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THE NATIONAL GEOGRAPHIC MAGAZINE

The World in Your Garden

By W. H. CAMP

The New York Botanical Garden

With 24 Paintings by Else Bostelmann

THE WAY had been long and over passes more than two miles in the air. Down to the lowlands we slithered and slipped on precipitous trails to become involved in seemingly interminable miles of mud, some of it almost saddle-girth deep.

Ahead through the mists loomed the goal, the somber ridges of the Cordillera Cutucú, one of the easternmost wrinkles of the Ecuadoran Andes, which lies at the margin of the great Amazonian plain. Only one real obstacle lay ahead. And that was the Jivaro Indians.

Only a few years before, in the course of a single morning, one group had made "museum specimens" of more than twenty gold miners who had been trespassing on their territory, and I was not certain if it would be this group with which I would make contact, or possibly a more friendly one.

I had supposed that head shrinking was no longer practiced by these Indians, but after seeing a rather fresh relic with a magnificent set of red mustaches, I seriously pondered removing my own natural facial adornment. Personally, I was in no mood to let some Jivaro try his hand at an art job on me.*

Love of Gardens an "Open Sesame"

I was received into the house of the chief of the region with the customary aloof courtesy. After some hours of circuitous and seemingly fruitless palaver, the old chief and I wandered out into his garden and, as best we could in the phrases we had in common, talked of the plants he was growing there.

The head-hunting Jivaros are excellent gardeners. Among the plants in the chief's garden were four which are commonly grown in parts of the United States. One of these is the papaya. The Jivaros do not use the ripe fruit; instead, they cook the green fruit.

Another plant which, by its trailing vine and bright-blue flowers would be recognized by anybody as a close relative of the garden morning glory (page 52), the old chief called *ingi*. Although we seldom see its flowers here in the North, we regularly raise it in our own gardens under the name of sweet potato.

The other two we know only as ornamentals. The Jivaros grow the canna for food and the angels trumpet as the source of a narcotic drug (page 50).

Apparently I was the first plant explorer the old chief had ever seen, and when he finally understood that all I really wanted was to study the plants of his territory, the barriers were let down. After that talk about the plants in his garden I lived with that group in perfect harmony for as long as I stayed in the region. Being gardeners, we had something in common.

Another time I walked in a garden at Skagway, Alaska, at 10 p. m., with the sun still shining, admiring such things as Mexican dahlias, Mediterranean sweet peas, African pelargoniums, European pansies, and South American petunias. All the while the grower and I—strangers an hour before—were discussing the peculiar problems he had encountered (and solved) in growing these foreign things in that far-northern garden.

* See "Over Trail and Through Jungle in Ecuador," by H. E. Anthony, NATIONAL GEOGRAPHIC MAGAZINE, October, 1921.

International

From Far-off Japan Came the Easter Lily

Bulbs for winter forcing in pots have been shipped in quantity to northern florists from Bermuda, leading to another common name, Bermuda lily. Large stocks of this and closely related varieties are now also grown in the Southern States and the Pacific Northwest. This sweet-scented display is in Cypress Gardens, Florida.

So widespread are the areas from which our decorative plants have come that when we walk along our garden paths it is almost like taking an extensive tour. In fact, with just a little planning, even with no more than a small backyard plot, anyone can say, "The world is in my garden."

Beginnings of Ornamental Gardening

The first cultivation of plants was for food. For thousands of years previously, the wild grains, fruits, bulbs, roots, and herbs had been utilized. When cultivation began—probably not less than 20,000 years ago—these were moved into the first gardens. And so, such succulent and quite edible things of the Mediterranean and western Asia regions as the tulip, hyacinth, narcissus, and Star-of-Bethlehem took their places, as bulbous crops, beside the nutritionally similar onion and garlic.

Before the advent of maize (Indian corn) into Mexico—an event of prehistoric times—the roots of the several kinds of dahlias (page 54) were an important source of starchy food and so were grown as a crop. Potatoes, now commonly grown in Mexico as a starch source, seem to have been introduced there from South America by the Spaniards.

