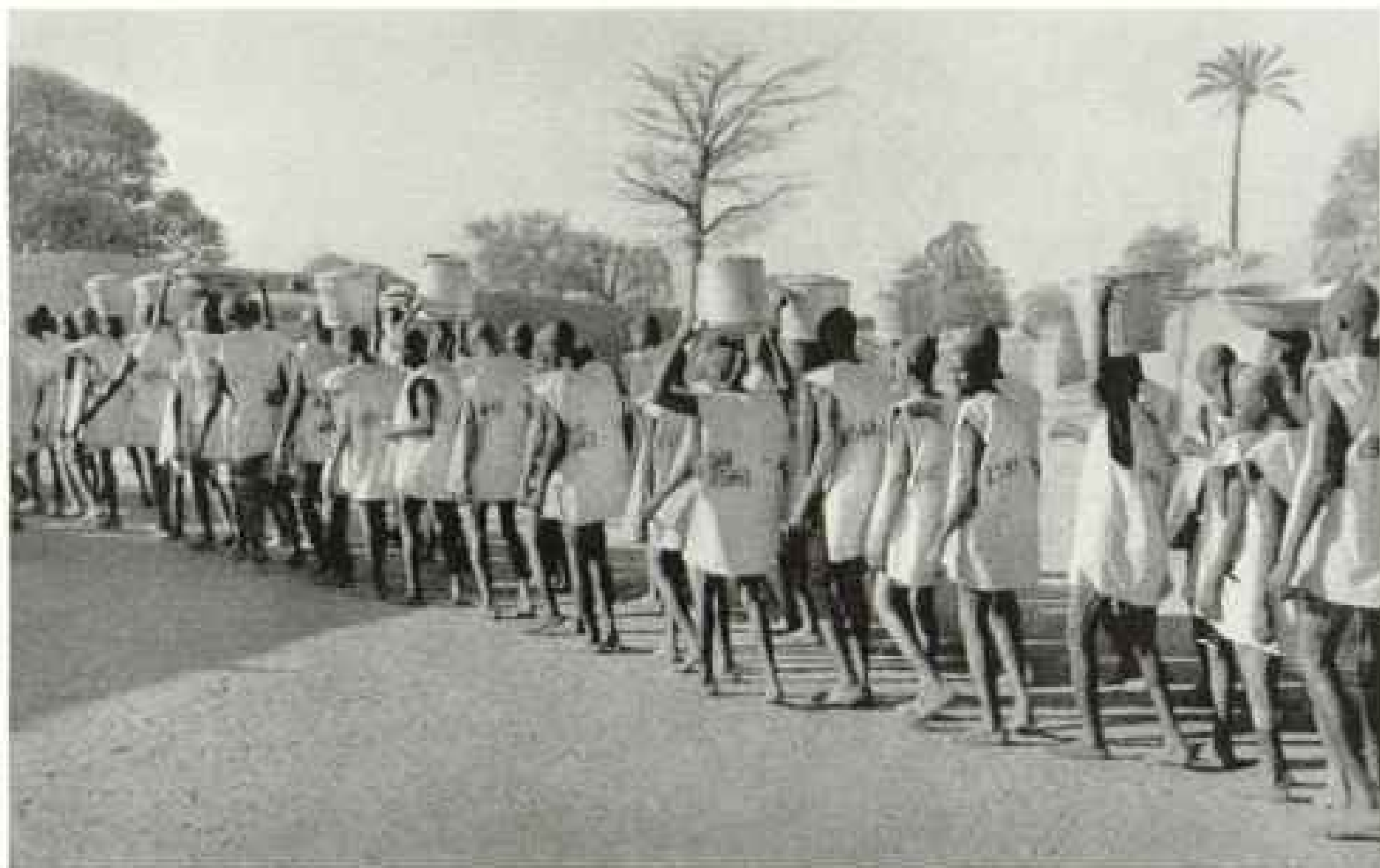
undisturbed by, and in perfect amity with, the handful of "white lords" only a short distance away (page 339).

We moved into the railway resthouse, a luxury after two months of tents, and called to make inquiries of the British Resident regarding the propriety of photographing the Emir and his city.

#### THE LOUIS XIV OF AFRICAN KINGS

The Resident was cordial, but explained that the Emir, with his large annual income from Great Britain and upwards of half a million dollars of private revenues, was far from being an ordinary chief.

He has absolute powers over nearly two million subjects and is one of the most



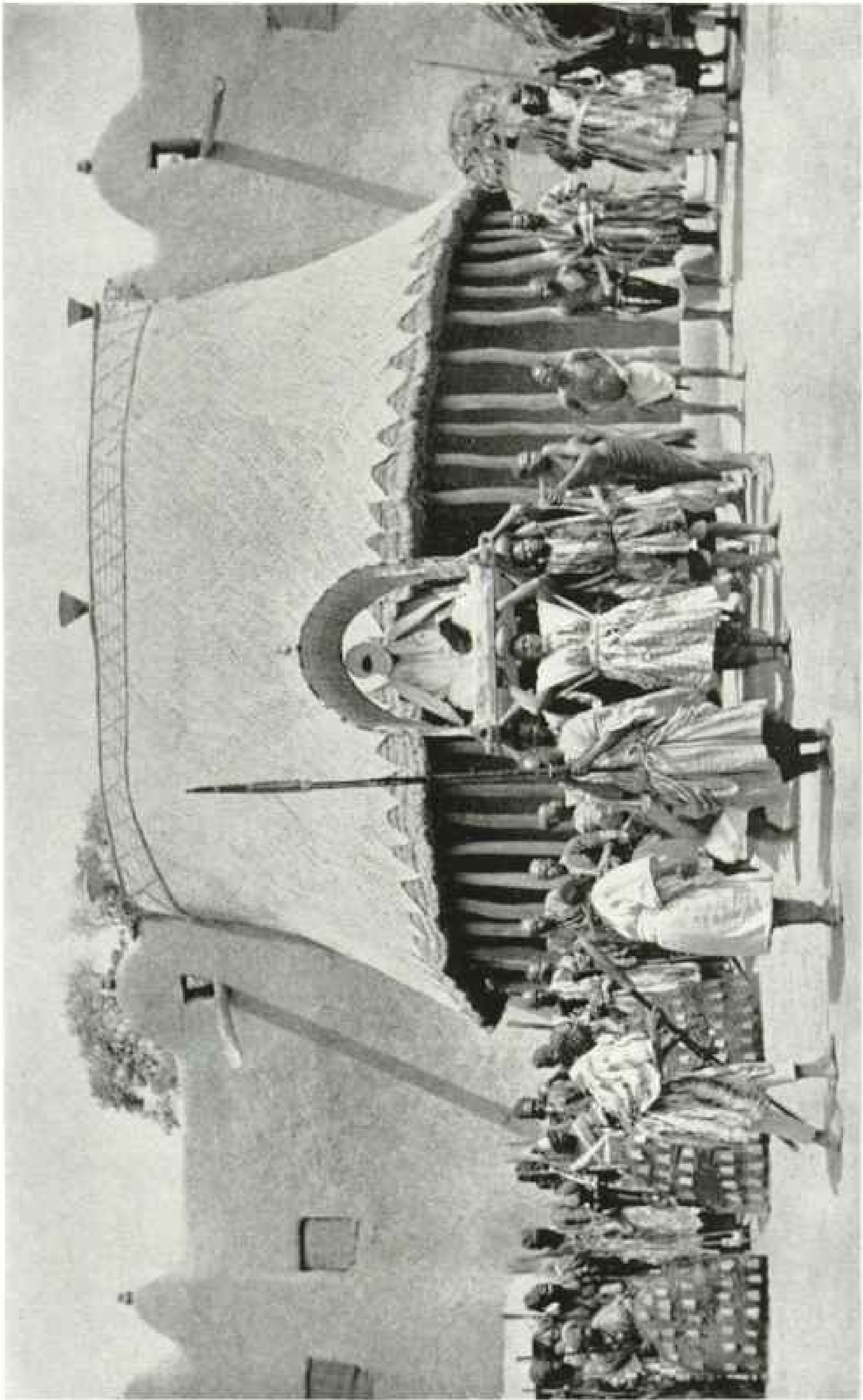
PRISONERS BEAR NUMBERS IN KANO, BUT JAILERS WEAR THE STRIPES

Although no guards appear in the picture, Mr. Thaw reports that their garb was similar to the traditional attire of convicts in the United States. The Emir conducts courts of law for his subjects, although, when a death penalty is pronounced, an appeal may be made to the British Resident.



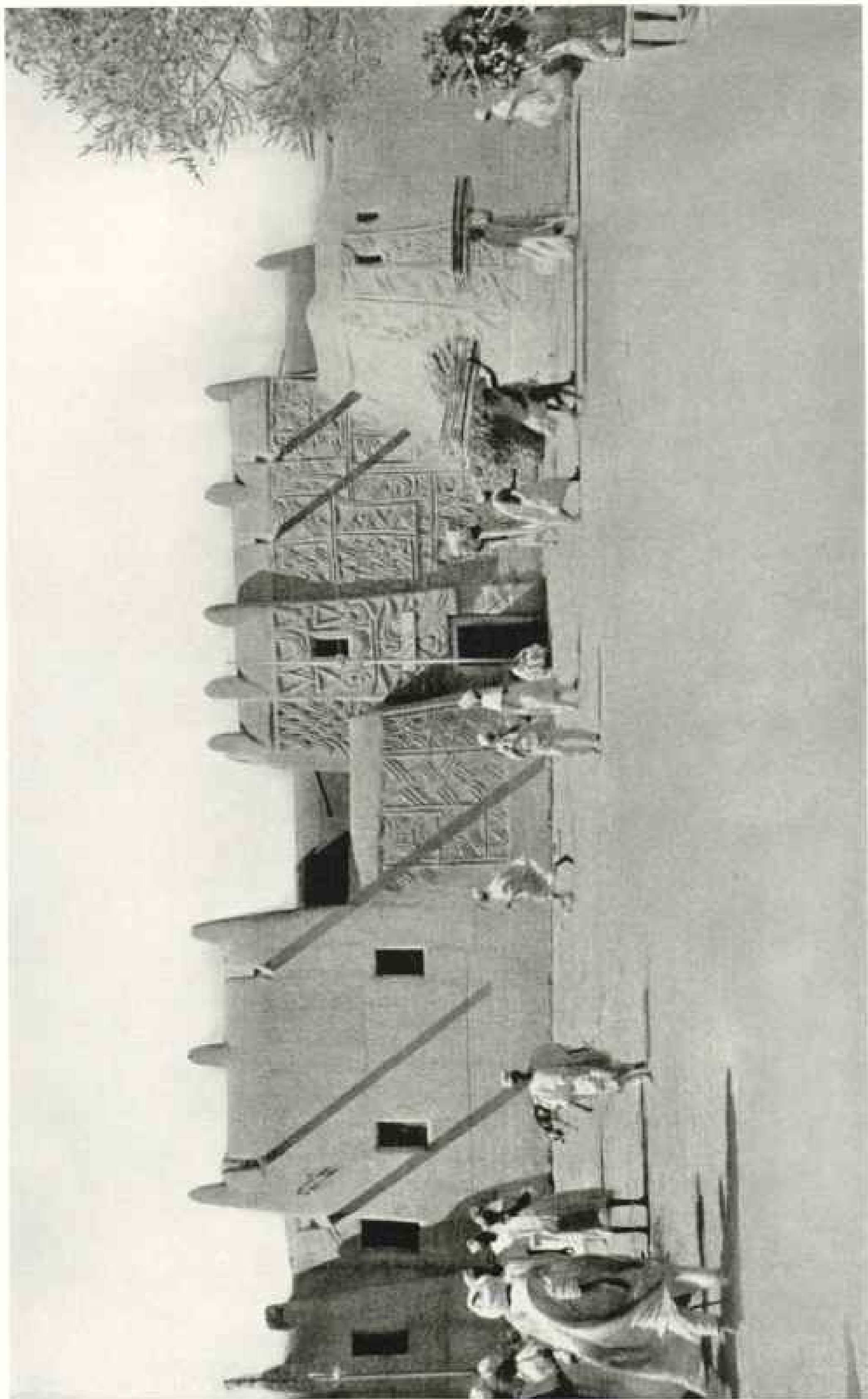
WARES OF BRITISH MANUFACTURE FILL A NIGERIAN BAZAAR

Unloaded from ships at Lagos, merchandise is brought to Kano by rail. Here, also, Tuareg and Arab merchants barter with businessmen from Lake Chad, the Niger, and far southern cities.



BORNE MAJESTICALLY ON THE HEADS OF SLAVES, THE MONARCH OF KÉI BOUBA BEIGNS TO BE SEEN BY HIS SUBJECTS

Seated in an elaborately decorated sedan chair, the Lamido is carried to a vantage point where he may review his army. He weighs 300 pounds and is nearly six and a half feet tall. Infantrymen form a guard of honor at the left (Color Plate IV). A prolonged ovation by several thousand subjects preceded the parade. The Lamido was unable to understand why Mr. Thaw should be accompanied on such a long safari by only one wife! He seemed sceptical when told that rigors of travel prevented more wives from making the journey (page 354).



KANGO BUILDERS IN BAKED MUD HAVE DEVELOPED THEIR OWN STYLE OF ARCHITECTURE

Walls of the city are 11 miles in circumference. The gates are made of cowhide, set in the massive entrance towers. On the outskirts lies the English colony. Cricket, tennis, and polo flourish at a country club here in the heart of Africa. Within the walls inhabitants crowd a maze of alleys flanked by sun-baked huts.



THE ROYAL EXECUTIONER OF GAROUA

He hits his victims over the head with the loaded stick, although sometimes he uses an ax. Proudly he displayed to Mrs. Thaw the contents of the pouch hanging from his neck—souvenirs of some of his unfortunate victims (page 341).

important, certainly the richest, of Africa's native kings.

We suggested that an ambassador be sent to the imperial court to explain to the Emir that we desired to perpetuate him and his people on film.

The next morning 300 horsemen of the royal guard were drawn up in front of the resthouse, the sun reflecting every color of the rainbow from their patch-quilt costumes and gleaming from their spears. Accompanying them was an interpreter who could not address a word to us without prostrating himself in the dust.

It took two hours for the cortege to cover the distance to the Emir's palace, as Tom, overcome by the photographic possibilities of the scene, halted the procession outside the city gates, while Larry, completely in his element as director, ordered the army in and out of the city five times in spite of intense heat and clouds of dust.

Finally we arrived at the royal abode, a vast collection of elaborately carved mud huts which seemed to cover about as much ground as Buckingham Palace.

We were greeted by a magnificent creature who embarrassed us by the profoundness of his obeisance, and started on what seemed a tour of Versailles but was, in reality, a short cut to the audience chamber. Footsore and weary, we finally arrived and, after much whispering, the heavy curtains were drawn and we were ushered into the Presence.

The throne room, also of mud, had walls and domed ceiling fully 25 feet high and painted with intricate designs of all colors, silver predominating.

The Emir came forward to greet us, in voluminous robes of purple and red, with huge ostrich-feather sandals on his feet (page 335). The interpreter told him we wished to photograph him, his nobles, court, army, city, and people. The unsuspecting monarch assented, whereupon ruthless Tom made him and his heavily robed court stand in the broiling sun for a good hour. We were told it was the first time His Majesty had posed for the movies, and probably it will be the last.

Christmas was made cheerful by the receipt of letters and cables; but it was not until noon that we discovered that we were in the heart of a turkey country. A live turkey was quickly procured; five minutes later off came his head, and the meat was amazingly tender.



ECSTATICALLY DANCES THE SULTAN'S CORPS DE BALLET

Native Garoua girls from 12 to 14 years old portray in rhythmic movements all the activities of the community. Drums beat and maidens nearby sing gaily in accompaniment. The ruler (Plates VI and VIII) staged this exhibition as a mark of his high esteem for the authors (see text below).

Our route now led us across northern Nigeria—a flat, desolate country annually inundated from the swamps of the Chad region, and full of yellow fever—into the north Cameroons. Walled off by high mountains, the former German colony marked the beginning of equatorial Africa. The natives became more primitive, more naked; and the Mohammedanism of the north changed to the paganism of the large majority of Africa's teeming black millions.

THE EXECUTIONER WAS FRIENDLY

At Garoua we picked up our local white hunter, François de Dreuille, who was to take us out for gorilla and pygmy elephant shooting in the south.

The Sultan of Garoua, Ayatou I, tall, dignified, and very black, spoke a little French. He aided us in obtaining pictures.

His executioner, a delightful old rascal who practiced his trade with both ax and club, became an inseparable buddy of Peggy's. He showed her his treasures, which consisted, in part, of the mummified hand of a victim who had cursed him, and the eye of another, from whose severed head he thought he had seen a malevolent gleam. Both he wore around his neck in leather pouches.

As a mark of his high esteem Ayatou staged an exhibition of his corps de ballet for us. In the great court before his hut, bathed in the brilliance of an African moon,



there gathered 20 young girls between 12 and 14 years of age. With an accompaniment of syncopation on drums, and an ear-splitting chant, they performed the most intricate steps in perfect rhythm (p. 341).

All the dances were symbolic and some, notably the Dance of the Virgins, would never pass a strict board of censors. These African natives are simple, child-like creatures, whose symbolism is as primitive as their other instincts.

At Garoua we crossed our first river, the Bénoué, or Benue, and the crossing was typical of many others. The raft was fashioned of five or six large dugout canoes lashed together, with a platform built over the whole. If the canoes were large enough, or if we could get enough of them, the raft would support a loaded truck. If not, the trucks had to be unloaded and sent over empty. Often we lost half a day getting the whole safari over a wide river.

If the river was shallow the raft was poled; if deep, paddled; but in either event rhythm would have to be provided for the human machinery of our clumsy vessel. It is easy, in this land, to see where our American negro gets his love of jazz and syncopation. No rhythmical work, such as paddling or poling, is accomplished without one or two drums to beat the tempo and preferably with a lusty baritone to chant an accompaniment.

#### THE PERILS OF RIVER CROSSINGS

Once the truck is perched on the improvised ferry, after threatening to swamp the craft as the heavy rear wheels roll on board, the orchestra and vocal soloist tune up. Soon the whole affair is moving precariously across the muddy stream (p. 361).

You have one eye on the inch and a half of freeboard of the rear canoes while the other rests speculatively on a half dozen 18- to 25-foot crocodiles lazily sunning themselves on a midstream sand bank. You apprehensively wonder if the hippo, which just pushed his shiny muzzle out of the stream twenty yards away, is simply curious or feeling playful; and always one or more of the canoes leaks violently through cracks unseen before the load was on board.

You order a boy to bail, which he does to exactly the same tempo as the paddlers; and, finally, after having run aground at least four times (bogey is three for Cameroon rivers in the dry season) you gently bump on the other bank.

It is too early to heave sighs of relief, however, for there is the other truck and the light car to be gotten across.

Even if the river is fordable; that is, not wider than your combined tow ropes are long, and not over two and one-half feet deep, getting across has its thrills. First, two or more boys are set to wading across to see if there are any deep holes concealed in the pea souplike flood. The boys beat the water on all sides of them with sticks in the optimistic hope of frightening away "crocs"; while all rifles in the party eagerly scan the surface for the telltale ripple.

You can't go too fast or water will splash into the carburetor and onto the ignition system, with dire results. Without much momentum even a small muddy patch on the bottom bogs you in, and then the wisdom of having a hundred yards of stout rope with each vehicle becomes apparent.

#### ONLY TALL TREES SEE THE SUN

Slowly we moved down the Cameroons,\* climbing a mile-high escarpment near Ngaoundéré and coming to rivers every day or so. As we descended to the steaming jungle that fringes the Atlantic, the country became more and more tropical. Great trees, towering 150 feet in the air, are the only vegetation that ever gets a glimpse of the sun. Vines and creepers grow as thick as a man's wrist, while in the swampy gloom of the forest floor there is a riot of vegetation. Cocoa trees, nut palms, coconut palms, and banana trees are a few we saw growing wild in profusion.

We stopped for a few days at the capital town of Yaoundé, the terminus of the little narrow-gauge railroad that runs up from the seaport of Douala. Without warning we had emerged from a solid wall of vegetation into this metropolis of 300 whites and 30,000 natives. The hotel, we found, boasted cold beer and a bathtub.

Two hundred miles of incredibly dense jungle were traversed between Yaoundé and Kribi, on the Atlantic coast. Here we had a magnificent camp, in a grove of coconut palms, right at the ocean's edge. The Atlantic rolled in on a wide sandy beach that formed our front yard; and, as we rested for three days, we could see native surf boats carrying bags of cocoa out to the freighters anchored beyond the breakers.

\* See "The Mandate of Cameroon," by John W. Vandercook, in the NATIONAL GEOGRAPHIC MAGAZINE, February, 1911.

## AFRICA ON PARADE



DEEP IN THE SAHARA, TUAREG TROOPS UNFURL THE FRENCH TRICOLOR

Fifty desert Berbers garrison Fort Laperrine, high in the Ahaggar mountains, 950 miles south of Algiers. Their nomadic fellow tribesmen live in tents and are tireless riders of racing camels.



© National Geographic Society

Field Photographs by Lawrence Shaw

VEILED TUAREGS ADOPT THE FRENCH MANUAL OF ARMS, BUT CLING TO NATIVE GARB  
Desert warriors of Tamanrasset, nominally Mohammedan, reverse Arab custom—women do not cover their faces, but the men do. French officers, wearing wide pantaloons, command the troops.



ASTRIDE HIS PANOPIED CHARGER, THE SULTAN OF ZINDER SITS IN THE SHADE. Ivory-tipped is his scepter, symbol of authority over 20,000 subjects on the southern edge of the Sahara. When their ruler appears, nobles and soldiers alike fall prostrate on the ground.



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Field Photographs by Lawrence Thaw

BRACELETS AND RINGS BEDECK PAMPERED WIVES OF THE TUAREGS

Independent and unveiled are the women of the nomad Berber tribes in the Ahaggar mountains. Indulgent husbands import silver for ornate jewelry from mines far to the south.

AFRICA ON PARADE



AN ARCHER OF REÏ BOUBA DRAWS THE STRING OF A LONGBOW

Carrying a quiver of iron-tipped arrows, this soldier of Reï Bouba, northern Cameroons, might have stepped from a page of *Ivanhoe* but for his dusky countenance, leopard skin, and fez hat.



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Finlay Photographs by Lawrence Thow

FOR CLOSE-RANGE FIGHTING, ARCHERS CARRY SPEARS AND DIRKS

Reï Bouba soldiers fought beside British and French troops in the World War, and helped defeat the Germans in the Cameroons.



MEDIEVAL HELMET AND TRAPPINGS EQUIP A REÏ DOUBA CAVALRYMAN  
Such a dragoon might have ridden with Saladin in the twelfth century to fight the Christians.  
Heavily quilted is the ornate horsecloth.



© National Geographic Society  
STRIPS OF IRON DANGLING FROM RHINOCEROS SHIELDS ADD A TINKLE  
Finlay Photographs by Lawrence Thaw  
Only one company of Reï Douba infantrymen displays the metal decorations, as a special insignia.  
All foot soldiers depend on the tough rhino hide for protection.

AFRICA ON PARADE



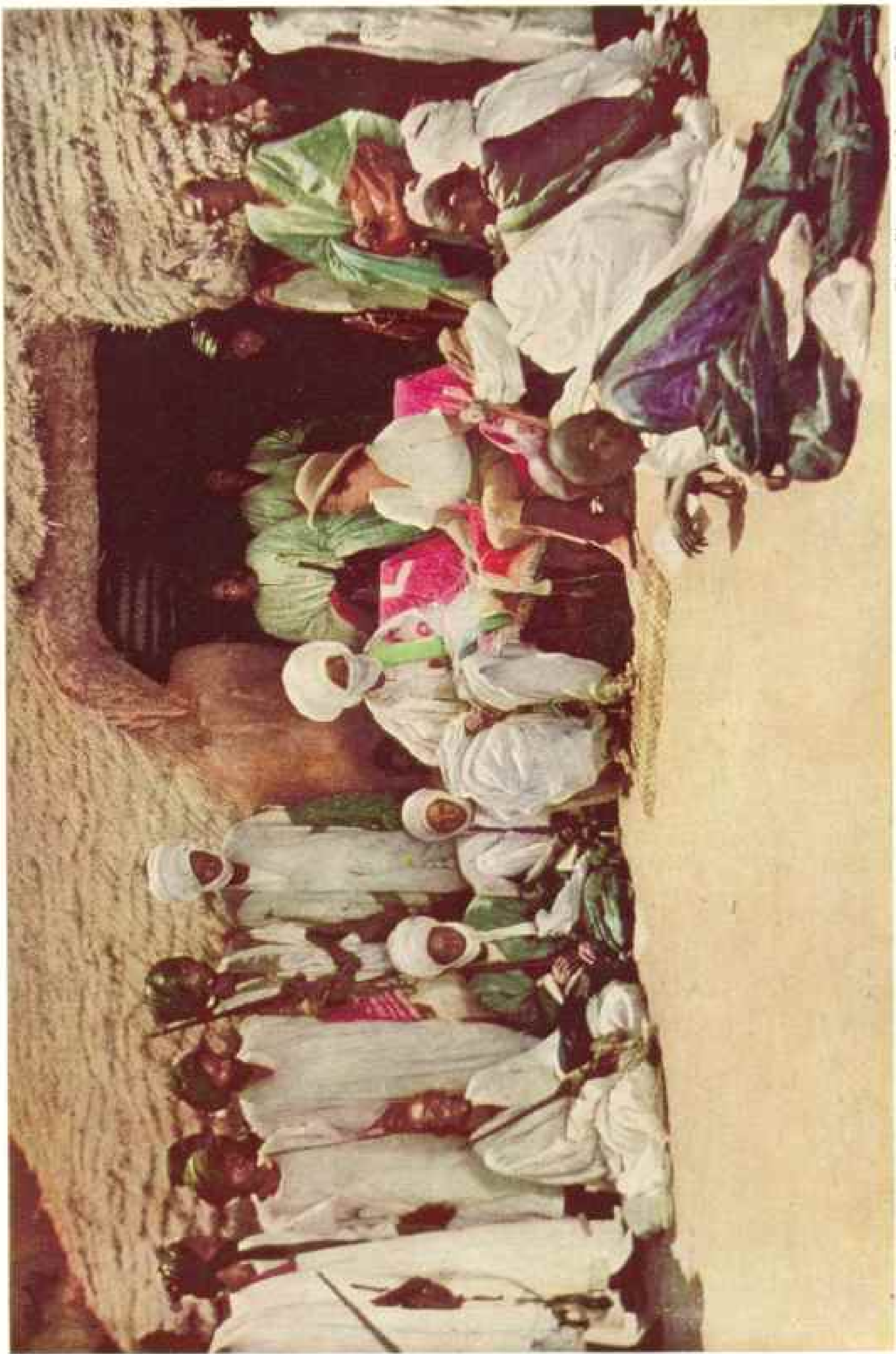
SHINING FIREMEN'S HELMETS, AUTHORS' GIFTS, ADORN THE LAMIDO'S HORSEMEN  
Well-supplied with presents were Mr. and Mrs. Thaw when they entered the remote kingdom of  
Rei Bouba. Ice cubes and phonograph records amazed the emperor.



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Finlay Photographs by Lawrence Thaw

CHAIN MAIL SUCH AS THE CRUSADERS WORE APPEARS ON REI BOUBA DRAGOONS  
Iron armor of the Middle Ages filtered from Mediterranean shores into the heart of the  
Cameroons across 2,000 miles of desert and jungle. How, is still a mystery.