One of the prettiest sights I have ever seen was a little dusky-skinned Mexican girl coming out of the hills with an armload of brightly colored dahlias. In olden times she would have been returning with the roots instead.

Also, it is indeed difficult for us to realize that so magnificent a sight as the water-lily called East Indian lotus even today stirs the salivary glands of many Asiatics more than it does their esthetic senses (page 41). The large rhizomes, or rootstalks, with their curious air passages, as well as the nutlike seeds are common items in Chinese groceries in our larger cities.

In medieval Europe a housewife out gathering a basket of violets, primroses, or similar flowers probably was not fashioning a pretty bouquet. More likely she was getting the materials together for a tasty salad, or "sallet," as she would have called it. Once the dietitians tell us that these common flowers are richer in vitamins than many of the pallid things we serve as salads, they will again become popular food.

With the invention of the sickle and the plow there was a great increase in the growing of the grains, agriculturally the most efficient producers of basic food materials and also the most easily stored. This led to a reduction in the effort spent on the cultivation of bulbous food sources such as the tulip and hyacinth. Apparently the same thing happened to the dahlia in Mexico when maize was introduced from South America.

But man is a sentimental creature. How often people have brought me plants which were diseased, physiologically senescent, straggly, and asked me what to do for them. Perhaps it would be no more than a common geranium, better replaced by one of the newer, more colorful, and more floriferous kinds. But no, the owners would not throw it away and get a new plant, for they had been tending it for a half-dozen years or more.

And so it must have been difficult for man to discard those plants he had been carefully tending for thousands of years in his vegetable gardens. Also, they could always be used as emergency foods in case of a failure of the grain crop.

Man also is fundamentally a religious creature, much given to watching for signs and portents. Thus he early noted that certain kinds of plants came into bloom at regular times. To primitive man this bordered on the supernatural, and so the flowering period of various choice kinds marked the periods when he worshiped particular deities.

These floral calendars are a feature of many primitive peoples. Although considerably changed, these religious ceremonies still persist in our modern cherryblossom, tulip, rose, and chrysanthemum festivals.

Thus, often starting out as foods, many plants were retained because of sentiment, or because they had become associated with religious ceremonies. In this way began the cultivation of flowers.

Flowers for Medicines

Although some garden flowers were first cultivated as foods, others were first domesticated for their medicinal properties. In the paintings which follow, several of these are featured. Foxglove originally was used as a source of medicines, notably heart ailments (as it still is), and sweet scabious as a cure for the itch. Both were in herb and medicinal gardens long before they were thought of as ornamentals (page 21).

The Christmas-rose (*Helleborus niger*), now prized for its early flowers, was originally grown for its roots, which contain a powerful purgative. The aconite, or monkshood, with its spikes of curious flowers, so common in our gardens, already in medieval times was a source of a series of potent drugs and poisons.

The roots of elecampane, a species of *Inula* often seen in herbaceous borders, once were the base of a much-used tonic. As some indication of how long this plant has been cultivated, the present common name, elecampane,

Arthur Sasse from International

Flowers from an Electric Garden Plug in Anywhere

At the International Flower Show in Grand Central Palace, New York, a novel exhibit showed artificial blossoms that give light. Used as a bedside lamp, this bulb glows with the colors of a rose.

is a corruption of the Roman name for it, *inula campana*.

In the southern Appalachians, where Elizabethan English words still persist, I once came to a cabin beside which was an old-fashioned herb garden. The old "yarbwoman" was quite willing to tell me of the virtues of the several plants.

One was the "feverfuge," which was guaranteed to "chase away the fevers." In Old English, the same plant is mentioned as "feferfuge," a corruption of the Latin word *febrifuga*. Today we list the plant as "feverfew," or *Chrysanthemum parthenium*.

In mentioning a species of chrysanthemum, one is reminded of another of the same genus, the common garden pyrethrum (*Chrysanthemum coccineum*). The dried flower heads of a closely related form (*Chrysanthemum cinerariaefolium*) are the source of the insecticide, pyrethrum, now commonly used in gardens.

It seems, however, that pyrethrum was not first used as a control for garden pests. Rubbed on fresh, or preferably applied as a powder to the skin and clothes, it seems to have been used as a control measure for such things as body lice and fleas.