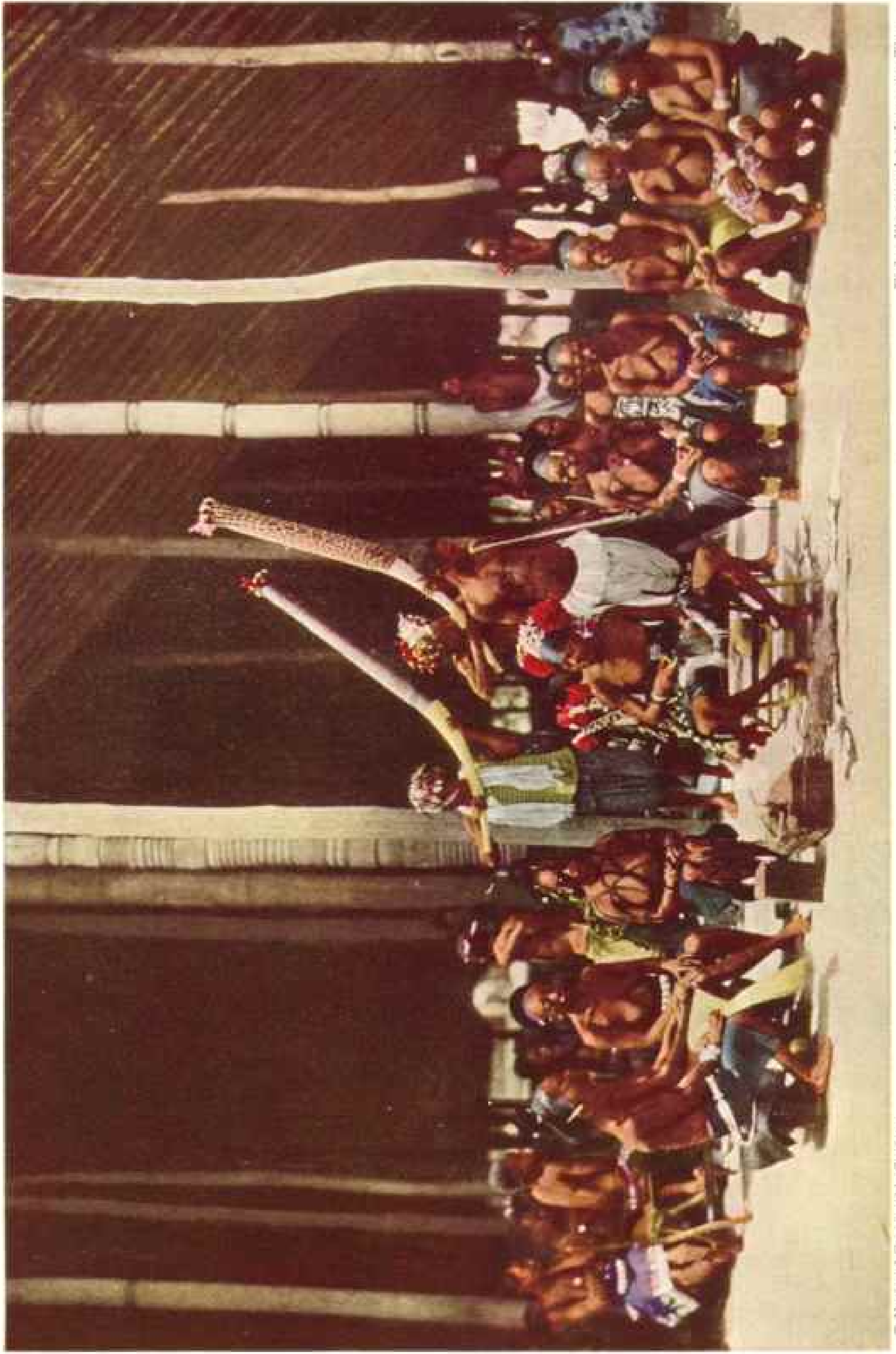


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Finlay Photograph by Lawrence Shaw

MYSTIFIED CHIEFS AND ADVISERS LOOK ON AS THE SULTAN OF GAROUA CHATS IN FRENCH WITH MRS. THAW

From his palace doorway, Aynou I, ruler of the native state on the Benue River, ordered his *corps de ballet* to entertain the guests. The old court executioner, whose tools were ax and club, became a firm friend of the explorers.



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Enslay Photograph by Lawrence Shaw

**HUGE TRUMPETS SOUND EERIE NOTES AS THE MANGBETU KING, WITH HIS FAVORITE LONG-HEADED WIVES, PRESIDES AT COURT**  
Subjects gather here in the principal village of the kingdom, near the eastern edge of the Belgian Congo. Religious ceremonies are held in the hall behind, its thatched roof supported by carved pillars. Wooden pipes covered with leopard and iguana skins lengthen the horns, made of elephant tusks.





PORTRAIT OF A SULTAN AND HIS HAREM: AYATOU I WITH 26 OF HIS WIVES. Rarely does a ruler thus permit his consorts to appear outside the zenana. No stranger is allowed to enter. The Sultan of Garoua masks his face in imitation of the Tuaregs.



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Finlay Photographs by Lawrence Shaw

LONG MUST BE THE HEAD OF A WOMAN TO GAIN THE KING'S ESTEEM

When the trio of Mangbetta favorites were babies, their mothers bound their heads with cords, distorting their skulls into weird, elongated shapes. Elaborate hairdress heightens the effect.

In this 200 miles we had added two new members to our party: a baby gorilla and a fully grown chimpanzee.

The baby gorilla was almost like a three-year-old child in his craving for companionship and affection; he was so deliberate in his movements that we named him Poli Poli, which in Swahili means "Slowly" (page 331).

#### THE "CHIMP" WAS AN IMP

The chimpanzee, tremendously imitative, soon ate his meals with a spoon, drank from a bottle, and smoked cigarettes. He had to be padlocked with a chain, as biting through ropes and untying knots were his forte.

Once loose he thought it very amusing to pull up tent pegs, tangle the ropes, steal and hide anything he could find, and assault all strange natives approaching the camp. Getting his hands on the cook's stores was his idea of seventh heaven. He stole and drank half a bottle of whiskey one day; and it took four boys to pull him out of a tree, where he was convinced he was Tarzan of the Apes. The hangover was terrific!

#### HUNTING THE PYGMY ELEPHANT

A few miles inland from Kribi we laboriously carved a camp site from the virgin jungle and started a hunt for pygmy elephants. The normal full-grown African bull elephant runs ten to eleven feet in height. We had heard of elephants in this dense coastal region which were apparent dwarfs, running around six feet. Only a few had been shot and brought back to Europe or America. We wanted one that was demonstrably adult, to prove they were pygmies, not ordinary elephants half grown.

For days we plowed through a steaming atmosphere, in semidarkness, following the plentiful spoor of elephants. Every few hundred yards meant a small stream and every dip in the ground a swamp.

Finally we came on fresh spoor and about noon one day—it seemed twilight—found ourselves literally in the middle of a herd. There wasn't a breath of air to carry our scent to the beasts, nor did we have the vaguest idea where they were. All we could hear was the crashing of branches as they fed. Our vision was limited to a few feet.

Creeping cautiously forward, for the natives had warned us that these little fel-

lows charged at the drop of a hat, we finally saw the top of an elephant's head. Larry aimed at where he thought the brain ought to be, and by a miracle found his mark. There was a crashing all about us; and when it subsided we approached the dead beast, which lay about fifty feet away.

It was a cow, and our gunbearers were scornful of her ivory; but we were confident she was adult, as she carried a calf inside her. She measured six feet two inches at the shoulder. We brought her skull and the complete fetus back for presentation to the American Museum of Natural History, New York.

#### OWNER OF 50,000 SLAVES

A month had passed since we had left Garoua for our long descent to the sea; and we thought that, by now, a swollen river that had barred our way into the remote kingdom of Reï Bouba in the north Cameroons would have subsided to fordable dimensions.

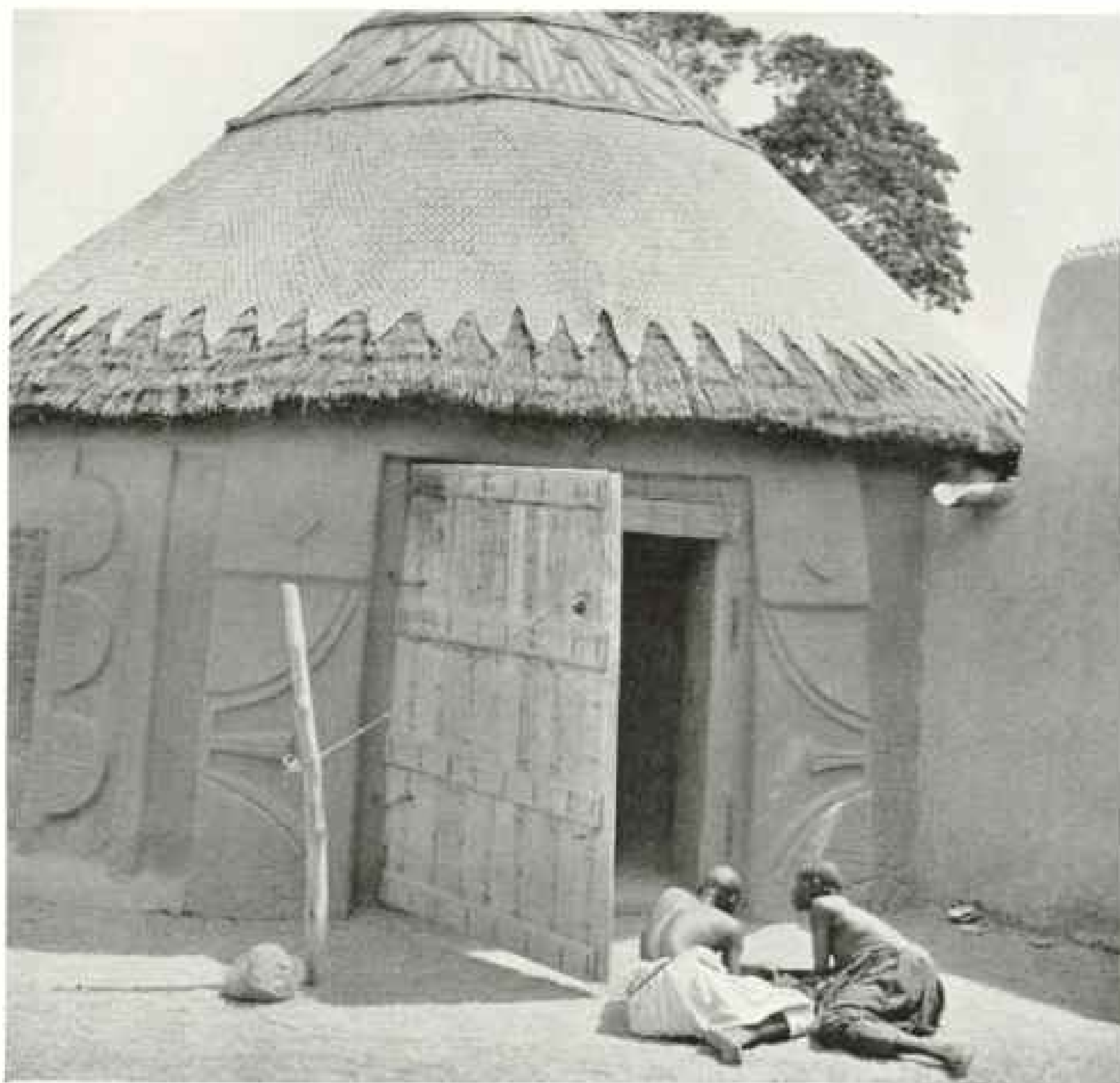
Leaving the chimpanzee at Yaoundé, we retraced our steps to Garoua, the baby gorilla sitting on the lap of one of the drivers and happily blowing the horn.

From Garoua a runner went forth to report on the river. Signal drums carried a message to the Lamido Bouba Jamaha, King of Reï Bouba, that "great white lords" were going to visit him, and that they would not arrive empty-handed. Our runner reported the river was fordable; and, after a delay suitable to the ruler's dignity, the drums signaled back that we would be welcome in the Lamido's domains.

Many African kings are absolute monarchs, in the sense that they possess unlimited powers over their subjects without any elective body to hamper their will; but in other kingdoms there are nobility, sectional or regional chiefs, and village headmen, while religion is represented by powerful witch doctors. Not so in Reï Bouba.

Here there are upwards of 50,000 slaves and one master, the Lamido, who owns them all, their land, their cattle, and their crops. Should you reward one of his subjects for a service rendered, he would immediately take the gift to the Lamido, even if it meant a hundred-mile journey.

We had heard of the prowess of the Lamido's highly trained army of twelve or fifteen thousand men, both infantry and cavalry. At the outbreak of the World War, although his kingdom lay in German terri-



SLAVES MUST CRAWL INTO THE DWELLING OF THE LAMIDO OF REÏ BOUBA

This seldom-visited monarch in the French Cameroons is master of 30,000 subjects, all of whom are his absolute property. They never approach their ruler except when stripped to their waists and bent in the most servile attitudes. They address him in a monotone while lying prostrate.

tory, he immediately joined forces with the French and British. He was of service to the Allies in bringing about the early defeat of the German forces on the west coast. British and French generals rewarded him by according him virtual autonomy.

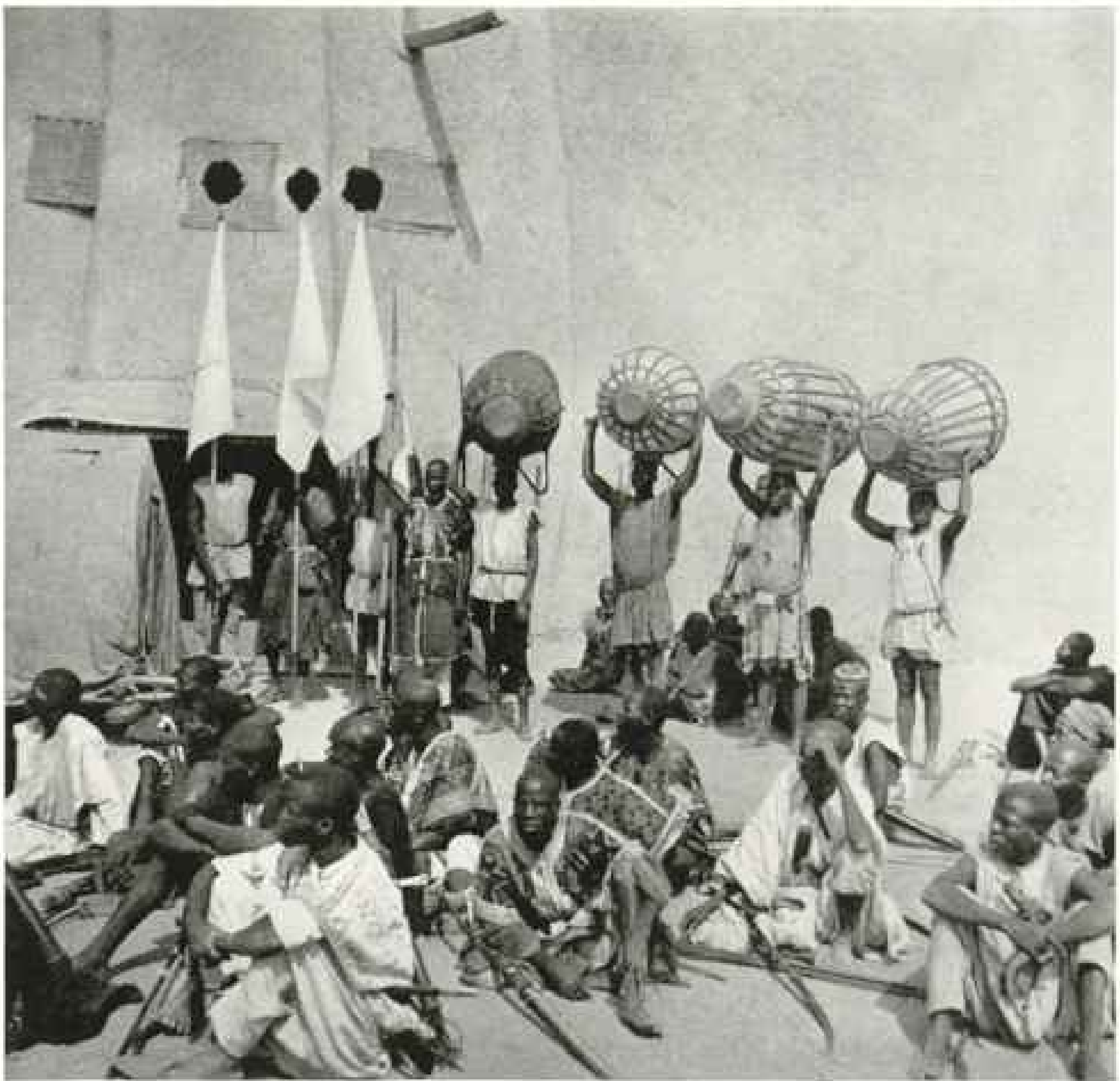
DUSKY KNIGHTS IN MEDIEVAL ARMOR

With keen curiosity, therefore, we approached the low mud wall that surrounds the chief village of Reï Bouba. A lone cavalryman galloped through the gate to greet us. Once inside the wall, we were met by half a dozen other horsemen, who formed a guard on all sides of the car and escorted us through a mile or more of twist-

ing narrow streets to an immense walled enclosure, the Lamido's palace.

Drawn up before the walls were a couple of thousand of infantry and cavalry; we were amazed to see the men accoutered as medieval knights! Many were dressed in chain mail, others had metal helmets reminiscent of the days of Saladin; all had crusaderlike swords, while the archers were armed with the longbow and carried a quiver of arrows on the back. Both men and horses were gorgeously costumed in quilted materials of brilliant hues. Leopard skins, slung over shoulders, provided one of the few African touches (Plates III, IV, and V).

How did these medieval accouterments reach this remote spot? Assuredly they



PALACE DRUMS TRANSMIT MESSAGES AND SUMMON TROOPS IN REI BOUBA

Sun-cured skins are stretched over the wide heads of hollow logs and laced tightly. Far-carrying are the deep, resonant tones when the drums are placed on the ground and heavily beaten. Drummers stationed at intervals throughout the kingdom relay messages from the ruler to every village and group of subjects. The authors made known their approach and received an invitation to call by this primitive jungle "wireless" (page 351).

were genuine and not native reproductions. These African natives lack the skill required for the forging of chain mail.

It could hardly have come up from the coast, as the west coast of Africa was first explored by Europeans when the Portuguese arrived in the 15th century. Incredible as it may sound, it must have filtered down through thousands of miles of desert and jungle, passing through the hands of the Arabs and Tuaregs, at some remote period of the past.

As we descended from our car, a dignitary addressed us in halting French and told us that the Lamido awaited our com-

ing. We suspected it was our presents, not ourselves, that caused his Majesty's impatience, so we ordered our boys to unload these at once and follow us in with them. The prime minister indicated that only palace slaves, stripped of clothing, were allowed in the Presence; so our gifts were handed over to a group of these and, preceded by the prime minister, who also removed all of his clothing except a breech-clout, we entered the palace.

We were ushered into a large hut in the center of the enclosure, all the natives literally crawling on their stomachs up to the door, and there, seated in the semi-

gloom, was a perfectly enormous man. He was easily six feet six inches tall and must have weighed more than 300 pounds (page 338).

Lying flat on his face, the prime minister delivered a long address to the Lamido in an awesome moaning voice (used by everyone in addressing him) no word of which was understood by us. The Lamido replied in what were evidently a few well-chosen phrases and our interpreter informed us that we were welcome; a compound had been reserved for us and our boys.

We had mental reservations about using the compound, as such quarters usually have to be shared with chickens, goats, and cattle, but we forebore argument.

Larry informed His Majesty that his fame had reached us many moons' journey away, and that we had come to view his puissance with our own eyes. He further said that we had many presents to give and many wonders to unfold; all we required was that he and his people follow our directions before our magic box, which permanently recorded all things it saw.

#### WHAT? BIG CHIEF, NO HAREM?

The Lamido promised that this should be done, but expressed considerable surprise that a chief of Larry's standing should travel accompanied by only one of his women, a most unusual and undignified procedure. Larry hastily explained that the balance of his harem he had had to leave at home because of the rigors of the journey. This explanation was received in skeptical silence.

Our gifts were then presented by the crawling slaves: a suit of armor; half a dozen French firemen's helmets; swords; plenty of Woolworth jewelry for his 400 wives; cheap flashlights and cigar lighters; and last, but most popular, a small saluting cannon.

The Lamido then informed us that he had arranged a review of the palace guard in our honor.

Emerging from the gloom of the hut into the brilliant sunshine of the courtyard, the king climbed into a ponderous, elaborately decorated sedan chair. We were ushered to a place of honor near the gate of the palace wall, and awaited his coming. In a few minutes he followed, borne high on the heads of slaves, to the delirious joy of several thousand subjects who thronged the large square before the wall. He ap-

pears before his people only once or twice each year; and the enthusiasm of their reception suggested a victorious crowd of undergraduates after a major football game.

Drums and tom-toms beat, accompanied by the weird wails of instruments ranging from 12-foot brass trumpets to flutes. There was no attempt at harmony, just din.

The ovation lasted at least ten minutes, and included impromptu dances all over the square. When it had died down the parade started, Squadron after squadron of mailed cavalry swept by, shaking their bundles of throwing spears in fierce salute as they passed the imperial sedan chair. These were followed by seemingly endless hordes of infantry: the archers with leopard-skin uniforms, and the wielders of the *assagai*, or stabbing spear, protected by huge shields of rhinoceros hide.

Tom tried to operate three cameras at once. We caught occasional glimpses of him bobbing around through a sea of black faces, flashing swords, and waving spears, getting "angles."

Eventually the parade passed; the Lamido returned to his palace, and we, escorted by several hundred plunging cavalry, were taken to our compound. Here we were again amazed. It was spotless; and not a domestic animal in sight!

Fifty-odd women were detailed to bring us wood and water while a dozen others were provided to make up the incomprehensible deficiency in Larry's harem. The last-named were a problem; but they were finally sent off, very mystified, though delighted with gifts of jewelry. Where they were going to put some of the modern shoulder clips we distributed was a question. Shoulder straps have not yet penetrated the north Cameroons.

#### WHITE MAGIC MYSTIFIES A POTENTATE

The next morning gifts from our host began to arrive. A seemingly endless line of slaves bore jars of cooked meats and honey; wicker baskets of peanuts, rice, and potatoes; huge rolls of beautifully woven grass mats; many spears, bows, and quivers of arrows; and half a dozen fine leopard skins. We were enchanted, but somewhat embarrassed at the profusion of food supplies that we couldn't take with us.

Larry had promised to show the Lamido some brand-new magic, so we carted the small refrigerator and the sound recording apparatus over to the palace.



BEDLAM BREAKS LOOSE WHEN THE LAMIDO IS READY TO APPEAR IN PUBLIC

Faithful subjects, frenzied by the news that the ruler of Raï Bouba is to sally forth before their eyes, gather before his palace and create as much noise as possible to show their delight. Some twang crude stringed instruments, others blow blasts on trumpets; but most merely shout. Only once or twice a year does the monarch leave his dwelling. On this occasion, he emerged to permit the authors to take his picture.

Ice the Lamido had never seen; and he was most puzzled by the "hard water that burned the hand." But when we set up the sound-recording apparatus, had him say a few words into the microphone, followed by some of the court chanters, and then played the recording back to him immediately, he was overcome. We presented him with a record which he gravely hung about his neck, on a cord, as a truly potent juju.

After four days, when Tom had photographed the local population and the army to a state of exhaustion, we took a prolonged farewell from the Lamido. A contingent of cavalry escorted us to the river frontier.

North of Garoua we spent several days in the mountains, with an officer from the fort, visiting the savage pagan tribes that inhabit these fastnesses.

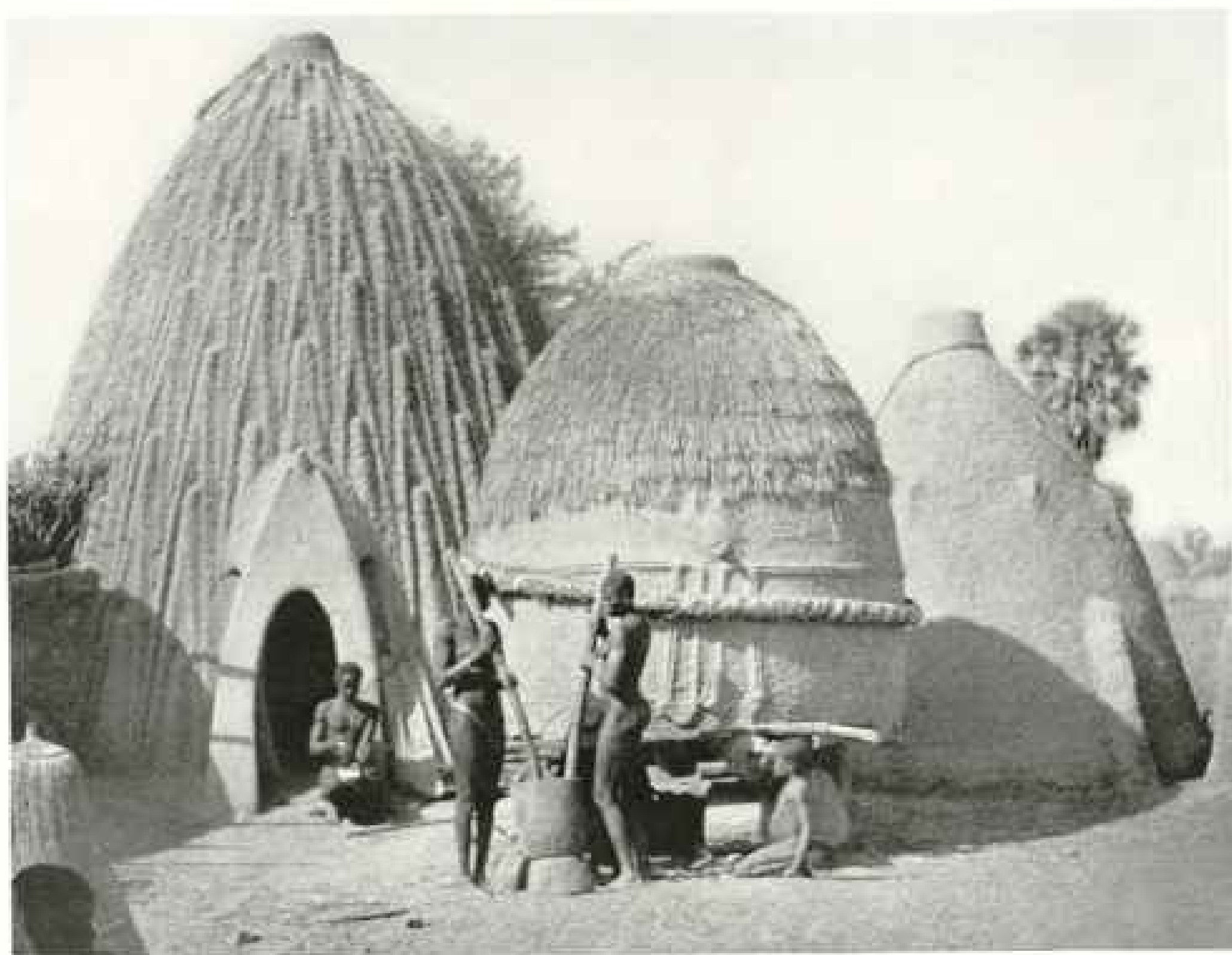
We stopped at a tiny village of four grass huts with only one old man in sight. The officer told him to call the tribe. This he did by letting out a series of piercing yells that echoed and re-echoed from the crags.

There were answering yells and soon black figures, like a troop of baboons, came clambering over the rocks.

The men and women of the tribe gathered in a little band before the huts, and at the finish of the talk broke into a dance. A quick "trucking" tempo was thumped on the drums; the men and women divided into two lines, faced each other, and did a sort of Virginia reel.

We were not sorry to leave these primitive hill people of the filed teeth. One minute they are doing a dance for you, and gratefully accepting your salt, while the next they are hidden behind rocks taking pot shots at you with poisoned arrows.

Just before we left, the little gorilla died. He had been ill for a fortnight and getting steadily worse. The fact that we could no longer get the fresh fruits of the coastal belt probably was responsible. Peggy and the boy who had charge of him nursed him very tenderly for days. Poli Poli would hold her hand like a baby while she brushed flies off him and fed him a teaspoonful of milk or rice water every few minutes. We were



POTTERS MOULD THE CONICAL HUTS OF LOGONE RIVER VILLAGERS

Along the broad stream that separates the Cameroons from French Equatorial Africa dwell craftsmen who build walls of pinkish-gray clay in various designs. Some are fluted, others are plain with thatched coverings. Doors are just large enough to admit cattle, with which some natives share their homes. The openings are widest near the center, to admit the thickest part of a cow's body. Women of these tribes wear small plates in their lips, perhaps in imitation of the large ones esteemed by the Uhangia to the south (opposite page).

all as shaken and unhappy, after his death, as if a child had left us.

Once we ran across the spoor of a large herd of the Derby, or giant, eland and, after a four hour trek, came up to them. Magnificent creatures they are, quite rare and the largest of antelopes.

#### TRAPPED, BY A WALL OF FIRE

Crossing the Logone River near Bongor, we found French Equatorial Africa much flatter than the mountainous Cameroons, and game far more plentiful. We had no lack of West African kob, a kind of antelope, for our meat larder; but water, once we left the river, was scarce. It was the height of the dry season and the parched thornbush was like tinder. We saw bush fires in the distance, but paid little attention to them.

The second morning after leaving the river we saw smoke ahead. A brisk breeze

was blowing and these fires can travel faster than a man can run. Larry stopped and consulted with the boys. It was decided that, by bearing slightly to the right, we could get around the fire.

We started; but before a mile had been covered the wind suddenly shifted and we realized that we were trapped. Huge flames were shooting out from our left, the dry bush blazing like gunpowder. It was too late to retreat, as the fire had cut across in back of us; we were in a little island of grass through which the fire was slowly licking.

With 125 gallons of gasoline in each truck it would have been fatal to remain where we were. Larry ordered all windows in the light car and truck cabs closed and all boys on the top of the trucks to cover their faces with wet cloths. With only a few seconds to go before the grass fire reached us, we started up and shot

through a spot where the bush fire had roared a moment before.

For a hundred yards all we could see was hungry flames through stifling smoke; and the roaring of the main fire, now on our right, drowned the open exhausts of the cars as we rushed, full speed, ahead. It was probably only a few seconds; but it seemed hours before we broke through the charred and smoldering bush into clear air.