In the South American Andes I found the Quechua-speaking Cholos using other plants, not too distantly related to the pyrethrum, as a cure for "nervousness" in infants. Anyone who has lived with these people knows that much of this infant "nervousness" is due to the bitings of insect pests.

I therefore suspect that man's interest in chrysanthemums as a source of insect powders may go back much farther than his appreciation of them as garden decoratives.

And I suppose that even the little wild pansy, called in England and sometimes here heartsease (page 19), might be classed as a medicinal plant of sorts, for in the olden days a decoction of it was administered to cure the pangs of love. Our modern English name "pansy" comes from the French word *pensée*, and, as the old poem indicates, the malady might become serious:

> Why so *pensive*, little maid?
> Prithee, why so pale?

And if the little lady also were having the "vapors" and going into a decline over the affair, she would be given in addition an extract of rue, used as a tonic stimulant. Although the younger generation is now some-

what more philosophical about such matters of the heart, we still grow heartsease and rue in our gardens.

There were other ways in which our flowers came into gardens. In those days when bathing was not too convenient, a lady had to disguise the fact as well as possible. So the somewhat sweet-scented orris-root was used both as a perfume and as a dusting powder. The word "orris" is a corruption of *iris*, and the source of this material is the powdered root of the Florentine iris, one of the ancestors of the more common of our modern garden groups of this genus.

A list of flowers which came into gardens first as the sources of perfumes and toilet waters —again as substitutes for soap and water— would be a long one. There is a legend that a certain ancient oriental potentate ordered that his bath water always have steeped in it a mass of rose petals. However, he noted that there was a slight oily scum on the water. Disliking this apparent contamination, he ordered that it be skimmed off; whereupon it was discovered that this oily substance was the real source of the rose odor.

While this legend may be apocryphal, the fact remains that the toilet water used by polite ladies for their occasional sponge baths until bathtub bathing became fashionable was no more than an infusion of flowers in water.

But things really were not so bad as they might seem, for almost every region has some plant which, when rubbed up in water, makes a sort of soapy lather. For example, the people of Europe and Asia Minor had several species of *Saponaria*, or soapwort. After the invention of soapmaking from an extract of wood ashes and hot fat some of the soapworts stayed on in flower gardens.

One of these came to America and is a common garden inhabitant, which sometimes strays away to become a roadside weed, usually under the name of Bouncing Bet. This is the American form of the English name Bouncing Betsy. And if you are curious as to how *that* name became attached to this plant, you will have to refer to a dictionary of 17th- and 18th-century English slang, or go down into the back coves of the southern Appalachians where it still is used. If you lack opportunity to do either, then just remember that this plant was long associated

Staff Photographer Volkmar Wentzel

He Repairs an Inlay of the Diwan-i-Khas at Delhi, India

Because of man's dependence on plants and his love of the flowers they bear, he has turned to them for inspiration in many ways. Ancient wall decorations evolved into our modern figured wallpaper (page 8). First used around temple doors, these ornaments later became stylized when cut into stone and placed on the columns which support structures.

with household laundering, and then imagine the rear view of a buxom and billowy laundry maid as she vigorously scrubbed her clothes.

As civilization developed, scratch crops gave way to systematic cultivation; agricultural tools were invented; new field methods and garden procedures were developed; and efficient crops displaced the poorer-yielding ones.

Along with his developing civilization man's esthetic sense also was awakening, so that ultimately, instead of being entirely utilitarian, many plants with showy flowers were cultivated solely for their beauty. From such evidences as we have, this beauty appreciation seems to be scarcely more than 10,000 years old.

The Wanderings of Plants

It is sometimes extremely difficult to determine just where a plant is really native.

Hollyhocks often seed themselves along embankments, finally appearing to be native. The blackberry-lily has become a denizen of fence rows in places (page 45). Yet both, Chinese in origin, have escaped from gardens.

High in the South American Andes in Ecuador I once came to a moist place where I found the African calla, the southern European iris, and the northern European pansy, all three growing in profusion and apparently perfectly at home with the native plants. Fifty yards away were some stones giving evidence that a house of the early Spanish era once was there.

From these evidences we may deduce that the owner had brought with him the plants which were growing in his garden in Spain. But the jungle had again taken over, leaving behind these three evidences of man's migrations and of his love of familiar flowers.

The East Indian lotus has always been a problem, for it is a double-threat migrator (page 41). Man has long used its tuberous rootstocks and seed for food—and the seeds are easily transported and viable for a very long time. Also, the beauty of the flowers is such that it early became attached to religious ceremonies.

Thus, botanists have made contact with it apparently growing naturally in such distantly separated areas as Egypt, China, and northern Australia. The evidence, however, points to an origin in southeastern Asia. The story of its wanderings is the story of the early migrations of peoples from southeastern Asia down through the islands of the East Indies, of the contacts between the southeastern Asiatics with the Chinese peoples, and of their contacts and commerce with the early peoples of India and ultimately with Egypt.

Further examples are the Cherokee rose and the peach. When André Michaux came to America hunting for new plants for European gardens (he was the first to bring the Catawba rhododendron and the flame azalea into cultivation), he found in what is now the region of our southeastern States a beautiful wild rose growing abundantly. Later it was called the Cherokee rose. It has been adopted as the State flower of Georgia. To our surprise, however, the Cherokee rose has since been shown to be a native of China.

Apparently the Cherokee rose originally was taken overland from China to Persia, there to be picked up by the Arab Moslems and carried along with them when they planted their gardens in Spain. The Spaniards later brought it to the gardens of their settlements in Florida, from whence it escaped to become perhaps the most common and most celebrated "wild" rose in parts of the South.

Similarly, when William Penn was negotiating with the Indians for "Penn's Woods," he found the savages cultivating the peach in their gardens. The peach is not a native American; it is a native of China and first came to North America by the same route as did the Cherokee rose. Being a food plant, it was artificially spread on this continent with greater rapidity. The peaches which certain of our Southwestern Indians raise were introduced by Padre Junipero Serra's co-workers into the Californian missions from the trees grown in Mexican gardens, but also introduced there by the Spaniards.