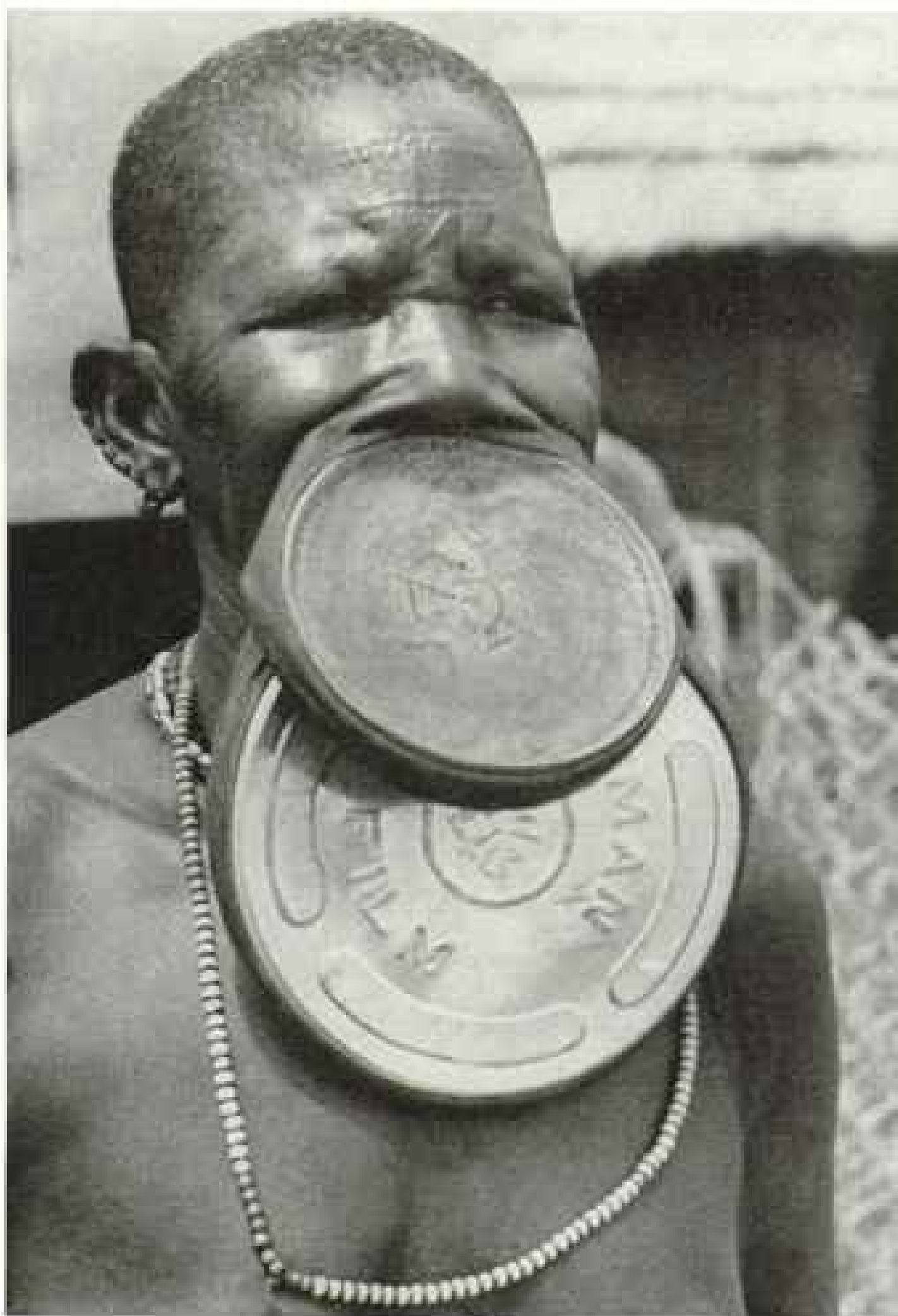
At every instant we expected to hear the deafening report of a gasoline explosion, as we stopped the light car in the clear air and waited for the lumbering trucks to break through the curtain of smoke. First one, and then the other appeared, the boys on top crouching low with the tarpaulin over their heads; we breathed again.

#### LAND OF THE BIG-LIPPED WOMEN

Fort Archambault, reached two days later, lies in the country of the Ubangi natives, land of the big-lipped women. Here both the upper and lower lips of girl babies are pierced and small wooden plugs inserted into the holes. As they grow up, these plugs are gradually increased in size until they reach the dimensions of large soup plates. The effect is amazing. We found one debutante who easily fitted the hub cap of our light car, 11½ inches in diameter, in her lower lip! Eating, drinking, and talking are difficult for these ladies (page 364).

Tom was enchanted, photographically, with what he termed the "platter pussies." "Mbya sana" (very bad) was the most complimentary remark we heard from our boys.

This form of disfigurement was begun



SUPPOSE HER HUSBAND HAD TO BUY HER LIPSTICK!

Her lower lip, about 25 inches in circumference, encircles the container for a 400-foot reel of motion picture film. So elastic has the skin become that when it is pulled it snaps back like a rubber band. Tradition tells that this form of mutilation was introduced centuries ago so that Ubangi women would not be sought by slave traders. But today big lips and shaved heads are fashionable.

centuries ago to discourage slave raiders, the French Administrator told us. Why it didn't discourage the young men of the tribe, as well, will never be known.

For days we traveled south and east across French Equatorial Africa and the Belgian Congo, where roads now permitted the staggering speed of 100 to 150 miles a day.

Due east we went, through Niangara, to Gangara na Bodio. Here, as well as at Api, the Belgian Government has established a farm where the African elephant





THE BUSTLE IS HER PORTABLE STOOL!

Although the pad is fancifully woven, it serves a practical purpose in a country where chairs are few. The Mangbetu woman's back and legs are not tattooed but stained with an indelible plant juice. Binding of the baby's skull will gradually duplicate the elongated shape of the mother's head (Color Plates VII and VIII).

is successfully captured, tamed, and trained to do useful work.

Until these experiments, it was popularly believed that the African elephant was untamable.\* But at Gangara's flourishing elephant farm more than sixty trained animals are available for rent or purchase by Congo farmers and 12 to 15 captures are effected annually (pages 360, 362).

We arrived in the middle of the hunting season, and Captain Pierre Offerman, the Belgian Army officer in charge, took us along on an expedition. When we heard that the captures are made with bare hands and ropes, and not by the Indian fashion of herding the wild elephants into a stockade with the help of tame animals, we were frankly nervous. The African elephant is an extremely dangerous animal, and this "salt on the tail" method struck us as being not without considerable risk.

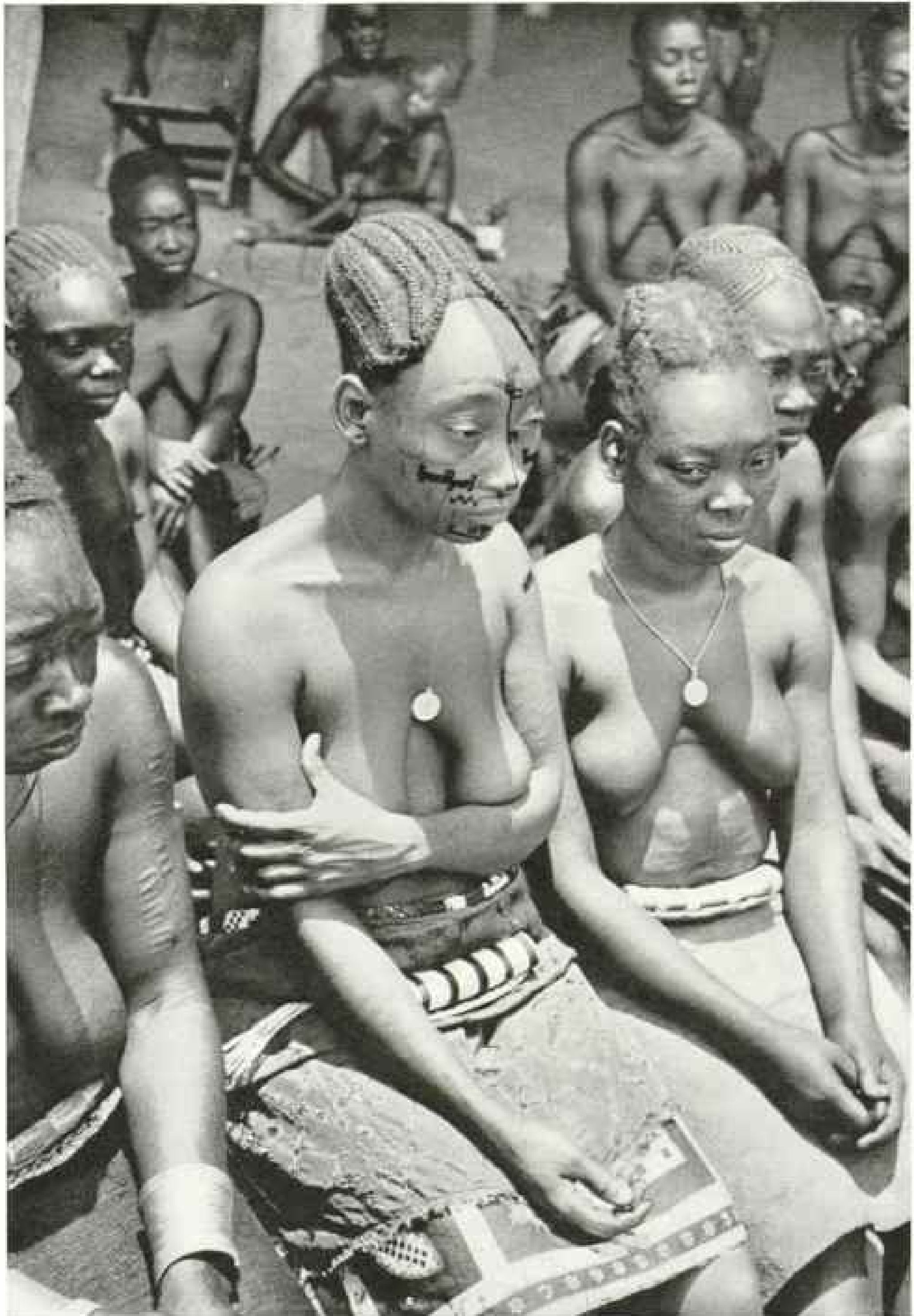
#### THRILLS OF AN ELEPHANT HUNT

Not were we wrong! The wild herd, which we found a day's march from the farm, was placidly feeding in an open glade. The captain halted his thirty trained boys and examined the herd carefully through field glasses to select the animal for capture. Half-grown elephants, 10 to 15 years old, are best for training.

Tom and Larry set up two cameras about a hundred yards apart, Peggy guarding Tom with her rifle, and Larry guarding himself; while the captain spread his boys out in a skirmish line down wind from the herd.

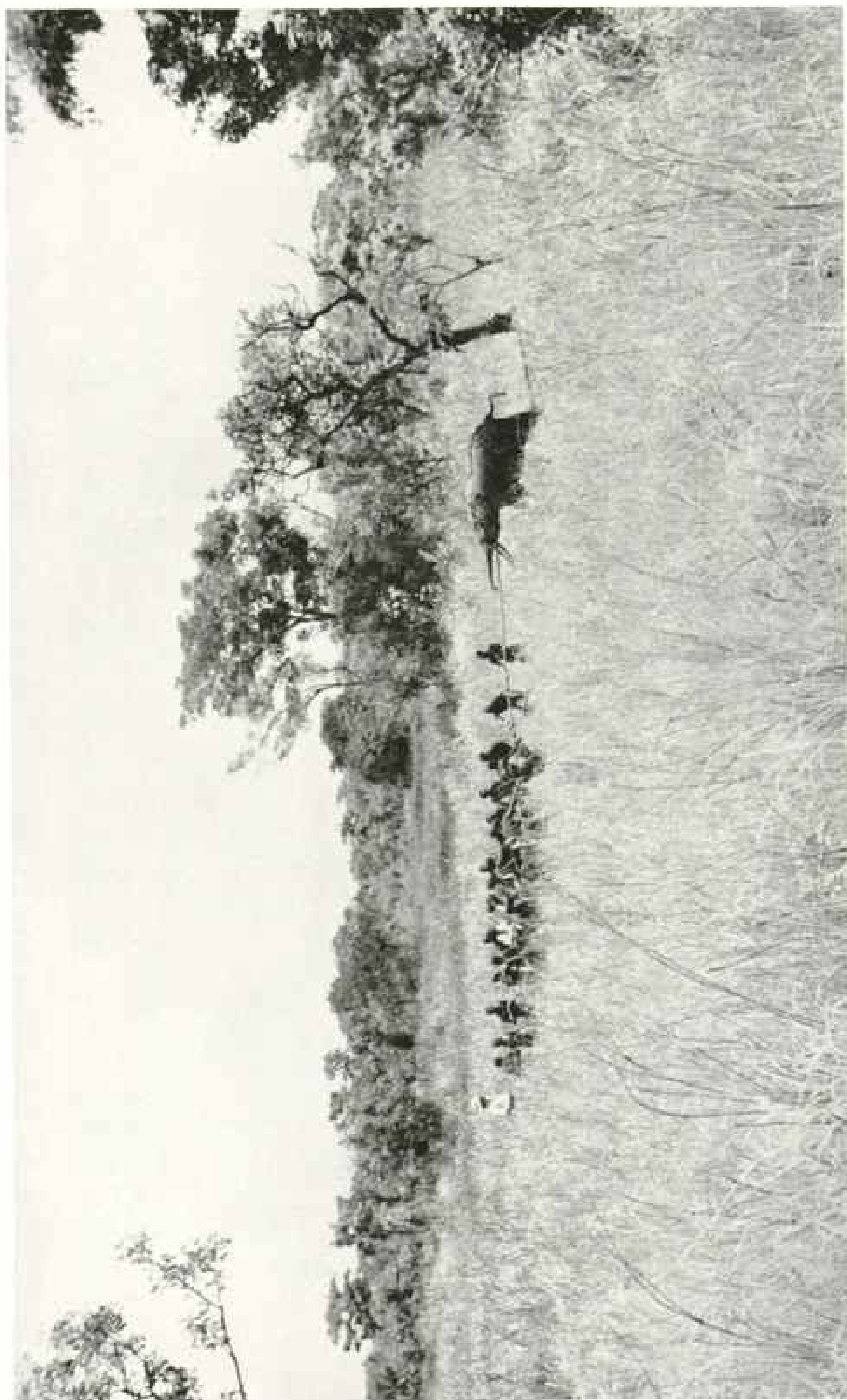
Slowly they approached the unsuspecting elephants and stopped, about forty yards away, concealed in the long grass. When the chosen animal was in a favorable position in relation to the herd, the captain

\* See "Nature's Most Amazing Mammal," by Edmund Heller, NATIONAL GEOGRAPHIC MAGAZINE, June, 1934; "Wild Man and Wild Beast in Africa," by Theodore Roosevelt, January, 1911, and "Elephant Hunting in Equatorial Africa with Rifle and Camera," by Carl E. Akeley, August, 1912.



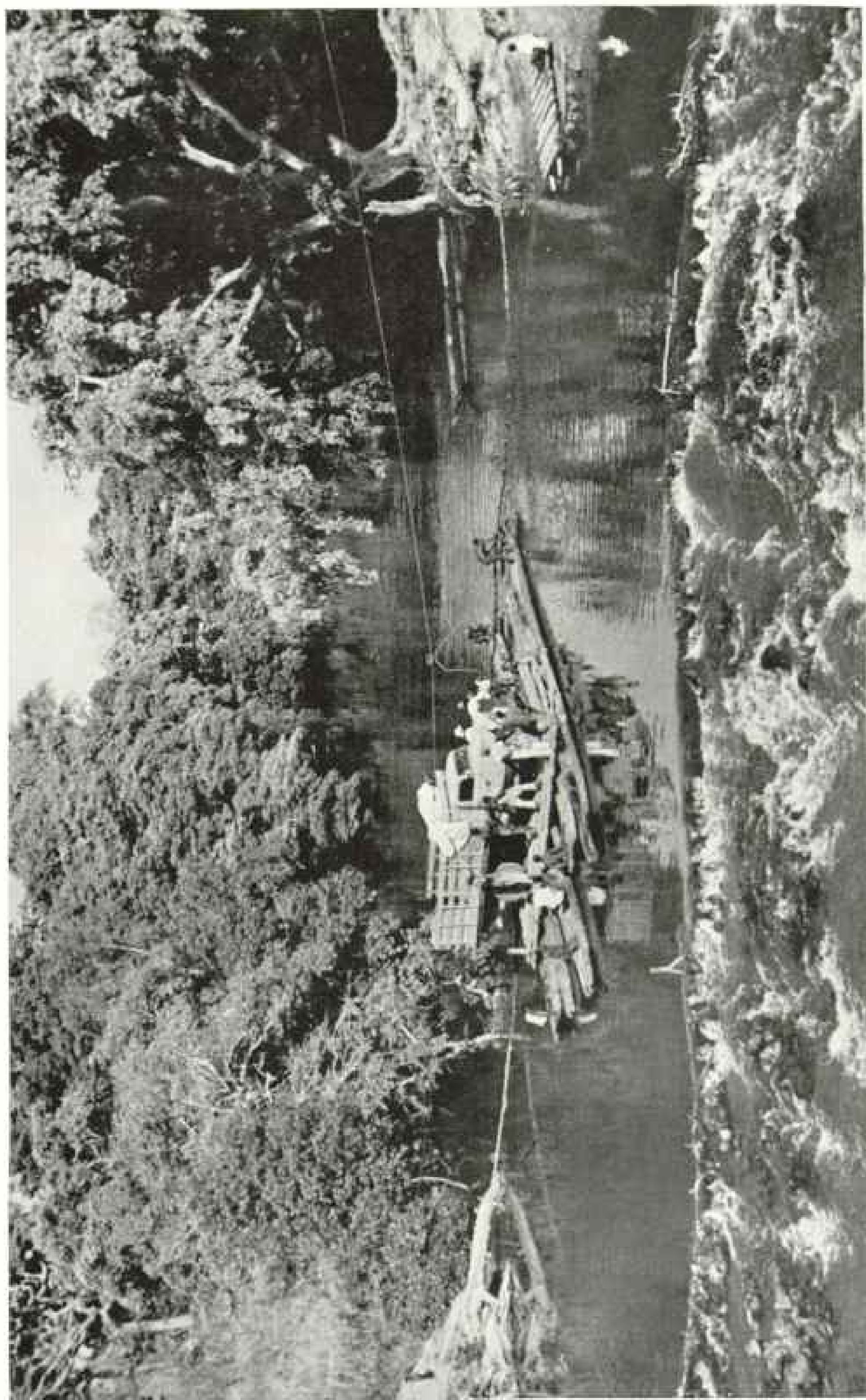
MANGBETTU FASHION DECREES LONG HEADS, FANCY COIFFURES, AND STAINED FACES

The elaborate headdress requires many hours to arrange. An esteemed decoration are the scars on the arms. These are wives of King Nlapu, one of the Mangbetu chiefs in the Belgian Congo. As potters, sculptors, boatbuilders, and masons, men of this tribe have excelled nearly all others in Africa. Their huts usually are larger and better built than their neighbors'.



CUT OUT FROM A HERD AND ROPED, A HALF-GROWN ELEPHANT SHRILLS DEFIANCE AT ITS CAPTORS IN THE CONGO JUNGLE.

Directing his band of hunters, Captain Offerman, the Belgian trainer, picks out a healthy youngster in a herd. Boys circle the prospect, slipping a rope around one of its legs. Then they yell wildly to stampede the other elephants. Furiously the captive struggles, pulling the boys back and forth, while they try to tether it to a tree. At the Gangara na Bodo training school, the newcomer is put in charge of an adult elephant. A moral bond soon is established between them and the pupil never tries to escape. After 10 years of instruction, the elephant is thoroughly schooled in doing the work of about sixty men—felling trees, drawing carts with six-ton loads, pulling six-bladed plows, and performing other useful work.



CROCODILES, HIPPOPOTAMUSES, AND LEAZY PONTOONS MAKE AN ADVENTURE OF FLOATING TRUCKS OVER JUNGLE RIVERS.

When canoes in the French Cameroons were large enough, a raft built upon them would support one of the expedition's trucks fully loaded. At this crossing only a small raft could be built and cases and boxes had to be transported separately. Often the craft ran aground, necessitating much labor to get it off. When streams were shallow the rafts were poled; when deep, they were paddled by natives to the accompaniment of drums beating lustily (page 347). Mr. Thaw supervised the work, at the same time keeping a weather eye for "hippos" and "crocs," residents of these streams.



STRUGGLING DESPERATELY, A NEW CAPTIVE IS BROUGHT IN BY TRAINED ELEPHANTS.

The half-grown prisoner from the Congo jungle is lashed to one domesticated giant while the other pushes from the opposite side to keep the little fellow in place. African elephants are much more difficult to tame than their more docile Asiatic cousins. Great care must be taken in adjusting fetters, as the animals are very susceptible to blood poisoning. Potassium permanganate is always at hand to put on any abrasions of the skin.

gave a signal and the entire skirmish line leaped forward, yelling and firing their rifles into the air.

The herd stampeded; but the number one boy had slipped a rope around the leg of the selected elephant, and most of the other boys hung on (page 360).

Then began the sport! Dragging a dozen boys as if they were flies, up and down the glade the elephant rampaged. Occasionally he would turn and charge; but the boys, with the skill of bullfighters, would avoid his lunges and, as he rushed by, another rope would be slipped on a leg. Finally they worked him over near a tree, several of the ropes were made fast, and the capture was effected. But what a quarter hour!

Returning to Niangara, we inquired for the best guide to take us into the country

of the Mangbettu, to the south. 'This is the land of long-headed women. Girl babies' heads are tightly bound with cords, distorting the skull into weird elongated shapes. We were advised to look up the good Father Bonhomme, in charge of the Dominican Mission on one of the innumerable branches of the Congo, a hundred miles south.

#### TO THE LAND OF LONG-HEADED WOMEN.

As we approached the Mission we were amazed at its size. Its dozen buildings included a sawmill where two bearded giants in overalls were working with a dozen natives. Larry asked where Father Bonhomme could be found.

"The Father Bonhomme, it is I," replied one of the white men.

Larry explained our errand. Without hesitation he dropped his saw.

"I will go with you. I will take my bed; and if you can give me a plate of soup, it is all I will need."

Within half an hour we were moving toward the country of the Mangbettu, some twenty miles away.

We made camp that afternoon in the shadow of the great meetinghouse of the village, and fell into quiet talk.

#### THE FIGHT AGAINST POLYGAMY

"Of course," said Father Bonhomme as we asked him questions, "one of the main things we are trying to achieve is to undo the evil practice of polygamy, principally because it is unfair to the young women.

"Monogamy seems to make a man and woman much happier—he develops a real affection for his one wife, and she a pride in her position. She is no longer just one of his many slaves, a tribute to his wealth in goats.

"Often women owned by rich men with large harems will run away with some young man of their choice. Almost invariably they are captured, severely beaten, and very brutally treated.

"If one seeks refuge in the Mission, we buy her from the rich man, paying him his asking price in goats, and then keep her until such time as a young warrior of her choice seeks to purchase her. It would never do to give the woman to him. She would immediately lose value in his eyes."

As we chatted we noticed, in the darkness outside the circle of lamplight, that the greater part of the village was squatting as if awaiting a sign.

"They wish to honor us with a dance," the priest said, and made a signal.

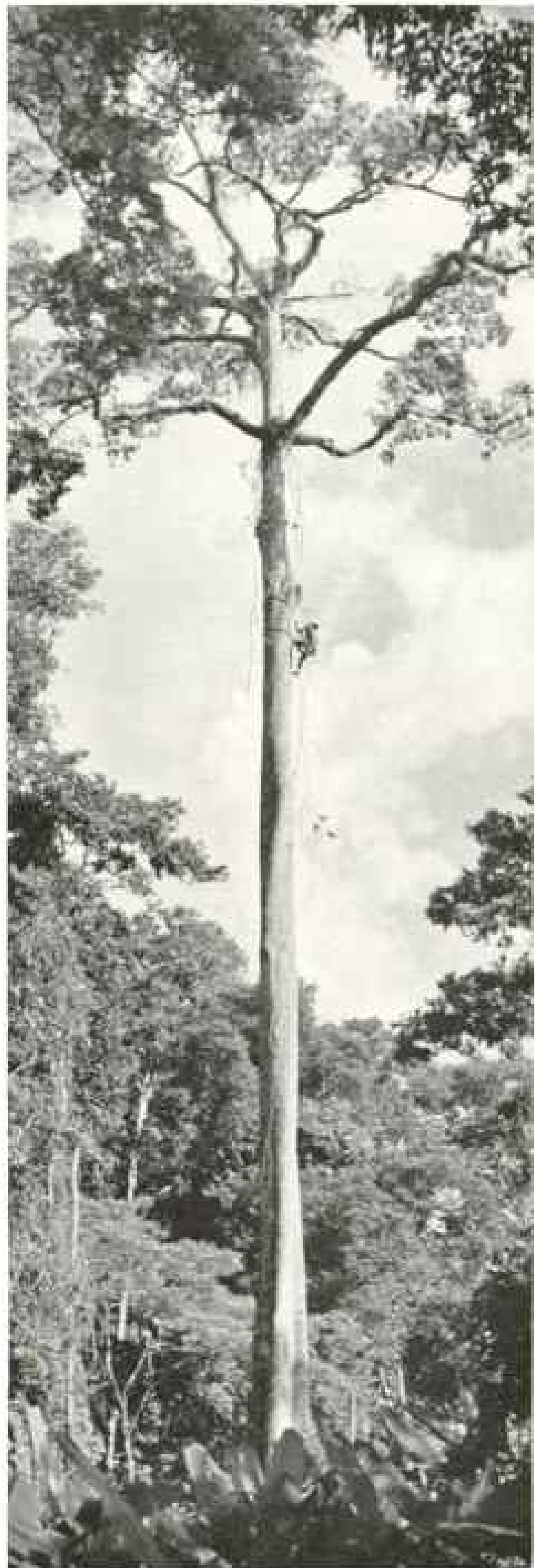
Almost immediately bedlam broke loose. The orchestra, strong on the percussion instruments, went into action.

#### BABIES SLEEP ON DANCERS' BACKS

Then the dancers appeared—all women. Naked except for a flat pannier effect behind (more for use as a portable seat than for any thought of modesty) their bodies were painted in grotesque designs and their long pointed heads embellished by fantastic coiffures (pages 358 and 359).

Strapped on the backs of many of them were their babies, sound asleep in all the din.

The dancers formed a ring around our table and for two hours we had cabaret with our dinner—a sort of circular "shuffle" to an ear-splitting accompaniment.



WILD HONEY LURES A PYGMY

The tiny Ituri Forest dweller ascends to the hive by slinging loops of bark around the trunk. With the vine, which dangles from his waist, he pulls up smoldering grass to smoke out the bees; but not without being stung many times!



"WELL—HOW WOULD YOU DO IT?" SHE MIGHT ASK

Tom Hogan, safari cameraman, gives a Ubangi maid a sip of water! Eating and drinking are ordeals for "platter pushes," as the photographer dubbed these women near Fort Archambault, French Equatorial Africa. Distortion also impedes their speech, converting it into a series of "clucks."

Over it all a brilliant moon shone down, gleaming on the swaying bodies and turning the rustling palm fronds to silver. It was enchanting, though we all felt rather exhausted when it finally ended.

#### STEALING A WOMAN IS PETIT LARCENY

One morning King Niapu announced he would hold court in the square before the great meetinghouse. Gorgeously arrayed in rust-colored, baggy trousers made of bark fiber, his head bound like a baby's with cords and topped with a leopard skin and four red flowers, he sat with several of his chief wives, meting out justice to his people (Color Plates VII and VIII).

Most of the cases seemed to consist of the theft of a woman (petit larceny) or of goats (grand larceny) with an occasional case of cattle rustling (practically a capital offense). Justice was swift and there was a noticeable lack of legal talent, possibly because any lawyer who offered an objection to the old king's rulings would suffer a fate too horrible to contemplate. Nor was there any appeal; sentences were executed and fines paid on the spot.

With genuine regret we said goodbye to Father Bonhomme and the Mangbettu, first distributing a prodigious quantity of salt

as presents; but the long threatening rains were beginning now and we had to make haste.

We paused only for a few days in the middle of the Ituri Forest to film the life of the Pygmies. But as we approached the Mountains of the Moon (Ruwenzori), on the Congo-Uganda frontier, massive black clouds formed and the roll of thunder became continuous.

#### OVER RAIN-SOAKED ROADS TO NAIROBI

The ride over the mountains was a nightmare. Solid sheets of water obscured all vision more than a few yards ahead; and the road was a slippery river over which we could average, even with chains, little more than ten miles an hour. Camps at night were made in a deluge and all of us were thoroughly soaked and miserable. But finally we mounted the great escarpment on the south side of the Rift Valley in Kenya and rolled over paved roads into Nairobi.

We had covered 11,516 miles of a part of Africa that is little known to the white man; and the luxury of civilized living in this modern African metropolis of big hotels, movie shows, and traffic officers was indeed welcome after our six months on safari.

# ON THE BOTTOM OF A SOUTH SEA PEARL LAGOON

BY ROY WALDO MINER

*Curator of Marine Life, American Museum of Natural History*

I STOOD on a brass-wire rope ladder leading down into the pearl lagoon of Tongareva\* in the South Sea, the warm waters bathing my shoulders.