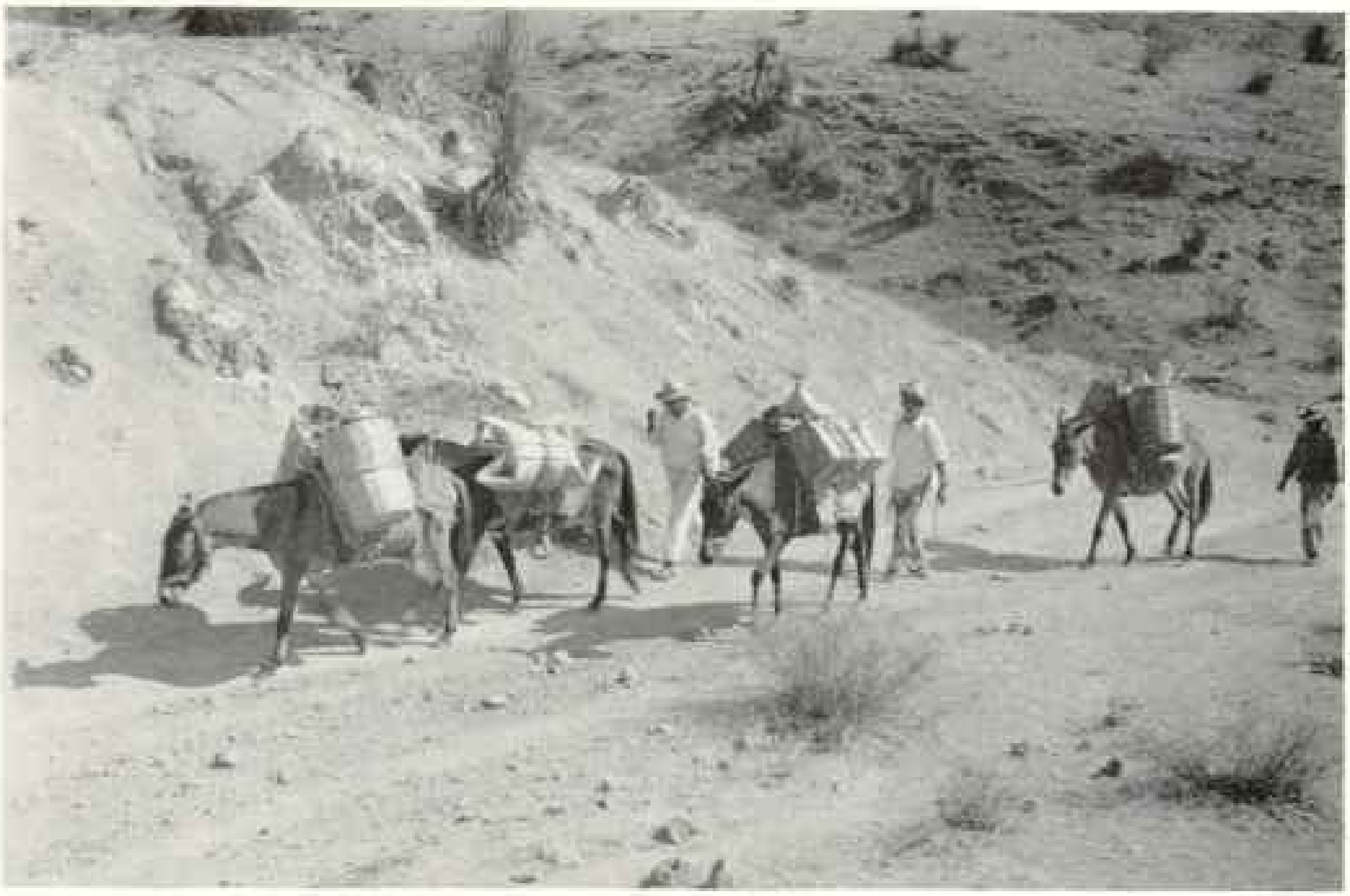
Early Centers of Ornamental Gardening

"And the Lord God planted a garden eastward in Eden . . . and . . . took the man, and put him into the garden . . . to dress it and to keep it."

As an old man sitting in the tents of his people in the land of Canaan, Abraham must have recounted the scenes of his youth in the neighborhood of Ur of the Chaldees. These stories became part of the lore of his descendants. Thus when the later Hebraic scribe set down the early history of his people, he had Adam placed in a *planted* garden full of all manner of animals.

Regardless of the other implications of the story, as described, the Garden of Eden was typical of the artificially planted, royal game preserves (called gardens) already present in the valley of the Euphrates at the time of Abraham's youth.

We know all too little of the early peoples who lived in the valleys of the Tigris and



W. H. Camp

With Botanical Specimens, the Author's Party Returns from Explorations in Mexico

The search for new ornamental flowers has been going on for thousands of years. Here an expedition is returning from Zempoaltepec to Oaxaca, its pack animals laden with living plants and seed of possible new garden species. Dr. Camp, a plant explorer on the staff of the New York Botanical Garden, has traveled widely, searching for ornamental and economic materials, especially for relatives of the rhododendron and blueberries.

Euphrates.* Yet the Sumerians and Akkadians certainly must have had gardens. There were peoples such as the Elamites, whose principal city was Susa, destined under the later Persians to become a famous horticultural center and the source of many of our garden decoratives (for example, *Crocus susianus* and *Iris susiana*). It was in Susa (called Shushan in the first chapter of the Book of Esther) that King Ahasuerus held a garden party that lasted 180 days.

One Assyrian king, Sennacherib, left us writings telling at great length of his gardens—of plants they contained which were more fruitful than in their native homes, of the many places he had sent expeditions to get the plants, and of his extensive irrigation systems, and of the many garden pools he built.

His grandson Assurbanipal, who reigned in the seventh century B. C., left us a fine set of carvings on the walls of the north palace at Kuyunjik which tell us much about the Assyrian garden of his day.

In the history of gardening, the reign of Assurbanipal is important, for it was he who pushed the Assyrian Empire into Egypt. Thus, for the first time the peoples of the regions of the Tigris and Euphrates came into close contact with the Egyptians and the Egyptian garden (page 8).