John, a sailor, lowered the diving helmet over my head and the pump started going. I could feel the fresh air pouring in from the valve at the side of the helmet (page 369).

Slowly I descended the ladder and the water closed over my head. The pressure increased against my eardrums. I swallowed and the pressure was relieved.

The ladder had been made with brass rungs conveniently spaced a foot apart. I counted them and stood on the sea bottom 25 feet below the surface. The water about me was as clear as air, melting in the distance into a pearly-blue fog.

The strange shapes of coral castles rose about me, fantastic in outline.† Around my feet stony blossoms of delicate texture spread their lacy panicles glowing with soft rose, light blue, rich purple, pale green, yellow, and tan (see Color Plates).

Cliffs of living coral overhung me as I advanced, rising in terraces adorned with massive rounded heads of brain- and orb-corals resembling giant mushrooms—purple, green, and golden yellow. These flanked deep, mysterious caverns, within whose depths I could perceive wavering light beams dancing down from concealed openings, in shafts of weird, luminous blue.

## AN OCTOPUS EMERGES FROM ITS LAIR

The sloping threshold of a cavern near by was protected by a low rampart of shells, crab fragments, and odds and ends of coral arranged so carefully that they at once attracted my attention.

Suddenly a tapering, serpentlike tentacle was thrust forth waveringly; then another, and another, advancing in coils that in-

creased in size as they became more fully disclosed.

The bulb-shaped body and baleful eyes of an octopus glided forward until the whole creature oozed over the edge of the coral shelf, four or five of its sucker-adorned arms writhing downward till they hung suspended over the cliff, while the rest still clung with their tapering tips to projections and crevices within the cavern (Color Plate V).

As I watched, it released itself without effort and darted out into the water, bulbous body forward, tentacles trailing in a doubly divided train as it propelled itself by shooting a jet of water toward the rear from its spoutlike siphon. Almost immediately it settled down in another crevice, watching me continually with its basilisk-like gaze.

It did not seem disposed to interfere with me, so I looked up toward the surface, where the keels of our two boats floated oddly, with the long, slender train of the brass-rope ladder dangling downward. A strange shape had broken through the silvery roof of water.

I soon realized it was one of the undersea camera tripods being lowered on the end of a rope. As it came within reach, I steadied it to the sea floor, untied it, and laboriously set it in position, working against the pressure of the watery atmosphere.

The rope was quickly hauled up and in a few minutes one of my brass undersea camera boxes descended toward me.

Lifting the heavy box to the tripod top, I looked around for the octopus, hoping to get a picture of it, but it had disappeared.

## A FISH BREAKS INTO THE MOVIES

I started to adjust the camera to photograph a beautiful vista through the growths of fairylike corals, when suddenly a great brown-and-yellow-striped grouper with a bright-red saddle spanning its shoulders flipped out of a cave toward my left, swam behind me, and darted directly between my legs!

Then to my amazement, after passing under the tripod, it rose immediately in

\* Tongareva, also called Penrhyn Island, is a typical South Sea coral atoll, 1,079 miles due south of Honolulu. See the Map of the Pacific issued as a supplement to the NATIONAL GEOGRAPHIC MAGAZINE, December, 1936.

† See "Coral Castle Builders of Tropic Seas," by Roy Waldo Miner, NATIONAL GEOGRAPHIC MAGAZINE, June, 1934.





Photograph by Tashio Aizawa

A WELCOMING SLOOP PUTS OUT  
FROM THE BLUE LAGOON

Philip Woonton, British Resident Agent at Tongareva, brings a pilot to the *Zuca* in his trim little craft. Most of the native boats are outrigger canoes, hulled from tree trunks.

front of the camera and calmly poised before my lens as if to invite me to take its picture.

Naturally I started the camera at once, while the strikingly patterned fish slowly and gracefully swam out and around a coral pinnacle. Later, in New York, I found that I had obtained a fine motion picture of the camera-conscious fish.

Looking sidewise from my helmet, I saw the rope ladder again in motion. Wyllys Betts, one of my assistants, was descending, also wearing a helmet. I could recognize him by the Hawaiian pareu he was accustomed to wear instead of bathing trunks.

Soon he was erecting a second tripod not far from my position, and we were both making motion-picture records of this wonderful watery fairyland.

A short distance ahead of me I glimpsed a large cluster of pearl shell growing from a small coral clump on the sea floor; then, on the rocky bottom, I saw another, and, in a sandy patch a little beyond, still others were lying scattered about.

To find and photograph the precious pearl oysters in real life was one of the main objects of our expedition, so I moved my tripod into a better position, meanwhile pointing them out to Betts.

DOWN COMES A PEARL DIVER

While we were thus engaged, the water surface again broke and the lithe, muscular figure of Tau came diving and swimming to the bottom.

Peering through his goggles, the Polynesian quickly caught sight of the pearl shells, swam directly to them, and soon was vigorously dislodging a large cluster, tearing away the silken byssus threads that anchored it to the coral rock (Color Plate I).

I lost no time in making a motion-picture record of the process, including his slow rise to the surface with the treasure clasped in his arms. The upper part of his body disappeared through the opaque, silvery surface, while the square end of a water-glass peered down at us as one of the sailors watched our progress.

When my film had been entirely exposed, I gave a signal and immediately another camera box appeared.

But this time Tau himself came swimming down with it, as in his opinion the process of lowering it and hauling it up on a rope was too slow.



Photograph by Roy Wilco Minor

LAND HO! CAN YOU MAKE IT OUT? TONGAREVA!

The *Zaca* sighted the island after ten days at sea, having sailed due south 2,079 miles from Honolulu. Here Captain Pedersen, mounted on the main boom, directs the anchoring of the boat about two miles outside the narrow, treacherous entrance to the lagoon.

With ease and grace he sank through the water, swam over to my tripod, and placed the camera upon it. Then he took the first camera from my hand. Though the heavy box bore him down to the sea floor, he gave a vigorous push with his foot on a coral mass, swam deliberately up to the surface, and lifted his burden to the sailor.

Tau remained above a moment to get a breath of air. Then down he came again, sat on a near-by pinnacle, and calmly watched while I took the new reel. Thereupon he swam over and repeated the operation.

The fellow seemed almost amphibious! He could remain under water three minutes at a stretch, and gave the impression of always being there. When he needed air he would rise to the surface and almost immediately return, so that whenever I looked around, there he would be, clinging to his pinnacle as if he had never left it. It was uncanny!

Tau's diving mate, Tony, and our Samoan sailor, Frank Tlaga, were equally at home in the water, and it was largely through their efforts that we were able to transplant to the American Museum of

Natural History in New York a part of the original environment of that strangely created gem, the pearl.

THOUSANDS RISK LIVES FOR PEARLS

Because a lowly mollusk has formed the habit of glossing over its irritations with concealing layers of rainbow luster, a far-reaching train of events is set in motion throughout the world. Tropic seas are dotted with pearling fleets, while thousands of natives risk their lives to wrest pearl oysters from their coral bed, in the quest for perfect gems for my lady's necklace.

The spherical concretions of iridescent nacre, in which the oyster imprisons the offending sand grain or invading parasite, are often so unbelievably beautiful and desirable to human eyes that not only is the lucky diver enriched by the pearl he finds, but all others who handle it.

The trader at Tahiti or Makassar, the dealer in the Rue Lafayette in Paris who passes it on, the government that taxes it, the importer in Maiden Lane, and finally the jeweler who gives a proper setting to the precious pearl and encloses it in a silk-



Photograph by Toshiro Asanaka

PUMPS GO FULL BLAST AS TWO EXPLORERS WORK BELOW

Pete, a sailor, constantly watches Dr. Miner and Wyllys Betts through his waterglass. A camera tripod lies in the dory, ready to be lowered. The scientists were photographing coral growths and other undersea life. Chris Olsen often took Betts' place and painted in oils beneath the surface (p. 377).

lined casket, all share in the beneficent wealth it brings before its fair destination is reached.\*

Nevertheless, these desirable jewels form but an occasional feature of the output of the pearl fishery. The main dependence is the mother-of-pearl shell of the mollusk that forms them.

In the South Sea the pearl oyster produces huge shells from 8 to 14 inches in diameter, a pair often weighing up to 12 pounds! These are almost solid mother-

\* See "Pearl Fishing in the Red Sea," by Henri de Monfreid, in the NATIONAL GEOGRAPHIC MAGAZINE for November, 1937.

of-pearl and find a steady commercial market for making knife handles, buttons, studs, and inlays.

Possibly one oyster in a thousand produces a pearl. Meanwhile, the shell is sold by the ton, and estimates indicate—except for India and the Persian Gulf, where the little thin shells are worthless and the pearl therefore all-important—that the world value of the pearl shell as a product is about equal to that of the total output of the pearls occasionally found in them.

Because of the importance of the pearl fisheries from a human standpoint, the American Museum of Natural History had asked me to plan a "Pearl Diving Group" for the Hall of Ocean Life and to secure the necessary materials for it. As designed, the group will

show a pearl bed on the sea bottom with native divers in the act of collecting the shell.

Not only to get the specimens but also to make accurate firsthand observations of the natural history of the sea-bottom life in the vicinity of the pearl growths, we had undertaken this expedition to Tongareva, a typical coral atoll of the South Pacific.

Our ship was the graceful schooner-yacht *Zaca*, owned by Mr. Templeton Crocker of San Francisco, who had offered her to the Museum for this expedition and accompanied her to see that every facility was placed at our disposal (page 372).

Day after day we visited the amazing sea gardens of the Tongareva lagoon and every dive disclosed constantly varying wonders.

#### BIG CLAMS AS MANTRAPS

Sometimes a sunny undersea slope blossomed with gorgeous displays of the *Tridacna*, or furbeled clam, some nearly embedded in coral rock, others partly or entirely free (Color Plate III).

Their bivalve shells in the species found here (*Tridacna compressa*) are eight to ten inches in length and exhibit undulating margins that neatly fit into each other, while the conspicuous folds of their outer surfaces are roughened with coarse lines of growth.

When their shells part, gorgeously colored mantle edges overflow their margins with displays of rich color—indigo, striped with brilliant luminous blue; bright green, or light blue blotched with black; or variegated designs of yellow, brown, and tan.

Between the thick lips an orange-pink veil hides the inner cavity, except where oval windows of two mantle openings disclose glimpses of an inner chamber tapestrined with brilliant green and jet black.

This species is related to the giant clam (*Tridacna gigantea*), which is absent from the lagoon of Tongareva but is abundant in the Caroline Islands, the Philippines, and the Great Barrier Reef of Australia. There



Photograph by Toshio Asada

#### "GOING DOWN" TO EXPLORE THE OCEAN FLOOR!

The diving-helmet is being placed over Dr. Minor's head as he stands on a brass-rope ladder lashed to the dory. Bars of lead, two in front and two in back, hold the buoyant, air-filled helmet to his shoulders, when he submerges. When the air pumps have been started, the scientist descends, counting the rungs on the ladder, spaced a foot apart, so that he may judge the depth of the water.

the huge shells are from three to four feet in length and even larger.

They are reputed to be dangerous to divers, for they often grow among clumps of other sea growths, and an unwary foot or hand slipped between the giant shells would be instantly caught as in an iron vise as the massive edges are clamped shut, and the diver drowned before he could be freed.

#### MORAY EELS INFLICT VICIOUS BITES

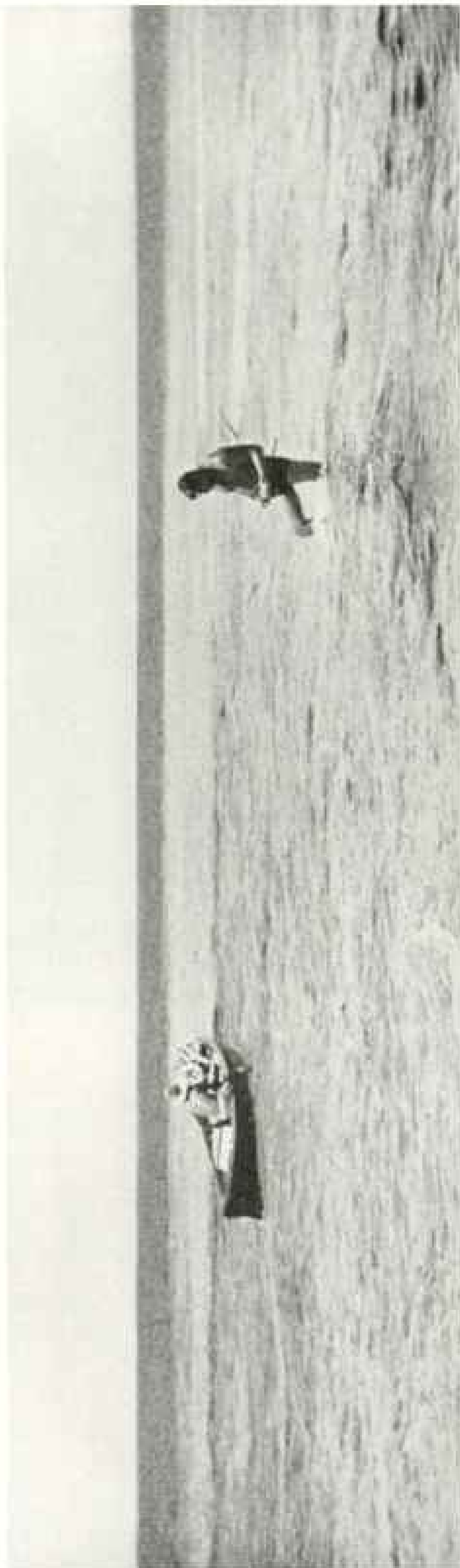
Even the smaller species of our lagoon would react like a steel trap if a diver thrust a casual hand between the shells.



Photograph by Roy Wulfo Jimer

SINCE TONGAREVA IS OUT OF THE PATH OF HURRICANES, COCONUT PALMS COMPLETELY COVER THE ISLANDS IN DENSE GROVES

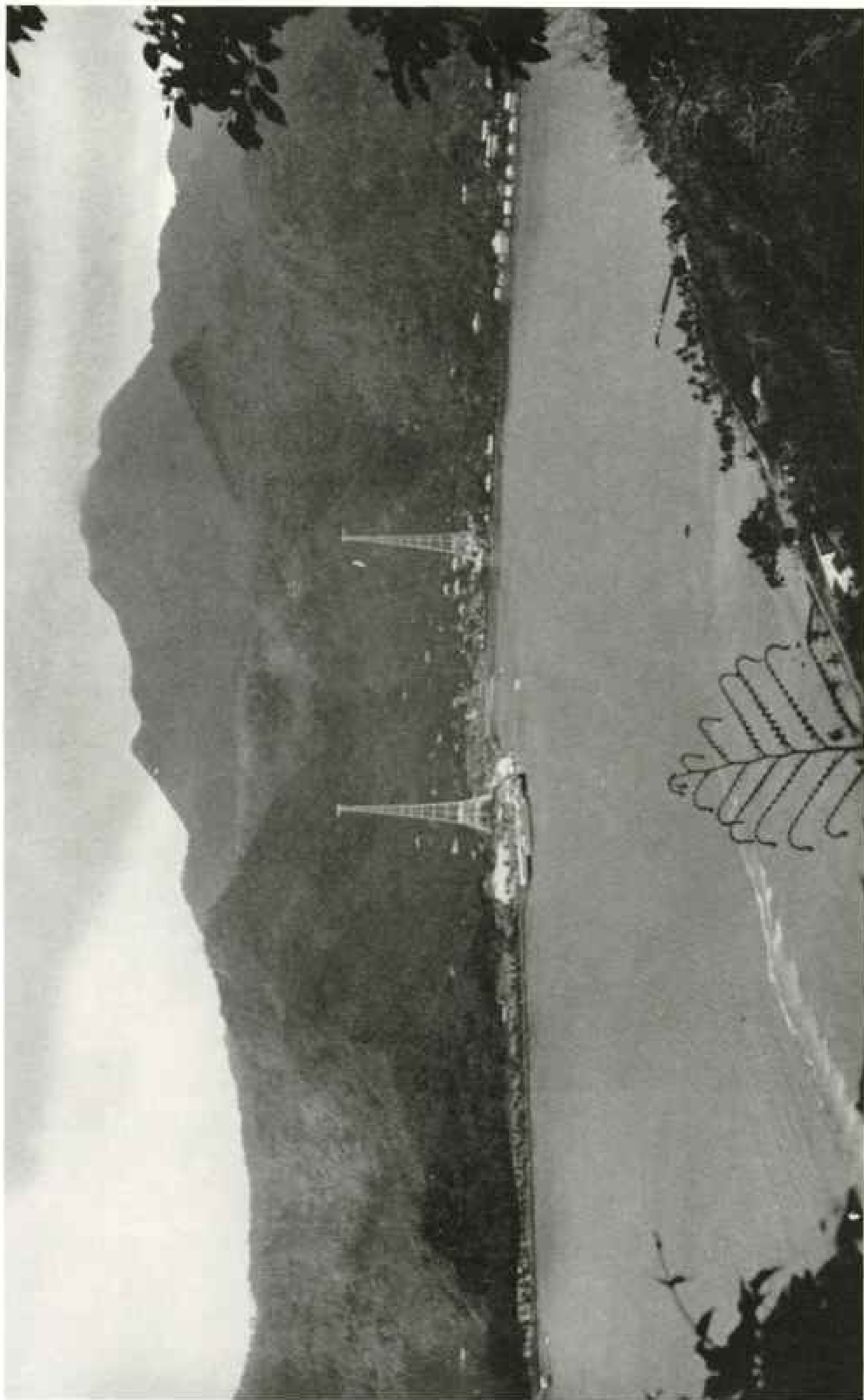
Most of the 467 natives who live in this village of Omoko and in Teiautua, across the lagoon, are full-blooded Polynesians.



Photograph by Wybbe Betts

FRANK TIAGA, SAMOAN SAILOR, WADES ON A TABILLEIKE SHOAL TO COLLECT LIVING CORAL.

Light-colored water against the darker blue indicates the shoal, which descends precipitously at its edges. Clifflike walls are covered with living corals.



Photograph by Chela Olchin

INTO LANDLOCKED PAGO PAGO SAILED THE "ZACA," LADEN WITH CORAL TREASURE FROM THE SEA GARDEN OF TONGAREVA

Five days out from the island, the author's expedition reached this port on the eastern end of Tutuila, American Samoa. Towers of the United States Naval Station rise high above the barracks, hospital, school, and dwellings. The harbor is the crater of an ancient volcano, flooded by the sea. Dr. Minet and his assistants explored the green mountains and the shore. U. S. sailors helped pack the coral shipment, weighing ten and a half tons, which was sent to New York by liner.



Photograph by Toshio Asaeda

NO STRANGER TO SOUTH SEA LAGOONS AND CORAL ISLES IS THE GRACEFUL "ZACA"

Templeton Crocker, of San Francisco, has sailed his craft across the Pacific on a number of scientific quests and in 1932 he took her around the world. Built along the lines of Gloucester fishing boats, the ship is 118 feet over all and equipped with Diesel auxiliary power. With a scientific laboratory and motor boats, she made an admirable floating headquarters for the expedition. Across the lagoon may be seen several of the disconnected *motus*, or islets, which form the ring-shaped group hemming in the quiet waters.

The crevices of the coral conceal other dangers. Vicious moray eels, sometimes six to eight feet in length, lurk among the eroded passageways. Their heavy bodies terminate in small heads with jaws bearing rows of sharp, needlelike teeth capable of inflicting a savage bite. Both the large brown moray and the smaller white marbled moray, the bite of which is said by the natives to be poisonous, are depicted in Color Plate II.

There are also immense sea stars, their leathery bodies covered with needle-sharp scarlet spines that move on ball-and-socket joints, menacing in all directions (Plate V).

These creatures, about two feet in diameter, have 16 arms and crawl over the sea floor by means of countless tube feet, sucking up bottom animals through the powerful central mouth on the under side of the body.

SEA STARS WOUND—AND CURE

Should a diver step on one of these gruesome creatures, the spines would penetrate his foot, breaking off and working inward to inoculate the blood stream with a poisonous secretion.

The natives have a remedy. They say that if a diver is injured in this way, he

should at once turn the sea star on its back with a stick and apply the wound to its mouth. The powerful pumping action sucks out the spines and the poison, too, they assert, and quick recovery follows.

We visited one shoal shaped like a horseshoe. The summit of the coral growth composing it was flattened out like a table top about two feet below the water surface. On all sides the serrated irregular walls descended precipitously to a depth of 25 feet or more.

Above the heart of this horseshoe shoal we anchored our boats, and descended into its depths. The effect from the sea floor was that of an amphitheater, the overhanging corals rising on both sides and behind us. The bottom fell away in receding steps from which domes, rich foliations, and spreading lacy clusters expanded on all sides. Ahead of us, at the entrance of the gorge, a coral column rose almost to the water surface, dividing the undersea portal into two parts.

#### FACE TO FACE WITH FOUR SHARKS

I set up my tripod, adjusted my camera, and started to photograph.

Suddenly four large sharks swam into the gorge from the left opening and began to circulate about (Plate IV).

I waited for them to leave, but they seemed inclined to linger, meanwhile edging nearer.

I began to get nervous, and considered retreating up the ladder, but realized that then I would be dangling like bait, an impression that I least desired to give.

Just then I remembered a lesson I had learned from Tau. I had come up from a dive and remarked to him that there was a shark down there.

"That's all right, Dr. Miner," he had replied. "He not bite you. I make him run away."

So saying, he had plunged into the water and swam toward the shark, shooting out his arms toward it with an exaggerated swimming motion—and the shark had swum away.

Well, I decided to adapt his method to the present situation. So, taking my courage in my hands, I took two or three plunging steps forward on the sea bottom, making swimming motions toward the sharks with my arms in a threatening manner—and the monsters turned about and swam out of the gorge through the righthand opening!

Much relieved, I went back to my photographing.

Nevertheless, I do not offer this method as a recipe for driving away sharks. The only thing I can say is that it was effective that one time. Another day they might not be so accommodating. Any person following my example must do so at his own risk.

The undersea gardens of the lagoon were replete with gorgeous fishes of every hue and color pattern, and sometimes of the oddest possible shapes.

Round, vertically flattened Moorish idols, with broad black and white markings, absurdly pointed snout, and dorsal fin tapering into a long trailing streamer, glided by in comically dignified progression (Color Plate VI).

About my head swam red-spotted Tangs, decorated with a scarlet oval near the base of the tail, in the midst of which was borne menacingly a sharp backward-pointed hook.

A curiously marked Pacific filefish, with quadrangular body, foolish shape, triple series of rasplike pointed scales, and camouflage coloration, swam past like a gaily colored impossibility.

Tiny demoiselles, canary yellow, blue, green, and striped black and white, flickered around the finely branched corals like butterflies against the spreading blue-tipped branches.

Wrasses of every sort, brilliant in rose, purple, green, blue, and gold, darted about in all directions. The water around us was full of broken rainbows.

It was a problem to obtain a representative series of these fishes for our group. Some we caught with hook and line, with nets, or with traps. But the tiny demoiselles (Plate II, upper middle) could not be taken by any of these methods. They were continually haunting the coral clusters, nibbling and nosing at minute seaweeds and small fragments. As soon as we made a motion toward them, they would dart between the coral branchlets and disappear.

#### FISHING WITH THE "BANG-BANG"

We soon found, however, that we could collect all we wanted by breaking off the coral clusters, bringing them up to the boat, and dousing them up and down in a tub of water. Hosts of the little creatures would then swim out and could be scooped up in a sieve.

Butterfly fishes (*Chaetodonts*) were very abundant all about the coral pinnacles and





Photograph by Toshio Asaeda.

ALL HANDS KEEP WATCH OVER THE DIVER EXPLORING DAVY JONES'S LOCKER

Equipped with photographic and diving apparatus, the boat is anchored fore and aft near a flat-topped coral shoal whose precipitous sides descend to a depth of four or five fathoms. Dr. Miner has gone down; John, a sailor, has just relieved Harry at the pump; Chris Olsen draws in the cord on which the tripod was lowered; Pete, another sailor, watches the diver through a waterglass and pays out the air hose as needed; Wyllys Betts, swimming near the boat, peers down through goggles at Dr. Miner, who is setting up the tripod on the sea floor below.

caves (Plate II, upper right). It was not easy to capture these by hook and line, so we utilized the "bang-bang," an unusual contrivance suggested by Mr. Crocker.

This consisted of a jointed bamboo pole about ten feet in length, to the end of which two dynamite caps were attached. An insulated and waterproofed cable was looped along the pole and continued for about 30 feet up to the dory where one of the sailors sat with a switch box between his knees.

Equipped with our diving helmets, and holding the pole, properly weighted with sheet lead to balance it, we would stalk the elusive *Chaetodons* in and about the corals, until the dynamite caps were about a foot above their heads. Then we would jerk the cord as a signal; the sailor above would close the switch. There would be an explosion and the fish would flop over on its side, stunned (Plate VII).

Meanwhile Tau would be ready, swimming at the surface with scoop net in hand and peering down at us through his goggles. As soon as the explosion took place, he

would dive down, capture the fish in his net, swim with it to the dory, and hand it up to Toshio Asaeda, our Japanese artist, who would place it in a pail of sea water.

The fish would soon recover, and Toshio would sketch the color pattern before it had a chance to fade. There is always a problem in recording the colors of fishes accurately, for their hues tend to grow dull in captivity.

The fish were kept alive in pails until we returned to the *Zaca*, where Toshio would complete the paintings at leisure.

Chris Olsen, my right-hand man, and Wyllys Betts, then made plaster molds of each fish and the original specimen was preserved in alcohol.

When these molds were brought back to the Museum, wax casts were made and shaped to the desired attitude while the wax was still warm. Afterwards they were colored from the sketches, giving a lifelike result. Whole schools of fishes can be cast from the same mold.

Once Frank Tiaga, our Samoan sailor,



Photograph by Toshio Asōda

## OVER THE SIDE OF THE DORY GOES A TRIPOD FOR THE UNDERSEA PHOTOGRAPHER

Chris Olsen, one of the author's assistants, lowers the stand, its three wooden legs attached to the non-corroding metal top and weighted with bands of sheet lead. Harry, of the *Zaca* crew, operates the handle of the two-cylinder pump which replenishes the air in the diving helmet. Dr. Miner will set up the tripod on the floor of Tongareva's sea-garden lagoon, and fix his underwater camera upon it.

was scouting about the edge of the lagoon in a homemade sailboat with two Tongarevan natives (page 381). Looking down through the water, he discovered a remarkable coral growth of the genus *Acropora* about six feet below the surface. It rose like an immense rosette, its broad fronds arranged in spiral fashion in constantly diminishing tiers to a somewhat pointed apex.

"He look like Chinese house!" said Frank.

Apparently it reminded him of a Chinese pagoda that he had seen when voyaging in the *Zaca*.

## LANDING 900 POUNDS OF CORAL

He sailed back to the shoal where I was diving and called to me in wild excitement. I got into the boat and accompanied him to view his find. I exclaimed at its beauty.

"You want him?" eagerly inquired Frank.

"Why, *you* can't get it. It's too big," I returned.

"You want him?" he insisted.

"Yes," I admitted. "Of course I do!"

"All right. I get him!" he asserted. "I take boat and these two boys and get him Monday."

True to his word, he left the *Zaca* with the rickety native sailboat and its brown-skinned crew the following Monday morning at eight o'clock, and by three in the afternoon he was back alongside. The little boat was almost awash with the weight of the huge coral, its spreading fronds overhanging the gunwales (page 376 and Color Plate VIII).

We used block, tackle, and the hoisting engine to haul it aboard and later found it weighed 900 pounds. It came back to the Museum without breakage and will soon be on exhibition in the Hall of Ocean Life.

The coral structures in the lagoon at Tongareva grow up from the sea floor, at first in the form of pinnacles which later expand into turreted castlelike structures. Finally they nearly reach the surface of the water in towering columns with clifflike sides.

Because corals cannot live exposed to the air, however, these columns—when within a couple of feet of the surface—tend to spread out into flat, tablelike shoals,



Photograph by Roy Waldo Miner

GUNWALES NEARLY AWASH, A SAILBOAT FULLS ALONGSIDE WITH A 900-POUND CORAL

Frank Tiaga, Samoan sailor, aided by two Tongarevans, laboriously loaded the huge spiral cluster into the boat under water (Plate VIII). Bailed out at low tide and refloated at high water, the craft was barely able to carry its burden to the *Zaca*.



Photograph by Toshiro Asaeda

BLOCK AND TACKLE HOIST THE INVERTED SPIRAL CORAL ABOARD THE "ZACA"

Derrick and power winch were taxed to haul the 900-pound prize from the homemade sailboat. Frank Tiaga rests one hand on the coral mass, brought to the surface by his ingenuity (Plate VIII).

resembling a mesa. The summits of these, as well as the sides, are covered with living corals of many species.

Toshio and I took advantage of this fact to wade out upon them to get color sketches of the living specimens at close range for intimate details. I would pick out the forms desired and hold a waterglass in position so that Toshio could sketch the corals and record them while expanded in their native element.

#### MAKING SKETCHES, IN COLOR, UNDER 75 FEET OF WATER

Meanwhile Olsen would stand on the sea bottom in a diving helmet, as on previous expeditions, with an oiled canvas mounted on plate glass, busily laying on oil colors with a palette knife, making color sketches of the reefs and their life in the open water, 75 feet below the surface!

By these means we secured a large series of color memoranda of the living corals to aid us in building up our "Pearl Diving Group" upon our return to the Museum.

In our two weeks at Tongareva I made 72 dives, remaining down from half to three-quarters of an hour each time—easily possible in the warm tropical waters. The other helmet was shared between Olsen and Betts, and the latter was also continually diving with goggles only, in which art he almost equaled the natives, Tau, Tony, and the Samoan, Frank.

We collected more than ten and a half tons of beautiful corals, upwards of 100 pearl shells, about the same number of *Tridacna*s, and several thousand specimens of invertebrates for our scientific collections. In addition we obtained several thousand feet of motion pictures, many of which were taken under water, and a large number of still pictures, besides the color sketches of representative fishes and corals. We also made many interesting observations and notes of the methods of life and natural history of reef-living creatures.

Our corals were bleached by running streams of water over them until the animal film was entirely removed and the stony skeletons were snowy white (p. 379). We then packed them temporarily in nests of coconut fiber in any packing cases that we could find on our out-of-the-way island.

Tau, we found, was a person of consequence in the community, for he held the office of "policeman" in Omoko, one of Tongareva's two villages. Apparently his

duties were not very strenuous, for he gave us practically his entire time, acting as guide and general assistant.

Tongareva is composed of about 24 islets, or *motus*, strung like long narrow beads around the blue lagoon, which is about seven miles wide and twelve miles long. All the islets are low-lying, none being more than fifteen feet in height, and all are covered with dense growths of coconuts (pages 370 and 372).

Formerly, in the days when the natives followed their ancient beliefs, the population was scattered over most of the islets, but after becoming Christianized the people were gathered into the two tiny villages of Omoko and Tetautua, where the missionaries had built chapels. Omoko is somewhat the larger. The latest figures give 467 native inhabitants for the entire population of the atoll, besides two whites.

The people are fine-looking Polynesians, with a history, corroborated in its essentials, going back about 500 years in Tongareva. Their traditions and affinities of language and culture suggest that the island was settled from Manihiki and Tahiti, and that their progenitors were related to the Maoris of New Zealand.

#### TONGAREVANS KNOW THEIR FAMILY TREES

They are very intelligent, amiable in disposition, and proud of their ancient lineage. In fact, they hold their land by virtue of their direct descent from the original settlers. The genealogy of each family is carefully guarded, and can be recited orally with infallible accuracy.

Lately the New Zealand Government has had these genealogies reduced to writing and recorded in a native land court to form the basis of title to the land, which is all held by the natives.

The original settlers are said by the natives to have come in canoes, bringing coconuts which they planted. As the settlers had children, so the coconuts gave rise to new coconuts to feed the new generations.

The people believe that, as descendants of the original settlers, they have inherited the right to the progeny of the original coconuts and the land on which they were planted. Therefore they value their trees as evidence of continuous possession and hesitate to cut any of them down.

The natives are all excellent swimmers and divers from infancy, and are very expert not only in collecting pearl shell for



Photograph by Toshio Aseda.

IN THE "LONG HOUSE" AT AMOULI A FEAST IS SPREAD FOR THE VISITORS

Mr. Crocker, the guest of honor, members of the crew and expedition, and townspeople, join in the procession to the banquet hall. Several of the natives are clad in tapa cloth, made from the bark of the paper mulberry tree and stained with vegetable juices in geometric patterns. Rulers of the Samoan village are brother and sister to Pomasa Utu, one of the *Zaca* sailors. Tree trunks, carved and ornamented, support the thatched roof of the ceremonial structure, built on a raised platform of coral rock. The floor was covered with white sand.

export but also in capturing the food fish with which the lagoon and the surrounding ocean swarm. They also dive for *Tridacna* clams, which they consider delicious.

In their little outrigger sailing canoes the brown-skinned natives skim over the waves with all the skill of a natural seafaring people. They are famous, too, for their palm-straw hats, as well as for woven baskets and fans.

Most helpful to us during our stay was Mr. Philip Woonton, the resident government agent representing the Dominion of New Zealand, and his friendly assistance was important to the success of our expedition (page 366).

At last, reluctantly, we set sail from this idyllic atoll, with all our main objects accomplished, and shaped our course toward Samoa.

Every night at eight o'clock the engines were stopped and we drifted for about an

hour, with powerful lights lowered over the side and the crew standing ready with hand nets to capture the floating and swimming creatures that strayed within the area of illumination. In this way, in spite of varied fortunes because of heavy swells, we made fine hauls of invertebrates and surface fishes.

STRANGE CREATURES OF THE SEA

I sat at a bridge table on deck with a shaded electric light and low-power binocular microscope handy. As the nets were emptied into trays I examined each haul in turn.

There were hosts of transparent jellylike salps, banded in white; delicately colorful medusae contracting their wraithlike umbrellas, disk-shaped porpitas, about the size of a quarter, deeply hued with brilliant blue; siphonophores with long strings of contractile swimming calyces; quantities of



WETTING DOWN LIVE CORAL, AS IT BLEACHES, REMOVES ANIMAL TISSUES.

On a jetty at Tongareva a native pours water over clusters gathered by the expedition. The film of coral polyps which covers these growths must be kept wet in the sun so it will decay and slough off.



Photographs by Toshiro Asaeda

MULTI-HUED LIVING CORAL TURNS SNOWY WHITE WHEN EXPOSED TO THE AIR

Under water, the foliated variety at upper right is yellowish green suffused with clouds of purple. Just below it is a rounded, finely divided colony of *Acropora* with tips of forget-me-not blue. Bright green is the *Pachyseris*, lower right, when living. More massive specimens at the left (*Porites*) are golden yellow and royal purple. The piece covered with circular dots is salmon pink dotted with green. All were gathered by the expedition at Tongareva.



Photograph by Toshiro Asanda

#### GAFF AND TACKLE CONQUER A BATTLING DOLPHIN

A trolling line, lashed to the after starboard deck of the *Zara*, lured with its feathered jig many large fishes. These either replenished the larder or were added to the scientific collection of the expedition. This blue and silver dolphin (*Coryphaena*) has a large, rounded head and continuous dorsal fin.

shrimp, tiny copepods and amphipods, brilliantly mottled with red; small flying fishes and even a young dog shark.

Many species were brilliantly luminescent, especially some of the medusae, squid, and ascidians. There was one colonial ascidian, known as *Pyrosoma*, or "fire body," comprising hundreds of little tapering creatures standing out around a hollow cylinder, each gleaming with luminescence like so many points of flame.

Often lanternfishes, their sides adorned with rows of light organs, came to the sur-

face and were caught in our nets. When examined closely these luminous structures were seen to be equipped with perfect lenses, reflectors, and iris diaphragms, and to vary in color—green, red, and white.

Several times we secured small argonauts, each with a little ribbed shell of papery texture shaped like a liberty cap. Out of this the creature would pop, exposing itself completely, while its body, mottled and speckled with chromatophores, would blush through successive changes of color, reds, blues, and purples flooding its translucent surface in waves. Meanwhile, it would stare at us with conspicuous eyes, the velvety black pupil surrounded with an iris of pearly luster.

#### NATIVES FAIL TO FEAST ON SWARMING PALOLO WORMS

While at anchor in the harbor of Pago Pago, seat of government of American Samoa (page 371), we would lower our lights

over the side of the vessel and add to our collections all sorts of interesting sea creatures with which the water teemed.

The famous palolo worm was due to swarm at this time. This remarkable creature ordinarily lives in crevices in the reef rocks, but on two days in October and November of each year, the day the moon is in the last quarter and the day before, the long, slender hinder portion of the worm, containing the ova or sperm, becomes detached. These segments then swim out in countless numbers at the surface of the

water to mate, and myriads are caught for food by the natives.

Such a coveted delicacy is the palolo worm that the islanders look forward eagerly to the time of the swarming and know exactly when it is due. Rising before dawn on the great day, they set forth in canoes and with hand nets and baskets scoop up whole boatloads of the teeming worms. Some are eaten raw, though usually they are wrapped in leaves and cooked.

On this occasion (October 7) the islanders were disappointed, however, as the weather was so stormy that the swarming did not take place on schedule. Accordingly, all celebrations in honor of the event were postponed until the following month, when better luck was expected. Nevertheless, the next evening quite a number of free-swimming palolo worms were caught in our surface nets.

Once during our stay we hired a car and drove out along the south shore of the island to visit Vaitogi, "Village of the Shark and the Turtle."

Immediately upon our arrival a crowd of little children appeared, apparently from nowhere, gesticulating and crying out with musical voices. They grasped us by the hand and led us to the crest of the precipitous cliffs which jut out into a rocky cove.

Here the sea dashes over outlying ledges, rushing into the cove in huge masses of foaming spray. Spouting fountains rise



Photograph by Roy Wilcox Nimitz.

#### A SAILOR WHO WAS AT HOME ABOARD OR OVERBOARD

Frank Tinga, whose home is near Pago Pago, was one of the two Samoan members of Mr. Crocker's crew who had sailed with him on three cruises. Powerfully built, he was a tireless swimmer and diver. He located many of the larger coral masses for the author, who called his assistance to the Tongareva expedition invaluable.

high in the air to fall on the heads of the spectators in fine showers and rush back down the rocks in cascades.

#### CHILDREN CHANT—AND A LARGE SHARK AND TURTLE APPEAR

Where the transparent rollers break on the rocks, the Shark and Turtle appear in response to the proper incantations. These are sung by the children in concert, some leading, others responding in bursts of wild melody accompanied by the music of the resounding surf.



One little ragged damsel of about ten, waving her arms as she jumped up and down, cried out, over and over, "Apa-apa! Laumei! Apa-apa! Laumei!" The others took up the chant, meaning "The shark fin! The turtle!"

Then followed stanzas which I could not catch before the whole was repeated.

Suddenly the urchins danced more wildly, shouting and gesticulating toward the sea.

We looked where they pointed and saw a huge shark clearly through the transparent water of the rollers and a little later a great sea turtle was visible swimming on the crest of the waves with head erect!

We gave the children a five-pound tin of canned beef, which is more acceptable to them, when divided into morsels, than bonbons would be to white children, and came away much delighted with the dramatic ceremony.

It is very likely that the shark and the turtle haunt particular locations among the rock crevices and that the youngsters can always count on their appearance if they sing the incantation for a long enough time.

#### SEA GARDENS OF SAVAI

Visiting Apia, capital of British Samoa, we were readily given permission to work and collect on Savaii, our next destination.

Savaii is perhaps the most beautiful of the Samoan Islands. The high mountains, rising to 6,000 feet or more, the sparse settlements, the dense forests, have kept it relatively unspoiled by civilization.

Here William Coultas and Toshio, aided by members of the crew, obtained sketches, photographs, and specimens for an oceanic bird group, while Betts, Olsen, and I, assisted by Frank, the Samoan, explored the reaches and nooks of the harbor for striking corals.

The bottom here was carpeted over extended areas with the most beautiful corals I have ever seen, of an almost inconceivable delicacy and fragility.

The whole undersea prospect was so astounding that Frank cried out:

"Oh, see! He just like garden of stone flowers!"

He dived indefatigably for the beautiful specimens and we brought back an overflowing boatload to the *Zaca*.

We spent a most profitable week here, collecting these gorgeous corals, and bring-

ing large fragments of dead corals to the *Zaca* for breaking up. This was an important part of our work, for when we hammered the various branches into fragments, we found large numbers of crabs, shrimp, anemones, brittle stars, sea urchins, sea worms, sponges, and shells hidden in the crevices.

#### A CRAB WITH LIVING BOXING GLOVES

One of the most interesting was a fine specimen of the "pugilist crab," a little fellow with a back decorated in a diamond pattern with alternating patches of scarlet and buff, for all the world like a harlequin. But its most remarkable feature was that it held in each claw a tiny sea anemone, with which it sparred my intruding finger as if they were a pair of boxing gloves!

The advantage of this peculiar habit is obvious. Sea anemones are armed with batteries of sting cells which, upon contact with small invading creatures, are discharged, thus repelling or killing them. Even larger creatures will shy away from them, apparently aware that their sting can be felt unpleasantly.

Enemies are kept aloof by the living boxing mittens, and it is conceivable that small creatures killed by the anemones for their own food may be shared by their crustacean exploiter.

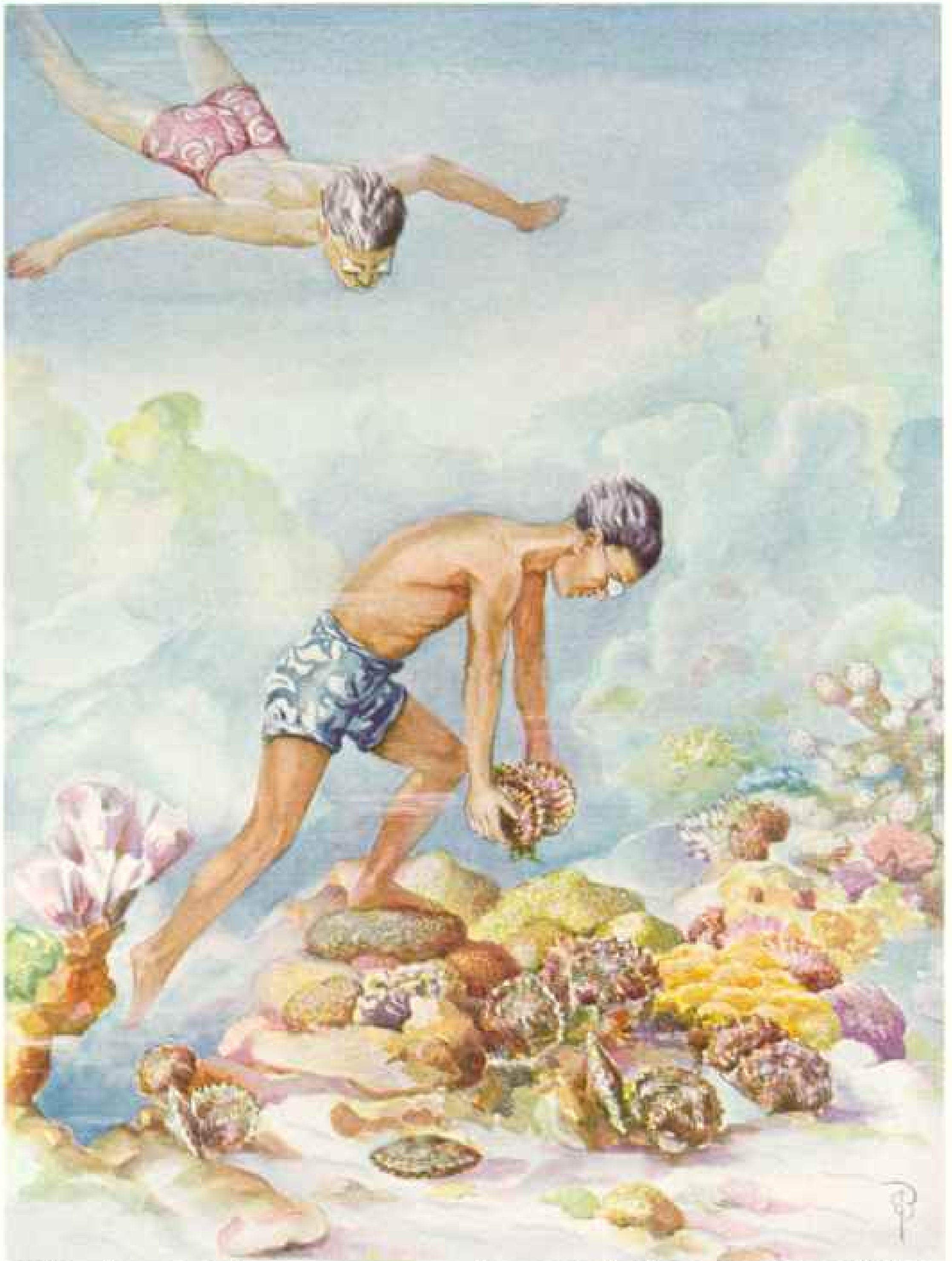
This species of crab always has a pair of these anemones held in its claws. The anemones, for their part, seem not to mind and apparently thrive on the results of the partnership.

Betts, Olsen, and I had now accomplished our aims and so the *Zaca* bore us back to Pago Pago that we might catch the *Mariposa* of the Matson Line. Our tons of Tongareva corals had been packed and were awaiting the *Mariposa* on a lighter tied up to the wharf.

That evening Mr. Crocker had an elaborate farewell dinner served in our honor, including a huge turkey, cranberry sauce, sweet potatoes and other northern vegetables, as well as old-fashioned mince pie, and this at Pago Pago, some 8,000 miles from home and 14 degrees south of the Equator!

The next morning the *Mariposa* steamed into the harbor and, exactly at noon, while the *Zaca* dipped her colors to us, we sailed toward the entrance of the harbor bound for the open sea and home.

SEA FLOOR AQUARELLES FROM TONGAREVA.



© National Geographic Society

Painted by Elise Hostelmann under direction Roy W. Miner

DOWN, DOWN GO GOGGLED NATIVES TO GATHER PEARL SHELLS FROM THE SEA FLOOR

Polynesian swimmers plunge 25 to 60 feet below the surface, pluck shells from among coral growths, and quickly rise again. Many stay under water three minutes. In deeper lagoons, to save time and strength, they descend with weights attached to cords. Objects are plainly visible, for the water is unbelievably clear. About one-fourth of the lagoon is floored with pearl shell. Paintings reproduced in this series depict the curious creatures and fantastic coral growths observed and collected by Dr. Roy Waldo Miner on the 1936 American Museum-Crocker Expedition to Tongareva, a coral atoll midway between the Tuamotu and the Phoenix Islands.



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Painted by Elsa Bostelmann under direction Roy W. Miner.

MORAY EELS LURK IN SUBMARINE CORAL-REEF CREVICES, READY TO SNAP AT DIVERS

These creatures, sometimes six feet long, have small heads and beady eyes. Their slitlike mouths are armed with long, needle-sharp teeth with which they greedily attack any creature that ventures near their dens. Pearl divers suffer severe bites when, in their quest for shells, they swim too close to the darting jaws. A large brown MORAY (*Gymnothorax undulatus*) lies at the left. The smaller black and white marbled specimen *Echidna nebulosa* (right) possesses a poisonous bite. Above them tiny DEMONSTILES of varied colors dart in and out of the coral growths.

SEA FLOOR AQUARELLES FROM TONGAREVA



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Painted by Else Bostelmann under direction Roy W. Miner

TOUCH A GIANT CLAM'S LIPS AND ITS SHELLS SNAP SHUT LIKE STEEL-TRAP JAWS

Pearl divers must take care not to get hand or foot caught in the viselike grip. Open shells protrude from the corals or stand on edge on sandy bottoms. When distended, their thick mantles pour over the wavy shells in contrasting patterns of indigo and sapphire, purple and turquoise, green and black, orange and brown. Through mantle openings a food-bearing stream of sea water is pumped. A pair of huge clams (*Tridacna gigantea*), taken in Australia and now exhibited at the American Museum of Natural History, weighs 579½ pounds. Those in Tongareva (*T. compressa*) are a foot long.



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Printed by Else Dostermann under direction Roy W. Miner

FOUR MAN-EATING SHARKS WHIRL ABOUT FOR A GETAWAY FROM DR. MINER

Working 25 feet below the surface, the author suddenly looked up into the faces of four large sharks. He could not retreat because coral cliffs surrounded him on three sides. Remembering the advice of Tau, a Tongarevan pearl diver, he lunged forward, waving his arms toward the enemies. All four turned in retreat. Sharks are at all times a peril; not always will they flee when challenged. They attacked two native boys while the Expedition was at Tongarova, and one finally died of his wounds. The opposite plate shows another section of this lagoon.

SEA FLOOR AQUARELLES FROM TONGAREVA



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Painted by Elsu Bostelmann under direction Roy W. Miner.

A GRUESOME, EIGHT-ARMED OCTOPUS SLIDES STEALTHILY FROM A CORAL CAVE.

Just below one of the protruding eyes is the siphon through which the creature squirts water to propel itself forward. On the sea floor crawls a spiny SEA STAR two feet in diameter. Its sixteen arms radiate in all directions, searching for mollusks and crabs. The long spines move on ball-and-socket joints. When stepped on, the spines break off in the foot, exuding poison. Natives, when stung, promptly turn the offender upside down with a stick, and place the wound against the sea star's mouth. Spines and poison are sucked out, and the wound soon heals.



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Painted by Elie Bostelmann under direction Roy W. Miner

WEIRD AS CAMOUFLAGED WARSHIPS ARE GAUDY FISHES SWARMING IN THE LAGOON:

MOORISH IDOLS, banded black, yellow, and white, have long, stringlike dorsal fins (upper right). Spiny tails of BANDED FILEFISHES (lower left) are armed with close-set teeth that resemble rasps of a file. Here and there dart TANGS, or surgeon fishes, of indigo hue (lower right). These have a sharp, hook-shaped lancet near the tail that can lacerate an exploring hand. Gay-colored WRASSES also abound (upper left). Tropic waters often scintillate with tiny emerald or sapphire DEMOISELLE fishes (Plate II) which speed between coral turrets. To capture them, collectors break off a piece of coral and douse it up and down in a pail of sea water. Clouds of rainbow-hued inhabitants swim out.

SEA FLOOR AQUARELLES FROM TONGAREVA



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Printed by Else Bostelmann under direction Roy W. Miner

BOOM! GOES THE "HANG-BANG," AND TAU DIVES TO NET THE STUNNED BUTTERFLY FISH

The hang-bang is a long bamboo pole with two dynamite caps attached to the end. Insulated wires looped along the pole lead up to the surface where an assistant sits in a boat with a switch box between his knees. When the helmeted "fisherman" has maneuvered the pole to within a foot of a fish, he signals the boatman to throw the switch. An explosion stuns the specimen, which is taken to the surface and revived in a pail of sea water. There an artist records the colors before they fade. Later, other members of the party make a plaster mold of the fish. The hang-bang is used to capture species that cannot be taken alive in any other way.





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Painted by Else Bostelmann under direction Roy W. Miner

HEAVE TOGETHER! A 900-POUND CORAL IS LIFTED ONTO A SUNKEN BOAT

When the author admired the spiral specimen from over the side, a Samoan sailor said: "You want it? I get." With two companions, he anchored a small boat just above the huge prize, dived down with a cold chisel and sledge, and severed the eight-inch stem. Then the men sank the boat, lifted in the coral, and pushed the craft into shallow water. At low tide, when the gunwales were partly exposed, they hauled the boat dry, floated it, and brought the load triumphantly to the Expedition's base ship *Zacia*, where it was hoisted aboard with block and tackle. It is now in the American Museum of Natural History.

# AMONG THE BIG KNOT LOIS OF HAINAN

## Wild Tribesmen With Topknots Roam the Little-known Interior of This Big and Strategically Important Island in the China Sea

BY LEONARD CLARK

*With Illustrations from Photographs by the Author*

SO, THERE is nothing left in the world to explore?

Actually, there are many dim corners still awaiting complete exploration.

Such a shadowland is the interior of Hainan, big tropical island in the China Sea and potentially one of the most important military bases in the Far East. It lies like some luscious tropic fruit, waiting to be enjoyed—or stands like a sentry guarding the door to both South China and French Indo-China (map, page 394).

### WILD STORIES OF MEN WITH TAILS

The island of Hainan, as great in area as Formosa, has belonged to China for about 2,000 years—since before the birth of Christ. Yet the Chinese have occupied little more than its fringe, and among them the legend still persists that the wild men of the interior have tails!

This island of approximately 14,000 square miles—about the size of New Jersey and Connecticut together—supports easily on its north plain some 2,000,000 to 2,500,000 Chinese and tame Loi aborigines; also a handful of Americans and Europeans, including missionaries and the French Consul.

Some 250,000 (my estimate) "wild Loi" aborigines inhabit the colorful mountains and jungles of the remote interior. It was through the so-called wild Loi country that I hoped to advance my expedition.

### "TAIL OF THE DRAGON"

Hainan means "South of the Sea," but Chinese sometimes term their far southern possession "The Tail of the Dragon." The name is quite appropriate, too, for to the bulk of the Chinese people Hainan is far more remote and mysterious than even Mongolia, Turkistan, or Tibet.

To this day, since the original conquest of the flat coastal sections of Hainan under the Emperor Wu-Ti in 111 B. C., the Lois of the mountains (where many have been

driven by successive waves of migration from the mainland) have held off all Chinese attempts to annex their lands, either by force or by peaceful penetration.

Occasionally lone Hakka traders go deeply into the unknown regions beyond the Loi-Chinese border area, but few indeed are the white men who have penetrated that fever-ridden hinterland.

Casting about for information I learned to my amazement that not even the oldest "China hands" in Shanghai, Hong Kong, and other cities could tell me much about Hainan—except that "it is a wild place at the end of the Chinese world."

### HAINAN AHOY!

On June 26, 1937, at blazing noon in the China Sea, Nicol Smith and I first sighted the cloud-mottled sandbars of Hainan. I did not realize that nearly two months were to pass before our expedition—or rather its remnants—were to emerge from the interior of Hainan, and I was to see again that lonely but bewitching shore of ivory, jade, and moving brown sails (page 396).

Because of shallow water the steamer dropped anchor about two miles off the flat north coast and opposite the port of Hoilhow (page 392). Our boxes and bags were quickly passed by Chinese Customs officers and placed aboard a junk, one of a fleet that had come out to take off several hundred Cantonese troops.

Hot winds from the unseen and mysterious mountains far over the rolling plains to the south filled the creaking brown mat sails overhead. In an hour, with flying salt-spray in our faces, we approached long sandspits. Junks sailed all around us and gave the impression that they were scudding over dry land! Long lines of fishermen, carrying nets on bamboo poles, were wading far from shore, and looked like grotesque sea monsters as the late sun cast giant shadows beyond them.



LIKE SOME WEST INDIES CITY BUILT BY THE SPANISH SEEMED HOIHOW,  
HAINAN'S CHIEF PORT

Near the shore are flat-bottomed cargo carriers. Brightly painted stucco houses and arcaded galleries suggest Cuba, which some writers liken to the fertile Chinese island. Shortly after the author's visit, Japanese destroyers bombarded the waterfront.

At Hoihow, a compact Chinese town of several thousand inhabitants, we were met by the Reverend John F. Steiner, American Presbyterian missionary, and taken in rickshas through teeming streets. Many rickshas were needed for all our equipment and supplies, which totaled over a ton.

#### CHOLERA KEEPS COFFIN-MAKERS BUSY

Hoihow, we found, was desperately fighting a cholera epidemic. We were told that over a hundred patients a day were dying. In many parts of the city could be seen flying the jagged black-and-white cholera "dragon-flags," swaying symbolically from bamboo poles.

That night an officer of the Governor notified us that our expedition could not immediately advance into the interior.

The cholera dead were so numerous that the Government had established martial law. This measure prevented the people from fleeing en masse into the surrounding countryside and so spreading the epidemic.

All bodies were buried at night. Above the street hung huge banners with painted

pictures instructing the people how to avoid getting cholera—by not buying cut fruit and by killing flies.

At night for weeks we slept but slightly, for the hammering with wooden mallets in the coffin shops thumped like a monstrous and diseased heart.

At last, one night at dinner, Mr. Steiner bent forward, listening.

"There is no more wood left to build coffins," he said quietly.

That night, for the first time, we slept soundly.

#### WAR RAISES NEW OBSTACLES

But in the meantime obstacles other than cholera arose to guard Hainan's secrets from us. Because of the war on the mainland at Shanghai and elsewhere, special passports were required, and more than three weeks—sweltering weeks—crept by before we were finally able to start.