Prior to this, the gardens of the region had been planted in an informal, more or less haphazard manner. The Egyptian garden was planted in a geometric pattern. And thus the formal type of planting came to this old Mesopotamian garden center.

Because of an increasing aridity in the region, irrigation was becoming more and more necessary. This brought a system of hillside, terrace farming. When incorporated into ornamental and pleasure gardening, it was called the "hanging garden."

In reality, these hanging gardens were series of terraces, their outer edges supported by pillars. Sometimes the pillars were of brick, and hollow so that they might be filled with earth and thus accommodate the roots of large trees.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "New Light on Ancient Ur," by M. E. L. Mallowan, January, 1930; "Archeology, the Mirror of the Ages," by C. Leonard Woolley, August, 1928; "Cradle of Civilization," by James Baikie, February, 1916; and "Pushing Back History's Horizon," by Albert T. Clay, February, 1916.

Occasionally these hanging gardens were wide-based towers. One of these seems to have been built by Nebuchadnezzar the Great for his little bride, homesick for the green hills of her native Media. Husbands still can feel some kinship with old Neb when the little woman pointedly remarks that it is about time to get out into the garden and do the spring spading.

The Greek historians Strabo and Diodorus saw one of these hanging gardens before it crumbled. They tell us that it was about 1,500 feet long on one side, that it was set back in ascending tiers of terraces, and that because of the plants it held it looked like a green mountain. The topmost terrace, on which was situated the principal garden, was supported by a hollow arch 150 feet high.

Beginnings of the Persian Garden

In 539 B. C. the Chaldean Empire collapsed under the attack of Cyrus, the Persian. The Persians already had garden traditions, but, now in full power, they began a new cycle of intensive garden development.

The idea of the formal garden with the plants in rows and an equal spacing between plants had been brought into Mesopotamia in the time of Assurbanipal. Under the Persians this developed into a real system, especially with the advent of increasing numbers of purely ornamental plants and flowers. With the Persians, horticulture was considered a royal occupation, and special classes of instruction in the art were conducted by and for the nobility. Cyrus is reputed to have boasted of designing his own palace gardens and even of setting out many of the plants himself.

When, in 330 B. C., Alexander the Great looked on the dead body of the last of these Persian monarchs, the Persian garden had developed into a thing of remarkable beauty.

The Greeks did not destroy the gardens which they found, as some other conquerors have done.* Instead, they cherished them and encouraged their cultivation. Marveling at their beauty and magnificence, the Greeks "discovered" the Persian gardens and brought back to Europe some of the plants they contained. However, it was the Romans, somewhat later, who really did the job (page 26).

So far we have merely mentioned Egypt, noting that the formal type of garden came into Mesopotamia from there during the seventh century B. C. Let us roll back the centuries again and see what was happening in Egypt.†

When the doors of recorded history begin to swing open along the Nile, the art of gardening already had developed to a remarkable degree. Fortunately, these early Egyptians left us a series of carvings and paintings depicting not only the general plan of their gardens but also many of the plants they contained.

From such garden pictures we may readily note that not all the plants they grew were native in the immediate region. Therefore, we must conclude that already many of them had been introduced. To help us in this, we also have carvings showing vessels with their decks crowded with trees and other plants being brought to Egypt.

One of these is the record of a notable plant-hunting expedition which was organized and sent out by Queen Hatshepsut to the "Land of Punt" (page 12).

The love of ornamental plants and flowers finally became so marked in Egypt that Rameses the Great is said to have boasted that he had furnished at least 19,000,000 ceremonial bouquets to the temples.

Other items which we take for granted in our everyday lives can be traced back to this Egyptian love of garden plants and flowers. At some time in their past the Egyptians had begun decorating their temples with sprays of leaves and flowers. Later the supporting columns often were decorated with carved flowers, the water-lily a favorite, with the palm leaf, papyrus, and others also used.

The papyrus design, for example, was made to simulate a bundle of the reedy stems capped by the spreading tops. When stylized and worked in stone, this became a fluted column. The Greeks may have picked up this architectural item from the Egyptians. At least it survives to this day in the fluted columns of many of our public buildings.