Hurriedly we gathered our supplies, equipment, and the personnel we had recruited among the north Hainanese, and at 6 o'clock one morning, heralded by the daily lightning bursts across the plains of



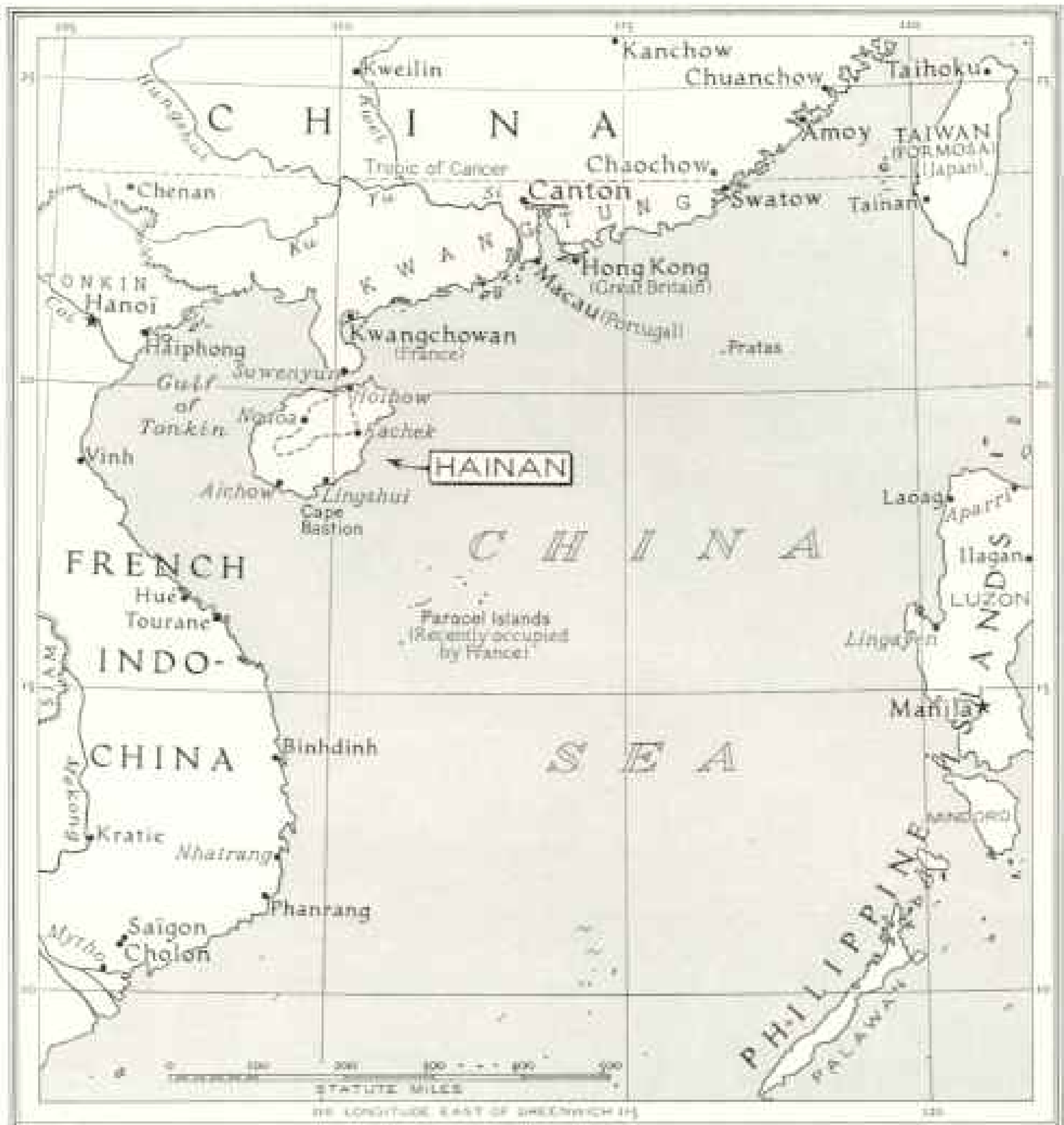
WONG, THE HAINANESE-ENGLISH INTERPRETER, HAD BEEN AN ESTATE  
MANAGER IN MALAYA

His European-style suit and sun-helmet show contact with foreigners, with whom he was more at home than with the native Loí devils who watched from "The Mountains of the Red Mist" (page 309). His language abilities carried him only part way to the tribesmen, for he spoke not directly to the "Big Knots," but through the medium of the cook, Lee Meng Yeok (page 404).



TWICE, WILD WATER BUFFALO CHARGED THE EXPEDITION'S CARRIER COOLIES

Patient, strong, and usually mild-tempered, the beasts sometimes run amuck and it is commonly believed that they have a special dislike for foreigners. Gentle companion of snowy egrets and naked youngsters, the water buffalo is, when aroused, a fit antagonist for a tiger. Like its cousin, the gaur, it is more alert than its mild brown eyes suggest and has a fierce cunning.



Drawn by Ralph E. McAmer

#### HAINAN, LONG-DORMANT TAIL OF THE CHINESE DRAGON, TROUBLES EASTERN WATERS

The island is strategically situated near the route from Hong Kong to Singapore and between French Indo-China and its territory of Kwangchowan. A dependence of the rich Chinese province of Kwangtung, this long-neglected and little-known island has been often mentioned in news headlines recently. When the author asked for information about Hainan, even "old China hands" could give him little, so in the summer of 1937 he and a friend set out for a five-weeks-long trek on foot deep into its jungle heart from Hoihow. His party visited aboriginal tribes whose women wear big brass earrings and whose warriors still fight and hunt with flintlock guns and poison arrows. The broken line indicates the route.

the southern horizon, we took two automobiles to the Chinese city of Nodoo, some sixty miles to the southwest.

It lay very close to our destination—the looming mountains of the wild Loi country.

In Nodoo, the Reverend P. C. Melrose, one of the few white men who have been into the interior, warned us against malignant malaria. No white person living on Hainan, he said, escaped it, but since the

bubonic plague was rampant in Nodoo, and since Governmental problems on the mainland might cause our long-awaited passports to be revoked any moment, we felt we could delay no longer for the height of the malarial season to pass.

Early in the morning of July 20, 1937, our boxes and bags were loaded into a Ford which we were told had once belonged to Wallace Beery, the actor, and we took



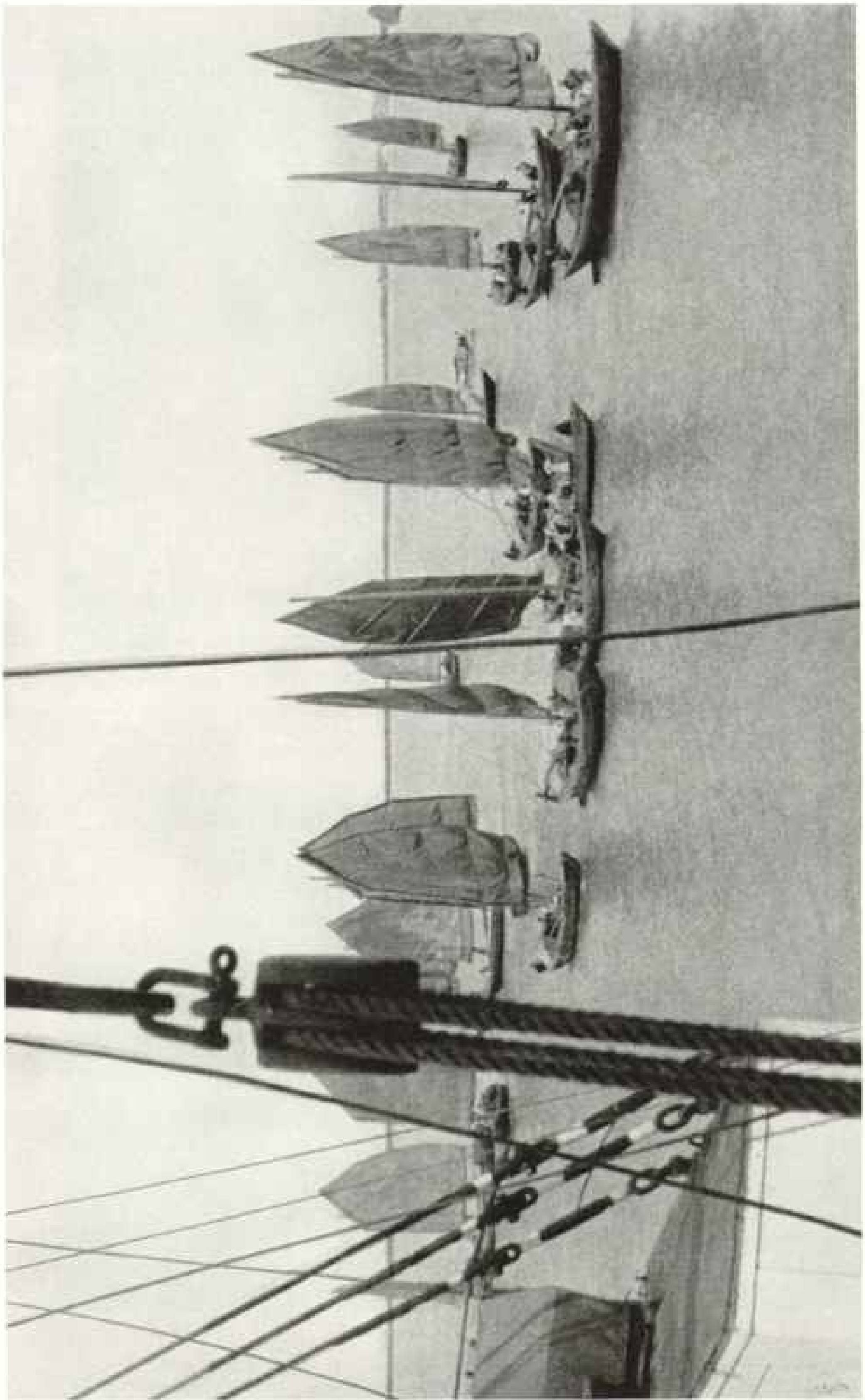
ANYONE CAN SEE HE'S A "BIG KNOT" LOI—UNTIL HE SHAVES HIS HEAD

Headman of some 3,000 warriors, this man clings to the distinguishing form of hair dress. Where they come in contact with the Chinese, even the lois have their heads shaved, thus leaving their distinction to language rather than appearance. The towel is a much appreciated gift from the author.



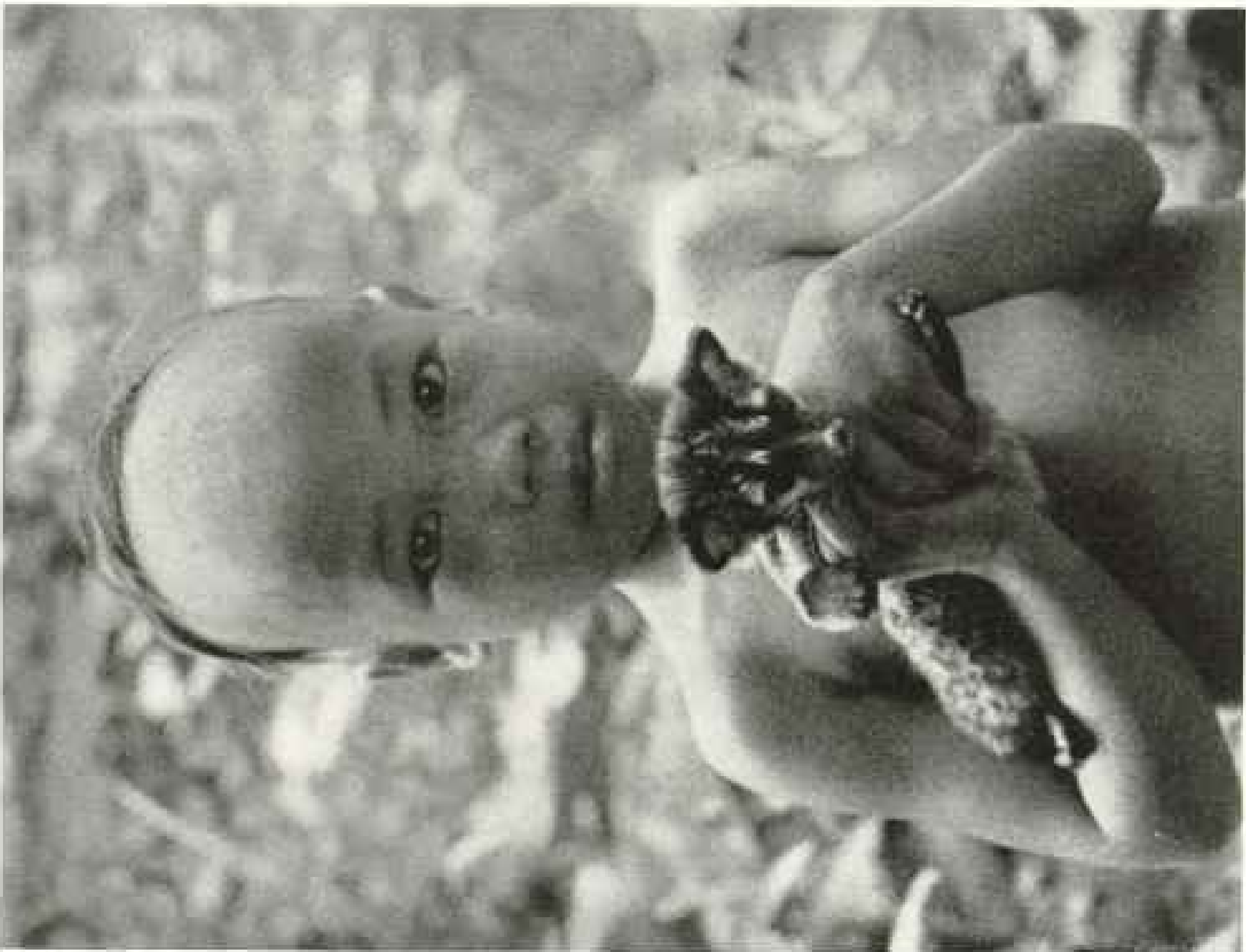
A HAND-CARVED OX-RIB HAS SUPPLANTED A DEADLY KNIFE AS HAIRPIN

In Hainan, women wear a decoration where they once carried a weapon. Called a "virgin's hairdress," this ornamented ox-rib is an adaptation from the blade which women once wore to protect their honor. When combined with a silken net, ear-chains, and an indigo tattoo, such an adornment goes well with glossy black hair.



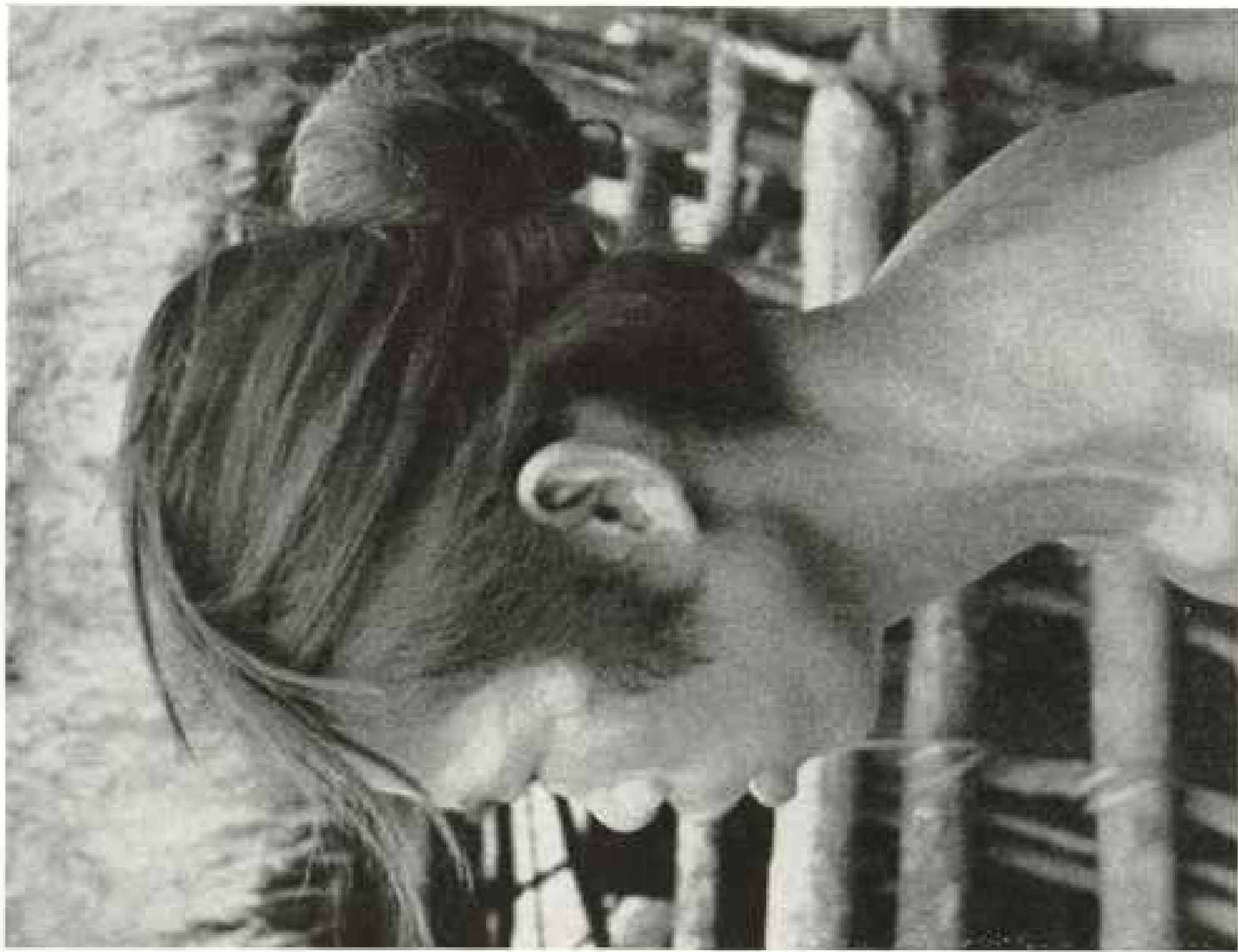
LIKE A FLOCK OF BATS; BROWN-SAILED JUNKS SWARM OVER THE SHALLOW WATERS OFF HOLLON

Dropping anchor two miles from shore, the steamer soon attracted a covey of junks, in which the expedition equipment was ferried to the flat north shore of the mountainous island of Hainan. From Japan to Java, junks are an important link in the chain of communications and experts can easily distinguish the types used on the Yangtze, at Nipapo, Foochow, or Hong Kong.



THIS BOY'S PET WAS THE PHOTOGRAPHER'S DECOY

With his shaved head and timid eyes the Ioi youngster seemed a good camera subject. But he was so shy that the author could get his picture only by photographing the palm civet.



THE "BIG KNOT" SHOWS HE'S A LOI

Its position indicates he is a Bi-Su-Dung. One group in Hainan wears its knot on the forehead (pages 395 and 398). Other Lois wear theirs on top like the pompon on a French sailor's hat.





BE IT EVER SO HUMBLE, BAMBOO WALLS AND A GRASS ROOF MAKE A HOME.

Doors droop and the roofs leak, yet this is a happy Hainan village. Above the huts are more bamboos, crackling with growth as the leafy shoots are detached from the main stem. A young bamboo shoot is a delicious tidbit. In such a hut, a missionary describes a wall fight between a gecko, or lizard, and a cockroach as "almost as exciting to watch as a football game."

the narrow military road through paddy fields and jungle to Nam Fong, Chinese-Loi market town a few miles beyond.

There we camped in the school compound and Chiah Jee Hong, our tall and genial cook, prepared a simple meal over a charcoal stove; he hardly realized as he did so that misfortune had already singled him out as a victim.

That afternoon the schoolhouse bustled with last-minute preparations for the march on the morrow, as the restless carriers arranged their loads laughingly, and the entire trading village of 100 families surrounded our portable phonograph. The records that delighted them most were those of Lawrence Tibbett!

All this gayety stood out in sharp contrast to the silence and slavish work to follow in the weeks ahead.

At 5:30 the next morning we started on our eventful trek deep into the interior of Hainan and out to Kachek near the east coast.

Extra pairs of new rope-sandals hung from the packs; apparently the carriers expected rough going.

Occasionally we passed groups of six to fifteen Loi men on their way to Nam Fong's market. Tall, lean, and bronzed, they were dressed in short aprons, fore and aft, and carried at their backs big knives in "Loi baskets." These also contained water pipes, bows and arrows, and food.

#### "BIG KNOT" IS FOUR INCHES LONG

Their long black or brown hair had been combed forward and knotted over the forehead, standing about four inches straight out (page 395).

This characteristic "Big Knot," from which the Hainan aborigines take their name, has now lost its significance. Various tribes, as I later learned, do up this peculiar knot in various positions on the head. The Ba-Sa-Dung, for instance—whose territory we were traversing—do up the knot on the back of the head (p. 397).

The ones we passed in the trail, with the big knot over the forehead, were Ha tribesmen from the far south. They were carrying herbs, dried monkeys on bamboo frames, snake skins and antlers, all of which are used in making Chinese medicines.



VIGILANT AND READY IS THIS BA-SA-DUNG WARRIOR

Poisoned arrows are still used by the tribesmen in hunting wild boars, antelope, and an occasional bear. Hainan has its own subspecies of porcupines, and cobras are common. Python steak is considered a delicacy and snake gall a medicine. The first hunter to hit an animal gets the head and hind quarters. If a second shot is necessary, that man gets the forequarters.

Distant mountains—half clothed in liana-bound jungle—rose in the south. And from them came a high, hot wind that bent down the tall *lalang*, or coarse grass, around us, roaring through it with a mournful sound like waves on a distant cliff-coast. Occasionally flocks of green parrots were flushed, turning and screeching in protest overhead, and the chattering of busy monkeys came down to us from the trees.

#### "THE MOUNTAINS OF THE RED MIST"

We camped that night on a jungle ridge about twenty miles due west of Hung Mo, "The Mountains of the Red Mist."

Often we had discussed this fascinating name, and its possible origin, with foreigners and Chinese on the coast. But no one had seemed able to shed light on the matter.

White bursts of lightning now flashed around the ridge; the daily shower had arrived. The rain drove hard against the taut and swaying tarpaulins overhead, giving the impression that some unseen hand was tearing cloth in little jerks.

Nicol was reclining on his army cot beneath a mosquito net, thankfully bathing

his swollen feet by extending them into the stream of water that drained steadily off the canvas.

Presently the rain and lightning seemed to be subsiding. It was nearly sunset. Tree cicadas overhead—sounding like piercing automobile horns—had already started their evening jungle symphony which was almost deafening. I was resting on my cot, eyes closed, but not yet asleep.

Then, suddenly, "Look, Leonard!" Nicol exclaimed.

Wondering if one of the restless water buffalo near by had invaded camp, I rolled over quickly and opened my eyes. Nicol had raised his mosquito net and was standing beyond the tarpaulins in the rain—now reduced to a drizzle—apparently regardless of the buzzing mosquitoes out for their night of feasting.

I saw almost immediately that the entire sky over the ridge had magically become an intense ox-blood red. The shiny translucent jungle surrounding camp reflected this red mist, so that it seemed that the very air I breathed was something tangible, tinted red! On all sides—toward the un-



Photograph by Dr. T. C. Lau

ONLY AT FESTIVALS DO THE HA LOI WOMEN LET THEIR JEWELRY DOWN

Although her face is tattooed, this girl's chief claim to beauty and social position is her ear load of brass rings. Fifty-six large rings were counted on one woman. When the wedding or other ceremony is over, the rings are looped up onto the top of her well-combed hair (page 402).

seen setting sun westward, toward the north, the south, and the east—the sky's original clouded marble gray had become uniformly, intensely, red.\*

"A WARNING!" SAY THE COOLIES

The whole effect was uncanny, and at the time it seemed almost supernatural. With loud exclamations the coolies appeared from under their tarpaulin. They were afraid.

Wong, the interpreter, who had once been an estate manager in Malaya, approached and, bowing, said apologetically, "Sir." He hesitated. "Sir, this is a warning from the

\*A bright red sky may occur when there is much fine dust in the high atmosphere and when the lower air is clear, as after a heavy rain. At sunset, when the paths of the sunbeams through the air are relatively long, the light that gets through this fine dust is reddish in hue and the whole clear sky has a rosy tint.

Loi devils who are watching us from the tops of Hung Mo . . ."

"That is superstition," I said, "and superstition is not believed in by educated men like yourself."

"We Chinese know that these Loi devils are very powerful," he answered gravely. "When a Loi curses a Chinese, that man dies!"

MALARIA STRIKES

In about twenty minutes darkness overtook the strange, prodigious red mist. Nicol and I talked late that night, speculating on the unknown country before us. But the men were very quiet, content to squat under their tarpaulin and smoke on thick green bamboo water pipes cut from a near-by thicket. Their premonition of trouble was soon to prove only too well founded.



THE CULT OF BEAUTY IS WORLD-WIDE—ITS PRACTICES VARIOUS

This girl neither plucks her eyebrows nor uses lipstick, but her cheeks are a geometrical chart in tattooing. Ear-chains lend a modern touch, but the blue beauty lines down the back of the neck mark her as a fit model of Ba-Sa-Dung cosmetics.

I wakened at dawn to find the coolies moving about in the dark, breaking camp. Nicol and I had scarcely dressed when Wong brought two of them up to me, saying, "These coolies are sick with malaria, Master."

Both men complained of having chills and fever during the night. Lightening their loads by distributing them among the other porters, we started again, following the ever-dwindling trail into Pak-Sa (sometimes called Bek-Twa, or Nga-Sa).

By late afternoon, two miles from Pak-Sa, we were overtaken by a lightly laden, fast-moving caravan. It belonged to the Chinese Magistrate who represented the Government in its dealings with the Lois.

Seeing that Nicol and I were weary, he and his companion, who had attended school in America, dismounted from their tiny Hainanese ponies, and graciously in-

sisted that we ride. Their armed escort helped our lagging porters into Pak-Sa.

Before retiring to my mosquito-netting-enclosed cot I gave each of our men ten grains of quinine in the hope of preventing a further outbreak of malaria.

Next morning as the sun began to light the village, the entire population woke to be on hand to give us further advice concerning the major intricacies of shaving with a cup of cold water.

The two sick coolies could not continue farther and it was arranged that two Lois take their places.

#### SNAKES ARE A LURKING DANGER

As we started on, through jungle and tall grass, one of the carriers nearly stepped on a bamboo snake, which is a beautiful green and gold but feared as much by Hainan natives as the deadly king cobra.



Photograph by Dr. T. C. Lau

**FIVE-POUND EARRINGS ARE MORE COMFORTABLE AS HATS!**

A Ha Loi woman measures her social importance by the tug of her heavy brass circlets (page 400). A homespun jacket and a short skirt, without lingerie, are clothing enough, but earrings become a drag at times. The Ha women the author saw, more primitive, wore less clothing and did not cover the breasts (page 409).

The 'coolies' snake-consciousness increased, as sandals are little protection.

There were many rivers to cross that day. The trail led us through several rather large villages of twenty to forty huts, the women of which were tattooed in strange block-like designs on face, hands, arms, and legs (page 405); the men were adorned with big knots on the back of the head, wore G-strings—brief breechelouts—and sported baskets with weapons.

**NATIVES SCORN MONEY, SEEK TOBACCO**

When we camped at midafternoon, bartering started almost immediately, the aborigines coming in steady streams.

There were bucket-skirts, turned out on the strange foot looms of the Loi women, coats intricately woven and embossed with shells and beads in animal designs and long-forgotten tribal patterns. The swastika was freely used; the Lois said it had been an emblem from the beginning of time with them. And there were fish traps, baskets, bows and arrows, big knives of many descriptions, and numerous other jungle equipment, all for sale for tobacco or cloth—but not money!

Next day Chiah Jee Hong, the cook—no longer happy—came to me and said in pidgin English that he was very sick and must return to Pak-Sa. I sent him back in care

of two Lois, for he could barely walk.

We stayed here three days, bartering and making motion-pictures of the Lois. By the third night, six men were down with malaria, one with an abscessed ear, and another with a badly infected shoulder where his pole had rubbed off the skin. These men would have to return, immediately!

Only five healthy coolies now remained, and Wong. We began to realize why Hainan had not been thoroughly explored.

Next morning, July 26, Nicol could not rise from his cot. Though he had taken only boiled water and had eaten only from our canned supplies, he began vomiting; his nausea continued all day.

That night I sent a Loi runner back to Pak-Sa for the Magistrate's pony. When a soldier arrived next morning with it, I put Nicol aboard and sent him, with all the weak and sick coolies, back to Pak-Sa.

Nicol and I decided that I should take the five remaining coolies, and Wong, and go on alone in an attempt to make the penetration of central Hainan.

I selected only absolutely essential articles: food, medicines (40 pounds), instruments such as cameras, films, aneroid barometers, thermometers, trade articles, and the like. I myself had suffered an aching back which was a symptom of malignant malaria; I took twenty grains of quinine that afternoon.

On July 27, 1937, at dusky dawn, my tiny expedition continued on its course.

#### CAMERA "MAGIC" FORBIDDEN

At a large village built on tall poles in a valley, I stayed two days getting motion pictures and other photographs.

On the afternoon of the second day, Wong was told by Foo Kwi Heick, who said he was headman of 76 villages, that I could not take more pictures. The people were angry, he said, and believed that they would die if anything happened to their likenesses. I had been unwise in showing them finished photographs.

Wong, who once in his versatile life had



KEENLY ALERT IS THIS EASTERN HA HEADMAN

With his red, white, and blue turban wound up like a pin wheel, and a boar-ivory charm to protect him from sickness, snake bite, and the wiles of his enemies, this young man is a Beau Brummell of his tribe.

been employed as a chemist in a British Malay hospital, handed out medicines to the needy people, and endeavored to cure Chief Foo Kwi Heick's persistent ring-worm. In some villages we had to show the people that the medicine would not harm them by swallowing some of it ourselves!

Many of the men of the Ba-Sa-Dung tribe are tattooed in blue ink, though their designing differs from that of the women (page 405). Wong said the natives had forgotten the original meaning of the markings, doubtless used for hundreds of years.

The women of the Ba-Sa-Dungs wear silver plugs in their pierced ear-lobes from which hang about four inches of silver chain. The married women wear bamboo



A SMILING TRIPLE-THREAT MAN: COOLIE, COOK, AND INTERPRETER

Not only was Lee Meng Yeok promoted from porter to chef, but he became one of the two interpreters necessary to translate from English through Hainanese into the varied Loï and Miao dialects. A two-language translator could bridge only one-half the linguistic gap between the author and the primitive folk among whom his travels lay. (page 393).

and silver combs in the back knot of their hair, while virgins wear a carved ox-rib, ten to twelve inches long, thrust through the knot (page 395).

The people are very superstitious, and extremely proud and shy. I found no indication of headhunting.

#### IN QUEST OF A "SMOKING MOUNTAIN"

On the last night before my departure, about fifteen headmen from surrounding villages arrived to talk with me. We gathered in Foo Kwi Heick's house by way of a bamboo ladder, and I was told about a "Smoking Mountain" not far away!

Now I knew that Chinese coastal legend had it that there was a volcano smoking in the interior. I decided to deviate from my course a few days and investigate.

On hearing of my decision Foo Kwi Heick himself decided to take a vacation and guide my party in person. He presented me with his walking stick.

Next morning before sunup, July 29, camp was packed away and we started southwest through a wild botanical garden, with Foo Kwi Heick out in front under probably the only real umbrella in all Loï land. Occasionally we skirted Loï paddy fields where the soil was being prepared by one of man's oldest methods—buffalo milling round and round, stamping rotted stubble into the mud and slime (page 416).

Before we reached Noh-Pong village, the people in the rice fields nearby ran in alarm at seeing my column. The village of 37 long houses was practically deserted as we entered. A gong was being beaten frantically somewhere.

Only an old naked man greeted us. He was too old to run, I guess. We learned that a ceremony had been in progress, and the people, afraid we were soldiers who had come to smash their gods, had fled in alarm.

Soon the old man called them back, and in an hour, their shyness worn off, they



ONE WOMAN WEARS HER WEDDING RING TATTOOED ON THE BACK OF HER HAND

Blue indigo patterns on brown skin are the pride of Loi women. But not until they are married are their hands tattooed. Since Hainan has rich forests, rice straw is not needed for fuel. The wastefulness of the villagers, who harvest only the heads of the grain, leaving the stalks standing, would be scandalous on the Kwangtung mainland. Chinese there, lacking wood, cut the whole ricestalk and use the straw to cook by.

continued with the ceremony. A man who had died three years before was being feted. Two gods about a foot high, and sitting on little chairs, were being "fed" rice balls while men played on flutes by exhaling from their nostrils, and the women wailed.

#### A WHITE MAN IS A NOVELTY

Chief Foo Kwi Heick's village had seen a white man once before, years past; but that man had been carried out to Pak-Sa through that same village ten days later in a wooden box, dead. However, the natives told me I was the first white to enter Noh-Pong village. The people were very curious in regard to my boots, my skin, and my hair, which they would touch as a child might touch a flower.

From this village on, I was to enter forty-seven villages of aborigines, some numbering 500 inhabitants, that had not

been visited by a white man before me, so far as I could learn.

It was not until I reached the Five Finger Range district that I entered my first village that had seen a white man—and that many years before.

We took rice at Noh-Pong and in an hour continued toward the mysterious mountain with another guide, who was black and had woolly hair.

Beyond Noh-Pong we entered jungle patches, but were soon traveling up a long windy ridge covered by shoulder-high grass. Above us rose the "Smoking Mountain."

#### DEATH TO A DEADLY SNAKE

We were setting up camp on a steep slope when one of the men let out a howl of terror. A cobra rose up in our midst; but with one backhand slash with his bush knife Seng Lun Chiang, my best coolie, severed the snake's head from its body.





"TREAT THE DEVIL RIGHT" IS LOGIC TO THE LOI.

They believe in propitiating the evil spirits, but their chief god, Pa-Thung, is a beneficent deity. A successful hunter treasures the head of his quarry which, when roasted, becomes an offering. Rude figures bearing childish representations of heads are common, and occasionally, sheltered from sun and rain, one sees devil images like that at the right.

Since the king cobra can glide almost as fast as a man running, it was fortunate that Seng Lun Chiang had been quick with his knife.

Next morning I took Wong and a coolie, and started for the summit to get a bird's-eye view of central Hainan. The first attempt was defeated by heavy rains, hundreds of leeches that fastened themselves upon us, dense eight-foot-high grass, and the inconceivably heavy growth of jungle below the rain forest.

The following day Wong and I succeeded in fighting our way to the summit—after greater difficulty, actually, than I had encountered on 18,000-foot Orizaba in Mexico.

#### WHAT MAKES THE MOUNTAIN "SMOKE"?

Great blocks of stone rose out of the jungle—cliffs hundreds of feet high, covered with vines, ferns, lianas, orchids, and wild jasmine. By using this tangle of vines we were able to scramble high up above the orchid-topped jungle. Thousands of red

begonias grew on the summit in crevices between the huge boulders.

Immediately I saw that the "plume," visible at nearly all times above this summit, was not smoke but mist formed when the high winds strike the mountain after sweeping over the hot and rain-soaked vegetation.

The aneroid barometer read 4,850 feet.

Central Hainan below, cut up in great ridges and mountains, jungle and grass covered, was of the wildest aspect. It was through this forbidding area that I must now make my way east. When the country was finally blotted out by clouds, we left by way of the cliffs. But first I deposited a can containing the record of my climb in a crevasse of the highest stone block.

A Loi who had started from camp with us and could have also scrambled up the vines, had waited in the jungle below—in trembling fear of the "devil."

On Sunday, August 1, 1937, we crossed the pass that divides the tribal areas of the Ba-Sa-Dung and the North Ha.



ANCIENT FIRELOCK, BEAD-HUNG CHARM, AND A FRIENDLY SMILE ARM THIS MIAO BODYGUARD

To protect the author's party, village headmen insisted on providing soldiers. The old gun might burst or the charm fail, but who would not trust such a smile? Although they live as neighbors to the Loïs, the Miaos, some of whom wear stringy queues, have a different origin (p. 413).



IN TATTOO-MARKS AND TAPESTRY ARE RECORDED LEGENDS OF THE LOIS

With a toil-polished stick this woman is slapping the recently woven wool tightly against the completed portion. A tribal G-man, reading the textile designs and tattooing on a body, would have sure clues to the victim's village, social standing, and identity.



MEI-FU-LI TRIBESMEN REMINDED THE AUTHOR OF AMAZONIAN INDIANS

He is one of the few white explorers to have visited the Loi aborigines. Some authorities believe them related to the hill tribes of Tonkin and Laos in French Indo-China. They are divided into several groups, distinguishable by their dialects. The Chinese separate them into the Shuang Loi, or wild Loïs, and the Shuk Loi, or tame (ripe) Loïs. The island may be considered as a series of three concentric divisions with Chinese at the rim, then the "ripe" tribesmen, and the wild aborigines in the center.

By midafternoon we saw a great valley, inhabited. I counted thirteen large villages, some of which consisted of a hundred long houses. The clarion clearness of gongs rose on the air, and the barking of dogs and the voices of children floated up to us high above.

About 3,000 North Ha people lived in this enchanted valley, eight miles long and two miles wide. The men were tall, many six feet, and wore their black or brown hair in big knots extending out about four inches from their foreheads (page 395).

#### ONE IS SAFER IF UNARMED

Many wore turbans of red, white, and blue through which had been extended the big knot. They dressed in G-strings, and carried great knives in baskets at their backs. None forgot to wear his bone charm, intricately carved, around his neck. There were more firearms than I had seen among

the Ba-Sa-Dung villagers, though there were also many bows and arrows.

I was totally unarmed. Before the expedition started I had been warned that this was safer, since the Loïs might slip into camp in the night and cut our throats for our rifles and pistols.

Throughout this Ha country the headmen insisted that I be supplied with bodyguards while camping near their villages. They feared that a neighboring village might send assassins to murder us so that the village would be held responsible and be made the object of attack from a Chinese punitive expedition.

I saw the charred remains of one luckless village, punished for robbery. Hundreds of empty machine-gun shells still lay about in piles.

The ears of the Ha women were weighted down with silver and brass, and their ankles were circled with silver and gold



A STEEL KNIFE IS MAN'S ALLY IN HIS FIGHT AGAINST THE JUNGLE

Not only does the tangled undergrowth oppose his progress, but it recaptures any neglected land. This easy-going Loi forest dweller wields a bush knife against the relentless vegetation. Thus armed, the aborigines can tame the forest, open up mountain trails, and make clearings for their homes.

bands (pages 400 and 402). The women I saw did not cover the breasts. They were very coy and shy.

I gave some quinine to the natives having fever, and invariably they chewed it! I could never get a Loi to swallow a pill; he always had to chew it.

That night I camped at a village of perhaps 500 inhabitants, and on the morrow followed a river up the long valley, along ancient paths worn four or five feet deep by countless bare feet down through the ages.

In the narrow head of the valley, for several miles, we found the greatest paddy irrigation system I had ever seen. These ancient paddy fields were an amazing patchwork of intricacy against the hill-sides and the result of hundreds of years of patient toil.

While skirting the edges of this paddy section, for the first time in many years of tropical exploration I was struck at by a snake. A bamboo snake, coiled in a grass

clump, lay unseen by three carrying-coolies ahead of me. It let all three of them pass unharmed, then struck at my boot!

I turned on my heel, bringing my other boot around, and crushed its back with a quick blow. It was kept as a specimen.

At the seemingly innumerable villages ahead, we always entered to the wild accompaniment of barking dogs—resembling little yellow coyotes—scampering, screaming children, and hurrying women. We were met by the slow uncertain gathering of the men.

#### LIVING ON THE COUNTRY

A few villages were deserted when we first entered them. But the people always drifted back, a few at a time. After greetings, the headman would take one of my coolies around to each house, with a basket. Each household would then provide one cup of hill rice, and when the basket was full, the headman would sell it to my headman for silver coins (from which orna-

ments are beaten) or for trade tobacco.

Thus I led my expedition on the country, and so made possible the crossing of Hainan's mountains. No provisions of any kind were carried for the coolies; rice, chickens, pork, deer meat, vegetables, and fruits were all obtained in this communal manner. The cost of feeding my men was three and a half cents each per day!

Hainan's wild life includes two species of deer—the muntjac, and a large deer five feet high at the shoulder called the "mountain horse." There are porcupines, foxes, flying squirrels, monkeys, and pythons which are captured alive by the use of iron hooks and transported to the Chinese border where the Hainanese eat the flesh as an aphrodisiac; there are also boars, a small species of leopard resembling the clouded leopard of Borneo, black gibbons, and numerous birds such as parrots, pheasants, mynas, pigeons, and doves.

After leaving me, Nicol Smith was fortunate enough to obtain a small bear alive. Another specimen, which I obtained, was entirely different.

These two bears are known to the Loïs as the "pig bear" (which weighs about two hundred pounds), and the "dog bear" (which weighs about fifty pounds). It was a "dog bear" that Nicol captured.

The Loïs hunt the black gibbon extensively, since a pair of forearm bones brings \$40 (Chinese). The Chinese say that chopsticks made from gibbon arm bones will turn black if thrust into poisoned food!

Among the Ha Loïs, three blue tattoo rings on the left hand protect a man from smallpox. When a village is known to have smallpox, all trails to the village are blocked off by outsiders, and no one can leave that village. Quarantine has been practiced in Hainan since time immemorial!

#### DEVILS MUST BE APPEASED

The "Big God," Pa-Thung, is a good god, and lives in some unknown place. But his agents, devils sent to watch the Loï villagers, are ever present and always live in a nearby cave, in a river, in the jungle, or on a nearby mountain.

At certain times of the year sacrifices to appease the devils are made. This is not devil-worship, only an effort to please the devil. Burning offerings are made to devil images when there is sickness in the family.

The villages have paid priests, or witch-

doctors, who complain to Pa-Thung when local devils get out of hand and spitefully send thunder, lightning, and rain which cause havoc in the fields; or when they bring sickness or famine to the people.

The natives do not use fishhooks, but dam the numerous interior rivers and pour in root poison which stupefies the fish, making them easy to spear. The fish are then dried and used to garnish boiled rice.

All of the villages I saw—except one—were stocked with black goats, as black as patent leather. The one village had only brown goats. The natives have water buffalo, chickens that are descended from wild jungle-cock, which are numerous; pigs, and also dogs. The last is the most important item, as dog meat is considered a delicacy. We met many parties on the trails, leading strings of dogs to market.

#### COURTSHIP IN THE JUNGLE

The courtship and marriage ceremony is beautiful and very modern in many respects. A young man from a neighboring village decides to take to wife a certain girl he has perhaps seen getting water in long bamboo stalks down by the river. (Loïs never marry within their own villages.)

After making sure that she is the one, he lets the young lady know, without speaking to her, that his heart can be won!

So, when a few days have passed, the inhabitants of the girl's village are apt to hear a young man's voice singing in the jungle. And the girl knows that it is *her* song. The suitor continues to sing for several nights, and if the girl is interested in continuing the romance—up to now very one-sided—she goes into the jungle and sings in return. They have not yet seen each other alone.

This poetic and long-distance courtship continues for some time; at last the boy knows that her heart belongs to him (assuming success so far) and goes to the "love house." Every village has one.

Perhaps he sleeps there many nights, and when the girl no longer gets response to her songs in the jungle, she knows that one of two things has happened; her suitor has cooled off, or he is at the love house!

She too, then, goes to the love house, and a period of "trial marriage" takes place. If, at the end of several days, the young couple decide they are really in love and want a "legal marriage," they make known this fact—not to the parents of the girl,



IN THE BAMBOO COUNTRY, FIVE-FOOT BUCKETS ARE USED INSTEAD OF JARS OR CANS

Light, durable, easily fashioned, and well insulated, a length of bamboo is an admirable rival of the old oaken bucket, the empty oil tin, and the pottery water jar. This girl balances seven loads on a single shoulder pole. Missionaries call the Miaos "The Eternal Pioneers" because they move from clearing to clearing, leaving each when its fertility is gone.

but to her eldest brother, who is her legal guardian in all matters.

I happened to be at a village when such an announcement of formal marriage was being made. Lois for many days had been gathering from miles around to see the festival. This rigidly consisted of the bride's family killing a pig and two fowls (never more or less), providing rice wine for all the guests, and paying a dowry of two water buffalo, considerable rice, and a pig.

After the feast the groom mounted one of his newly acquired beasts and with his bride behind him rode happily back to his own village. The bride, fifteen years old, was now entitled to tattoo her hands (legs and face are tattooed by all), assume charge of her husband's house and hold sway over his successive concubines.

These usually number four, but only if the husband can afford so many and can get consent of the village headman and council.

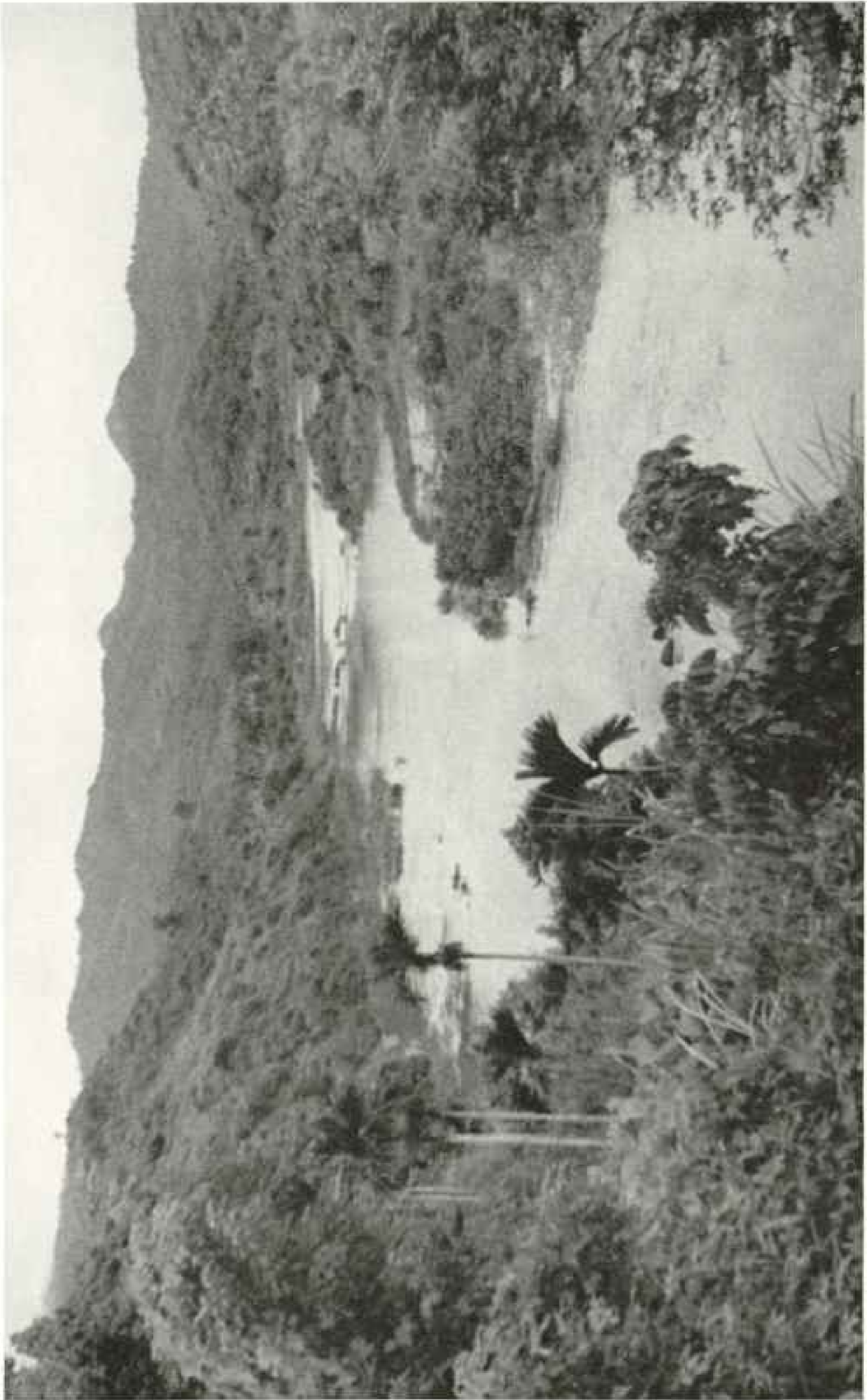
If a child dies, the body is kept four days, then buried. All this time iron and bronze gongs are struck to keep away the devil, and the villagers wail day and night. If an old man dies, the body is kept for eight or ten days and then buried. The graves are visited by the villagers each year and offerings are made.

A Loi widow cannot return to her parents. The Lois explained to me that this is supposed to discourage prostitution and looseness (which they frown upon) and to promote marriage. A widow must either marry again or else live alone in her hut.

Women are considered the equal of men—and no woman need remain unmarried as the men look forward to catching not only a fine wife but a fine dowry as well!

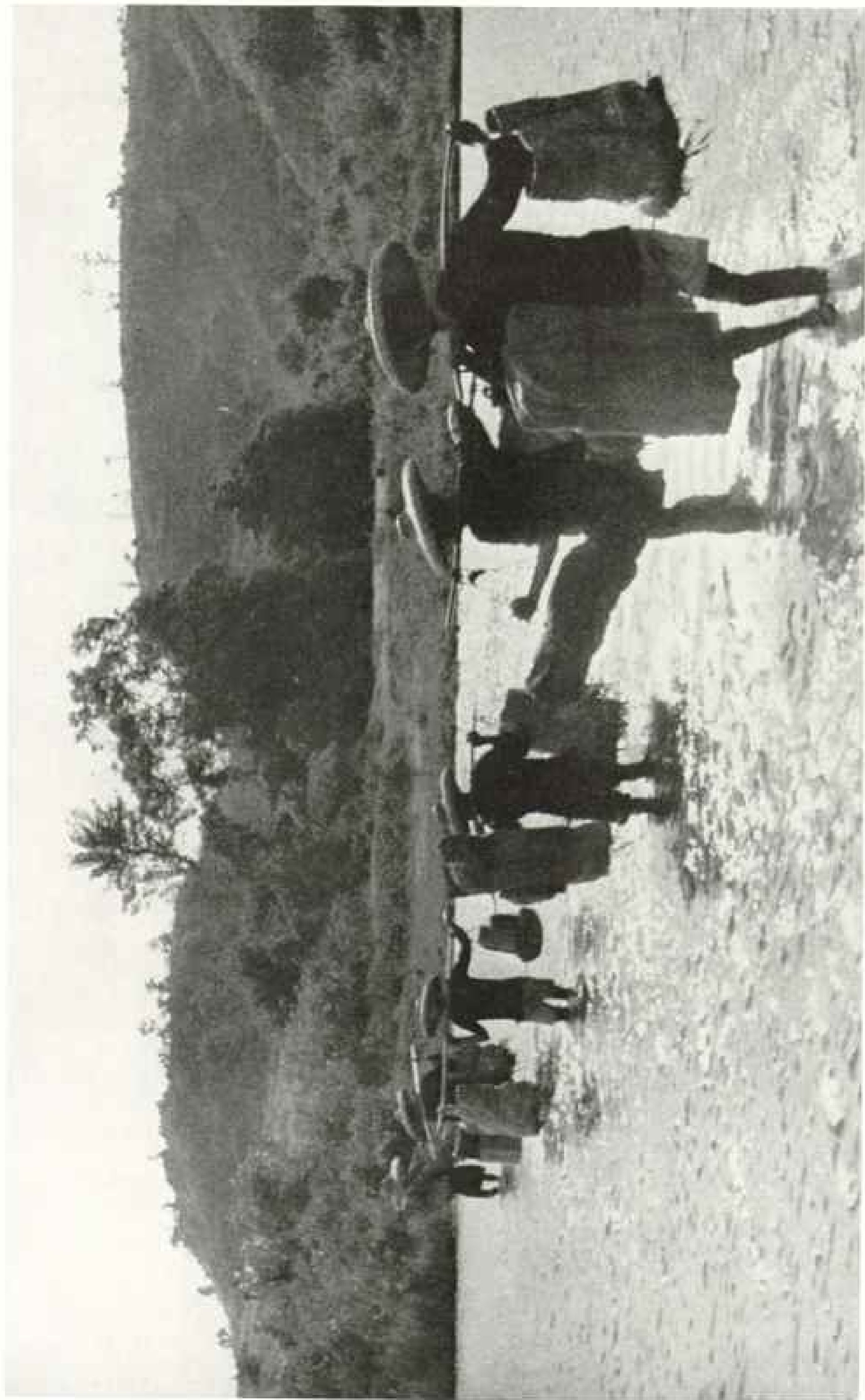
There is nothing in the Loi code resembling divorce.

When a child is born the village prays to the devil to have pity and let it live. Two fowls are "cut" on the twentieth birthday, the age of adulthood in men.



DOWN THIS RIVER OF RAPIDS, THE AUTHOR'S KAMPAN FLOATED FORTY MILES IN A SINGLE DAY

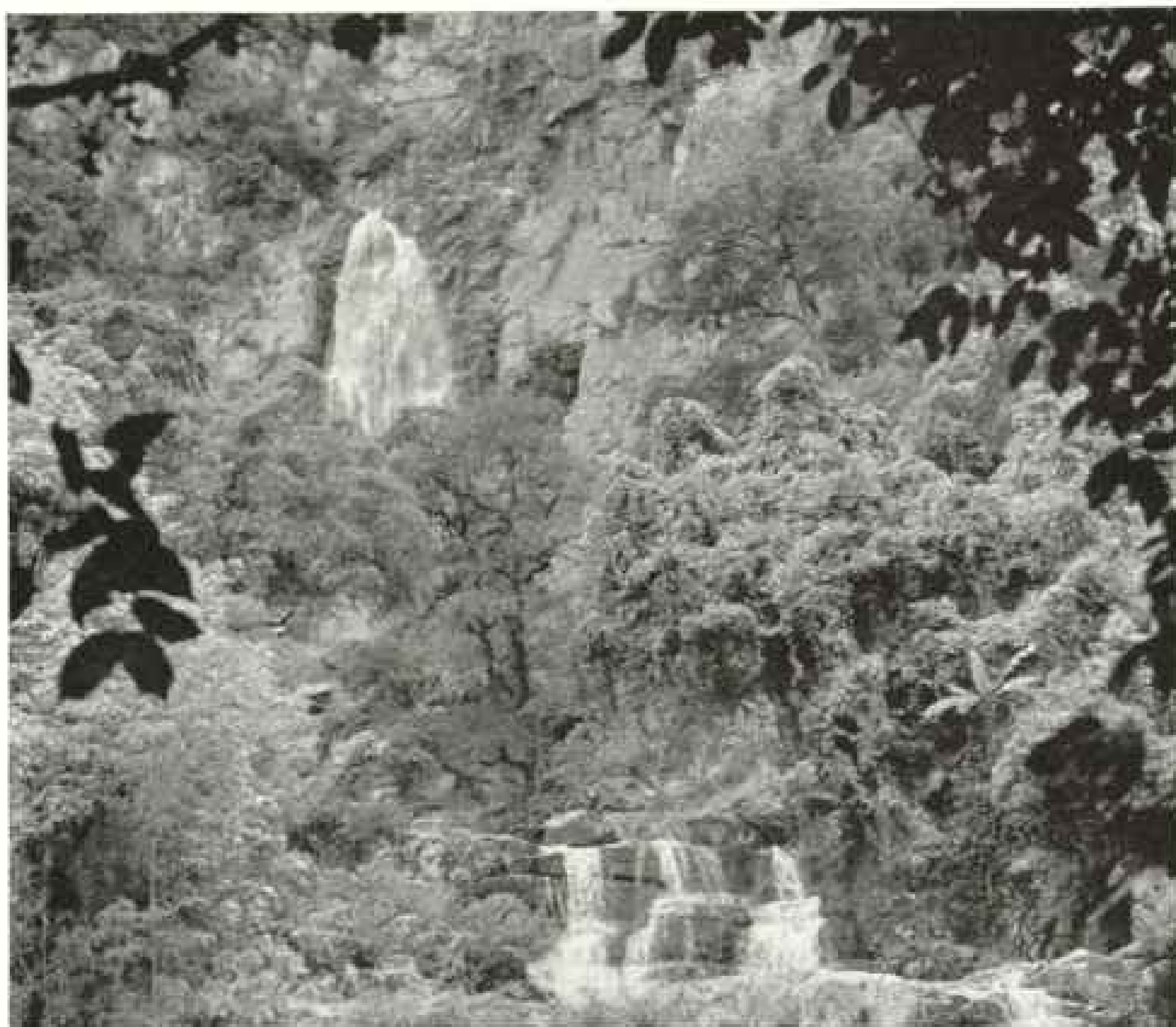
Second largest of the rivers of Hainan is the jungle-framed Kachek, whose headwaters are in the Five Finger Range. On the highest peak is a copper tablet recording the visit of F. A. McClure, an instructor in Canton Christian College, now Lingnan University, who reached the summit on April 30, 1922.



ONLY ONE CARRIER STAYED WITH THE EXPEDITION THROUGHOUT THE LONG FIVE-WEEKS' TREK AMONG THE BIG KNOT LOIS

Native boys were often hired from village to village rather than for the complete journey. During forced marches in the Orient, substitute porters often carry the supplies and the regular men tramp along empty-handed to conserve their energy. Swift torrents, swollen by rains, descend from the mountains and spread out in wide, shallow beds on reaching the plains. After the rains, such wide expanses become barren wastes broken by threads of water.





THE AUTHOR NAMED THIS CASCADE "LAURENCE FALLS" IN HONOR OF HIS BROTHER

Though forbidden by the natives to visit the falls, the explorer fought the jungle to the top of the cliff. Then, with a miniature camera and a barometer on his head, he swam to the brink of the cataract—and narrowly escaped being swept over (page 417). The Lois showed their disapproval by ignoring the adventurous foreigner who invaded the home of their local devil.

I once asked a headman what would happen to a murderer. He answered that it was very impolite for men to fight, but that if a man was killed in fair fight nothing would be done, because the village would be very proud to have a brave man numbered among its inhabitants! Murder, however, like insanity, is almost unknown.

#### KIND-HEARTED WILD MEN

Wild Lois are the most considerate people imaginable; whenever I entered one of their villages, hot, tired, and sweltering, the headman would himself scatter ashes around my hardwood stool, which was always brought out, the object being to repel ants and leeches. The natives would bestow presents of fowl, rice, and water, and I would instruct Wong to hand out tobacco, cloth, and matches.

Even in war-time, instead of marching en masse on the "enemy" village, bent on killing, the Lois prefer only to protect themselves. Tiny points of bamboo, drugged by certain herbs, are arranged under a cover of leaves in the trails leading to their village, so that would-be "bad Lois" approaching at night will be wounded and "made very sick."

Many of the houses are decorated with the skulls of big game, but I saw no human heads among them. One house belonged to an old man who had been a great hunter, and from its rafters hung more than seven hundred skulls of wild boars with yellowish white tusks. The heads or jaws of wild animals must be kept, always, after the "head ceremony," during which the hunters eat the head at the house of the man who first shot the animal; and offer-



NO WATER METERS OR PLUMBING TO BOTHER WITH IN CENTRAL HAINAN!

Water is delivered to the housewife's bamboo hut by a clan of older men who no longer relish the hard labor of the fields. This Loi eases the burden of his heavy jars with the much-used Chinese pole. Mission scholars sometimes carry water to help earn an education.

ings of forgiveness are made to the animals' spirits each year.

I gave away 5,000 quinine pills (20,000 grains) and was gratified to see many a fever broken up. Our forty pounds of medicine, which Wong gave out, helped various other ailments.

Lois are apt in the use of herbs, but even herbs have their limitations. Wong told me that during our trek we saved probably seven or eight lives, merely through having medicines.

One child's arm had practically rotted away from an infection. How this child lived—hardly more than a skeleton—I will never know.

Without instruments, except a carving knife sharpened on a piece of leather, the deft Wong put his ex-hospital knowledge into practice and cut away a great deal of flesh from the arm—with nothing of any

kind to ease the pain of the silent child. Then he applied some of his Chinese medicine and a bandage. He said the child had a chance to live, but I doubt it.

#### PEOPLE OF A "LOST VALLEY"

In almost the geographical center of Hainan I stumbled upon a "Lost Valley," surrounded by tall pines rooted in red dirt. The inhabitants were not Lois! I soon learned that they were Miaos who had migrated here from South China probably hundreds of years before.

Finding the valley unoccupied, they had made a treaty with the surrounding Lois, built a village from the giant bamboo in the valley, and, like the true pioneers that they were, begun work on paddy terraces on nearby slopes. Now they lived here happily and in peace.

Wong said their ancestral tablets, which



WATER BUFFALO USE THEIR FEET TO PUDDLE OR "FLOW" A FLOODED FIELD

When the paddy plots are inundated a herd of carabao, driven back and forth in the muck, prepares the earth for rice seedlings. After the harvest, the same hooves may tread out the grain before it is hulled in a crude mortar with a pole-like pestle. Water buffalo milk—little used by the natives—is highly nutritious and easily digestible.

he examined, showed that the people had increased from twenty to about three hundred and fifty. They did not intermarry with Lois.

The women wear robes like those of monks, wrap-leggings, and huge earrings. Heavy silver loops, twelve inches across, hang from their lobes. So heavy are these earrings that, when working, the woman ties them up over her head.

The two villages in the valley had houses with earthen floors and holes in the cow-dung walls to let devils escape through. The rooms were hung with ears of drying yellow corn.

These were the first people we had encountered who could read; for hundreds of years, from father to son, the language of China had been taught! They still wore queues and were amazed to learn that China was no longer ruled by the Manchus. When Wong explained that China was now a Republic, the people understood, for they themselves lived in a tiny republic (p. 407).

When Wong asked if they had ever heard the legend of the "tailed men of Hainan," they answered simply that they had not and "knew only how to walk and eat."

On August 7, I reached the upper waters of the Golden River, the largest in Hainan. This lovely jungle-banked river, born in the Five Finger Mountains, was in places 200 feet wide even here.

Flocks of wild pigeons and doves were so tame in this region that they refused to leave the ground though we walked among them. Monkeys called continually overhead, and the wonderful call of the black gibbon was with us all day and into the early night.

#### "THE DEVIL LIVES THERE"

As we descended into a valley toward a village in the Ki Loi country, I saw a magnificent waterfall pouring over a sheer cliff. The fall was about two miles above the village, but even at that distance we



UNDER THE TROPICAL SUN, SONNV WEARS THE SUNSHADE.

Loi tribesmen, equally fond of daughters and sons, differ from many Oriental races to whom a son is a pride and a daughter something not worth mentioning.

could hear the roar of falling water as it crashed pellmell against the granite rocks below.

Dark overtook us as we reached the village and camped under a nearby tree. No women or children came into camp, but about 150 G-stringed men of the Ki tribe gathered around suspiciously. They refused emphatically to show me the way to the falls, explaining that the devil lived there. I offered much tobacco, but to no avail.

Early next day, Wong, with two coolies carrying food and climbing equipment, accompanied me out of camp and into the river, which I followed to keep clear of the jungle. About a mile above the village we were overtaken by the brother of the headman. He said we would have to return immediately.

I refused to, intending to explore the falls and make readings at their head and base by aneroid barometer to get an approximate idea of their height.

The man followed, protesting, for several

hundred yards, and finally returned downriver.

Eventually after a hard struggle, we came out on the banks of the main river above the falls and we followed its verdant canyon downstream, at times wading.

Finally, because of the cliff walls on both sides, the two coolies said they could go no farther, since neither could swim. Wong and I undressed, and carrying a miniature camera and an aneroid barometer in an oilskin bag over my head, I waded into the river with him and we were carried downstream into a gloomy and dark canyon. The walls were thirty or forty feet apart and we were swept through at alarming speed.

#### NEARLY SWEEPED OVER THE FALLS

As we approached the head of the falls and could hear the resounding echo of crashing water ahead, Wong yelled that if there was no boulder to get hold of we would both be swept over! It was all I could do to keep the precious load out of the water.

We swept around the last bend in the gorge and saw daylight—and the end of the river. It seemed to vanish in the blue sky beyond. A flat boulder only a foot above water, and past which the river moved for its plunge, providentially came into view.

We swam out of the current, clutched the stone, and pulled ourselves to safety. We looked down and saw the jungle 700 feet below!

I shot some photographs through the great gun-sight where the water poured over, and obtained a reading as to height—2,570 feet above sea level. There seemed to be no trace of the devil, but we heard monkeys in the forests above the cliff.

Since we could not hope to swim back, we climbed the cliff and slowly worked our way along its face by holding to lianas and making use of cracks and ledges. We were nearly two hours recovering the distance we had accomplished in a few seconds. Both coolies were relieved when they saw us approaching, for they had feared that we had been swept over.

Upon reaching the base of the falls and taking another reading, I figured that the entire fall measured approximately 700 feet, with about an 80-foot span across the bow. It drops so that it strikes rock four times, making four breaks in the fall. The drop visible from the village two miles below was about 250 feet high (page 414).

That night, late, we reached camp, thoroughly satisfied, but tired. Not one Ki came to see us, but except for this snub they gave no sign of their displeasure.

#### "STRANGE GOD WITH A BEARD"

On August 11, out of Nodoa 23 days, we reached a large valley grown with paddy. On its east side stood a village on tall posts. On the northeast side rose many ranges, wild, rugged, and jungle-covered, with waterfalls leaping from cliffs at their bases.

From a paramount headman who lived here and governed several villages in the surrounding area I learned that two white men had been in this village before me.

One man had visited here about seven years before, and some ten years earlier there had been another, who had stayed for only an hour. His name they did not know, but he "distributed many papers showing a strange God with a beard!"

It seemed to me then, as if I had suddenly stepped into the middle of New York or London. Whites had been here!

The women of the Ki Lois, in this eastern country, like those of all the Hainan tribes and sub-tribes, wore dress peculiar to their region. Their silver ornaments differed in design, and the headdress was a turban or sometimes a tasseled handkerchief.

On August 16, in late afternoon, we reached Lia-Mui, the official market town for this section of the Chinese-Loi border. It was market day, and both Chinese merchants and breechclouted Lois stood aghast at seeing my ragged and lean men—and especially a "foreigner"—coming through the gate in the walled city, out of the wild Loi country!

#### A COOLIE'S IDEA OF LUXURY

We were in civilization again. Excited soldiers read my credentials and I relaxed in camp, pitched in a school compound. Now that the luxuries of civilization could be had, my coolies all fled to town and returned an hour later with their heads shaved as smooth as baseballs! I hardly recognized them.

On the Kachek River we camped for three days, waiting for a sampan to take Wong, the number one boy, and me downstream. My men scattered from here, since there was a food shortage in the nearby village, and I gave them each chits drawn on the mission in Kachek down the river.

Since the water was swift, because of recent rains, we made Kachek by nightfall.

The General in command there had commandeered all automobiles to evacuate his troops, as an air raid by Japanese was expected momentarily. But at last I got down to Hoihow. Mr. French, a missionary, kindly taking me in his own car. It was August 24, and all northern China was in the toils of war. Only the Lois and I had been unaware of war, for all the rest of Hainan was in a high pitch of excitement lest Japan take the island at any moment.

Wong and the number one boy—who was now sick with malaria—tearfully bade me "good-bye" in English (which Wong had taught Lee) and left for their homes in north Hainan.

Almost immediately I found passage on a coastal freighter bound for Hong Kong; luckily so, for two days later Hoihow was bombarded by Japanese destroyers.

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To carry out the purposes for which it was founded fifty years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material which The Magazine can use, generous remuneration is made. Contributions should be accompanied by addressed return envelope and postage.

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

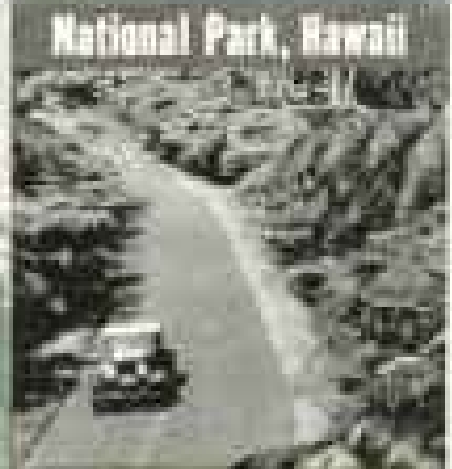
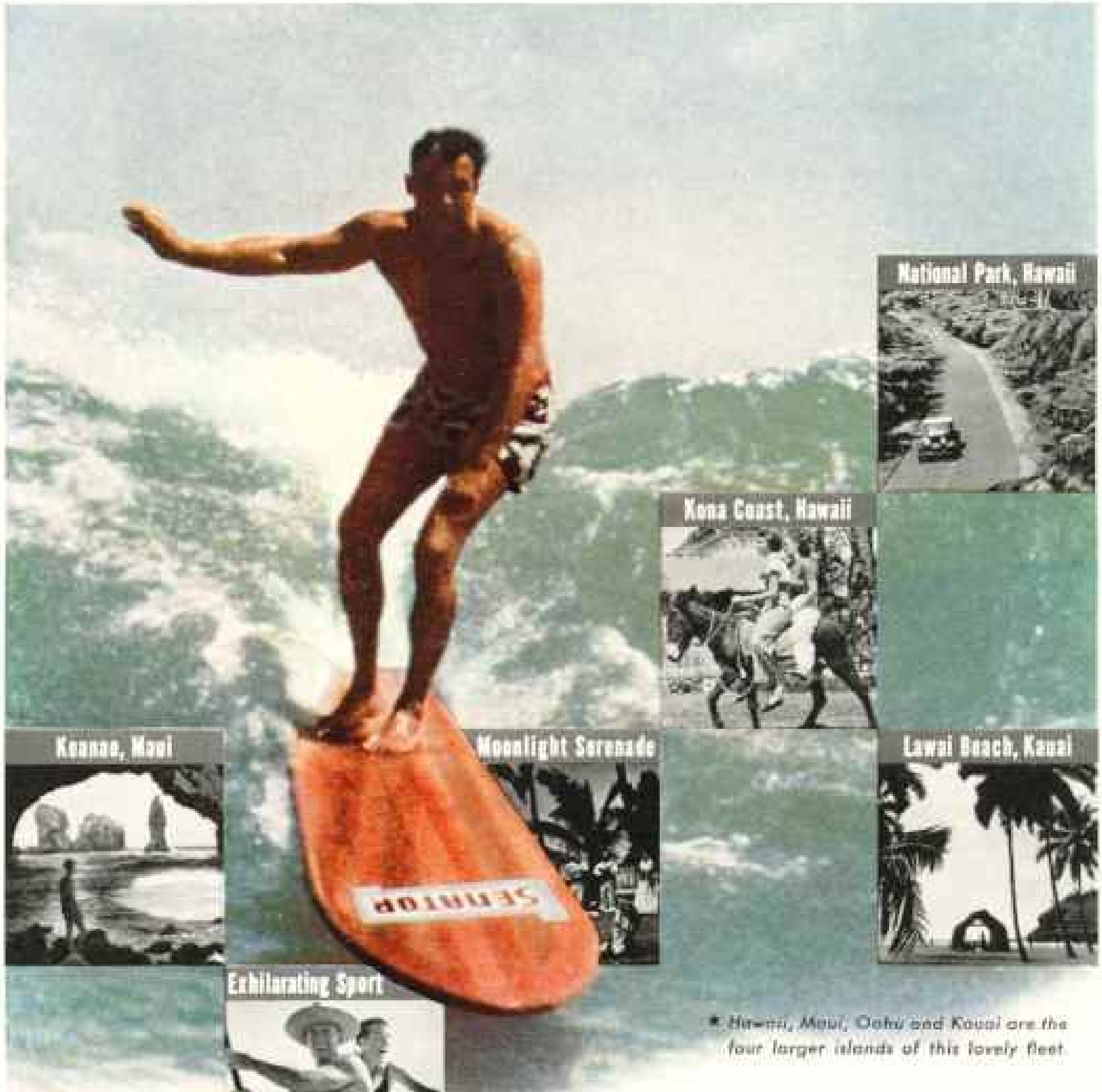
The Society cooperated with Dr. William Beebe in a deep-sea exploration of undersea life off Bermuda, during which a world record depth of 3,025 feet was attained August 15, 1934, enabling observations of hitherto unknown submarine creatures.

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 Expeditions.

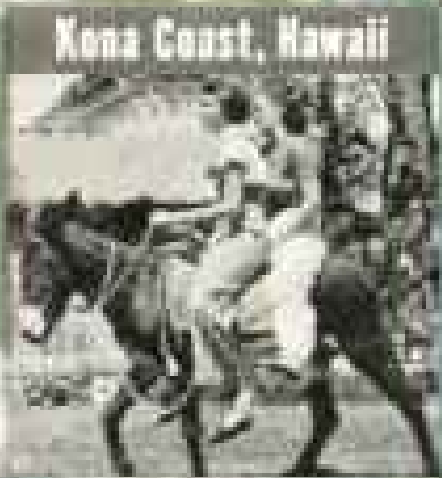
The Society granted \$25,000, and in addition \$75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the forest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

The Society's notable expeditions in 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.

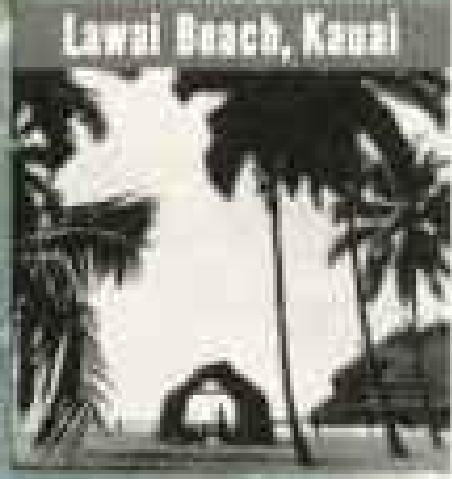
On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to an officially recognized altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.



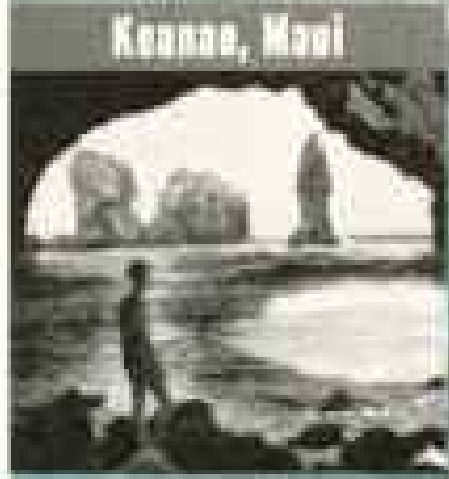
National Park, Hawaii



Kona Coast, Hawaii



Lawai Beach, Kauai



Kaunoe, Maui



Moonlight Serenade



Exhilarating Sport



COPY, 1938, HAWAII TOURIST BUREAU

THE THRUWAY SAN FRANCISCO  
HAWAII TOURIST BUREAU

• Hawaii, Maui, Oahu and Kauai are the four larger islands of this lovely fleet.

# LIFE is spelled with capitals in Hawaii

*Adjectives are totally inadequate to describe Hawaii...* To say you'll "enjoy" your voyage and visit among these exquisite isles is a futile way to describe the utterly new sensation of this South Sea experience ~

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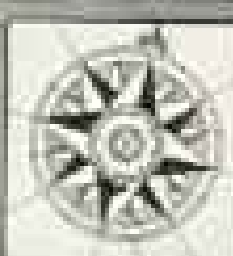
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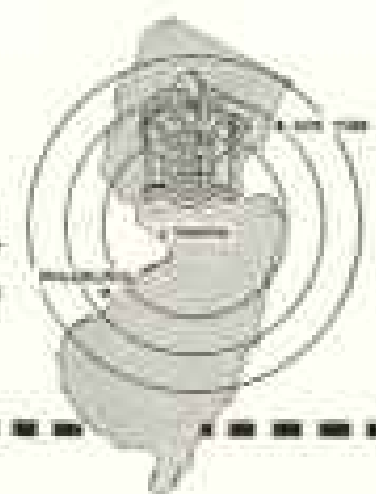
Spend marvelous September days in the high woodlands of northern New Jersey. Beautiful lakes, intriguing mountain trails, clear rushing streams (there are trout a-plenty) —all very nearly as attractive as the rates themselves.



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"In my opinion the improvement is due largely to better diet."

Like all other living parts of the body, your teeth are nourished by the food you eat.

Nature carries on for you a tooth maintenance program which requires constantly renewed supplies of the minerals calcium and phosphorus. Vitamins A, C and D are also necessary to the health of the teeth. Fortunately, all the essentials are in the ordinary diet. A balanced diet of vegetables, fruits, eggs, milk, cheese, lean meat, fish and cereals (partly whole grain) will furnish most of the supplies which Nature uses. An excess of sweet foods should be avoided.

Teeth benefit also from regular exercise. Every time you chew a hard crust of bread, crisp toast or crackers, or other crunchy foods, you are helping to keep your teeth sound and your gums firm. Raw vegetables such as carrots, celery and cabbage also furnish the hard resistance so important to tooth health.

Some foods, including meat, naturally require thorough chewing and so provide exercise for the teeth. But, as many foods are too soft, you must plan your diet to give your teeth sufficient exercise every day.

While food and exercise are necessary to preserve your teeth, they represent the *inside care*. *Outside care* is also essential—visits to your dentist every six months and, of course, the correct daily use of the toothbrush for the care of teeth and gums. Dental floss assists in reducing tooth decay by removing particles of food from crevices not accessible to the toothbrush.

The Metropolitan booklet "Good Teeth at all Ages" gives much useful information and practical suggestions on how to care for your teeth, as well as a list of tooth-building foods. It will be sent free on request. Address Booklet Department 938-N.



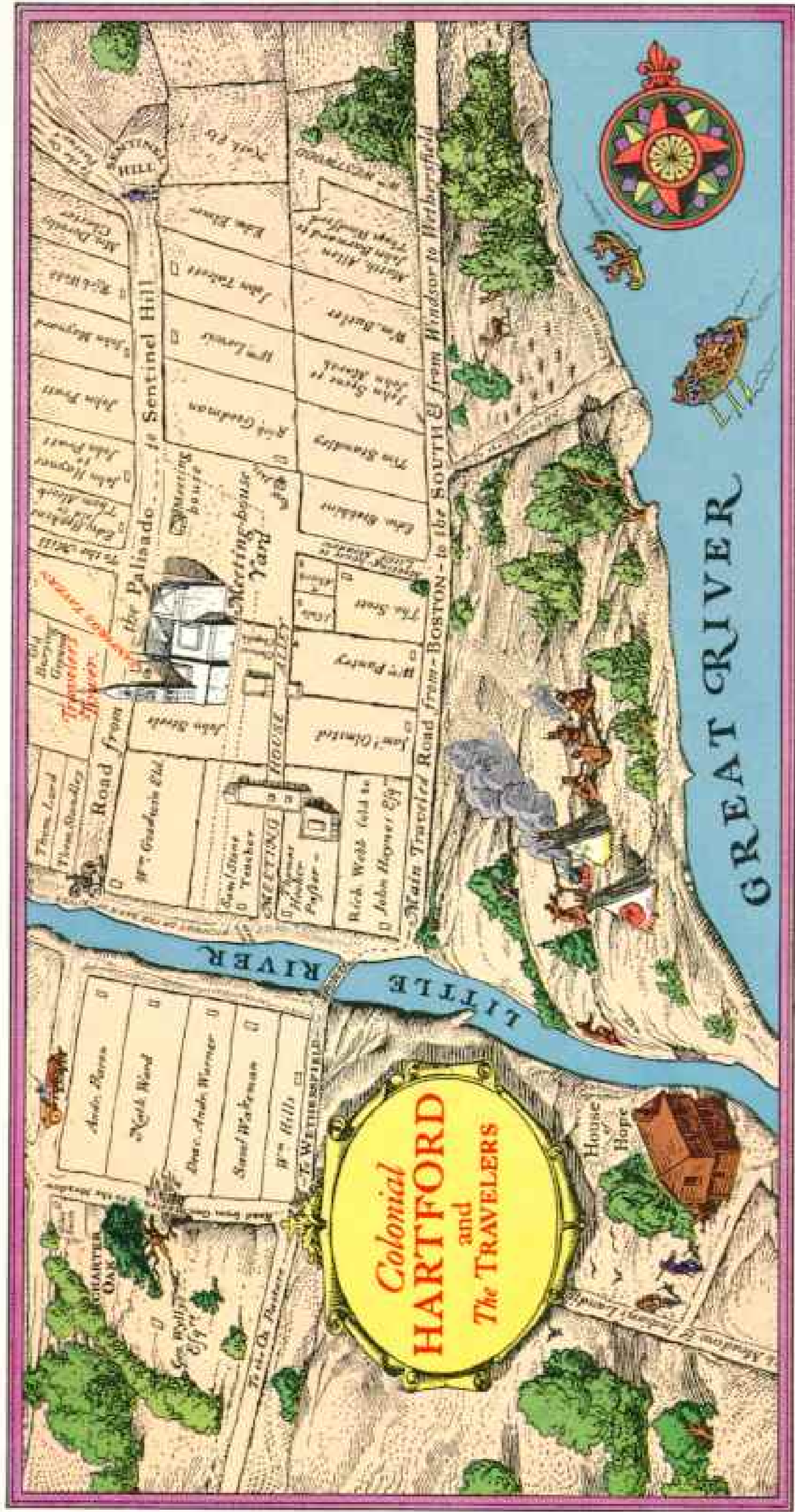
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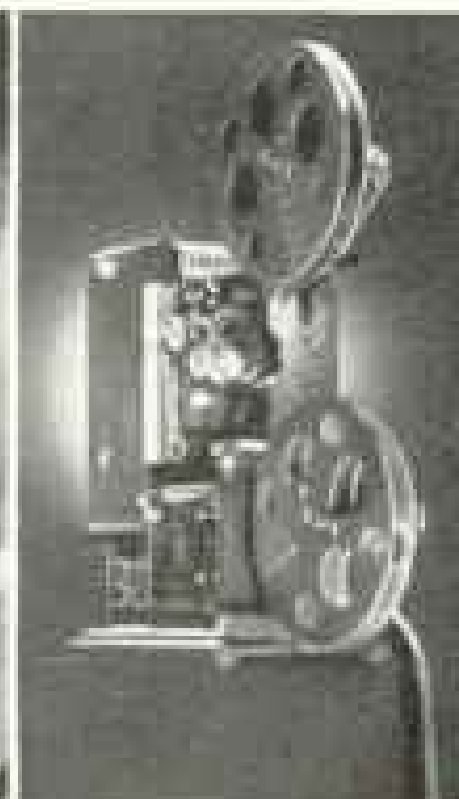
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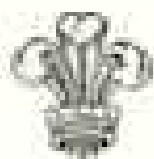
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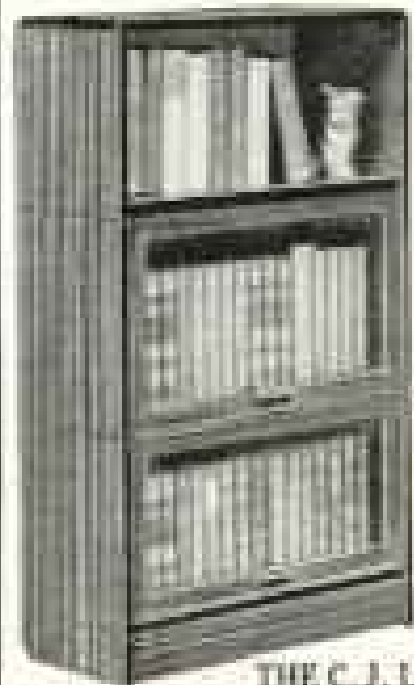
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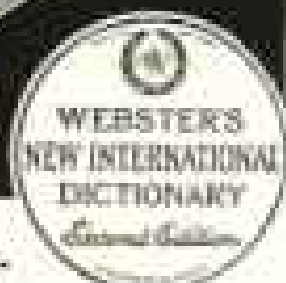
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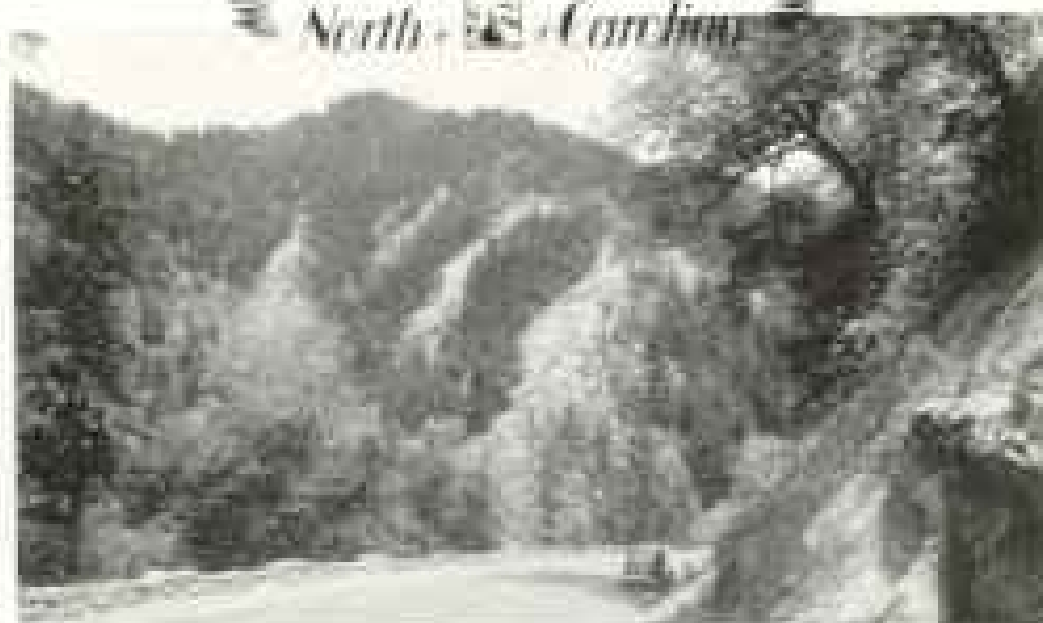
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### White Sulphur Springs



### The Greenbrier

As America's oldest and finest spa, The Greenbrier enjoys a year-in, year-out, year-around popularity! Its famous hydrotherapeutic department is in vogue at all seasons—offering all the beneficial mineral baths available at Continental watering places. Take "The Cure" at White Sulphur Springs. Tariff and information upon request to L. R. Johnston, General Manager.

## BERMUDA

### Paget-West

**Inverurie.** Directly on the water; bathing, sailing, fishing. Attractive rates. Contact travel agent or Bermuda Hotels, Inc., Dept. N, 90 5th Ave., N.Y.C.

## CANADA

### Montreal—Quebec

**The Ritz Carlton** . . . Famous for its service, cuisine and distinctive clientele. Location unsurpassed.

**BEHIND YOUR GOOD TELEPHONE SERVICE**

**IS THE**

*Constant Courtesy* **OF**

**THE VOICE WITH A SMILE**



**THE MAN ON THE JOB**



**THE MEN AND WOMEN  
IN THE TELEPHONE OFFICE**



This country is entitled, in good times and bad, to the best telephone service at the lowest possible price.

A great factor in accomplishing this is the real spirit of service that has

become a tradition among telephone men and women. Courtesy and efficiency are important words in the Bell System.

**BELL TELEPHONE SYSTEM**



THE NEW  
GOOD YEAR  
DOUBLE EAGLE  
AIRWHEEL

## THE GREATEST TIRE ADVANCE IN 25 YEARS

built with **RAYOTWIST** spun from rayon

**I**N this handsomely streamlined new Goodyear Double Eagle Airwheel you behold a truly sensational tire built of a new basic material.

This new element is *rayon*. Not the conventional commercial fabric, but a marvelous new silk-like cord spun from sinewy rayon filaments, called RAYOTWIST.

Rayotwist is only two-thirds the thickness of ordinary tire cord. But it so far excels in strength and resistance to heat that a 4-ply Rayotwist carcass long out-wears six plies of ordinary cord—and weighs 10% less!

**WHAT** this means to you is the ablest performing, most luxurious tire you have ever known—a nimble, featherbed-riding beauty that steps up the agility of your modern car.

It means a tire so free from road-fighting stiffness, so smooth rolling that it *actually reduces your gasoline consumption.*

It means a tremendous increase in tire mileage because the stronger, more resilient Rayotwist carcass permits the use of far tougher, sturdier tread-rubber.

**ON** this supple and shapely carrier you get the famous All-Weather tread in a new compact streamlined arrangement that sets a new high in road-holding grip and traction.

Complement the Double Eagle's matchless comfort, roadability and wear with the infallible blowout-protection of Goodyear LifeGuards—the modern successor to inner tubes—and you will have finer, safer tire equipment than you will be able to buy elsewhere for years to come.

**MORE PEOPLE RIDE ON GOODYEAR TIRES THAN ON ANY OTHER KIND**