Origin of Flowered Wallpaper

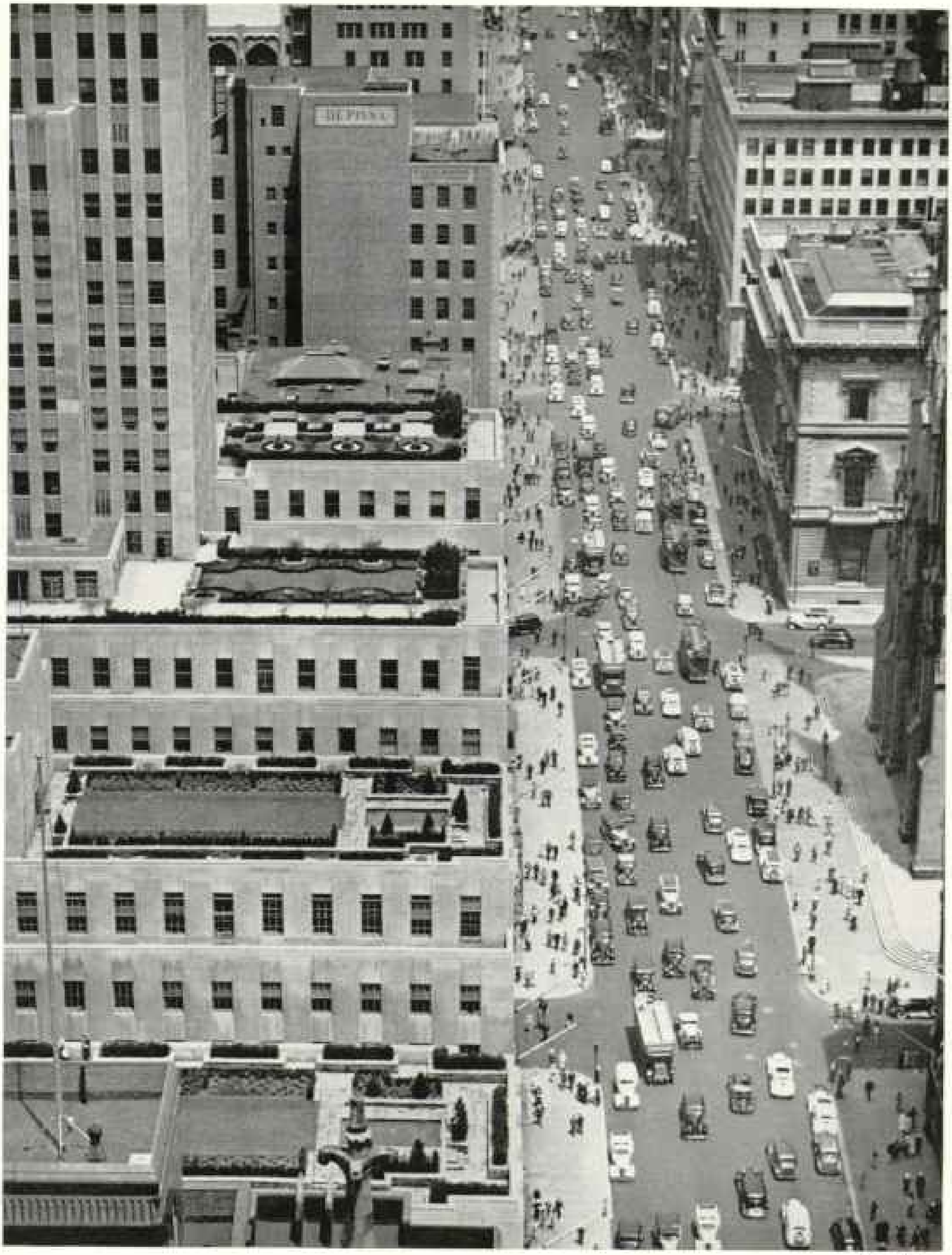
Another thing which the Egyptians started was the painting of their walls and floors with garden scenes. The custom of painting garden scenes on the inner walls of houses was taken over by the Romans after they made cultural contact with the Egyptians.

Excellent examples of such Roman garden scenes are to be found in the excavations at Pompeii. We got the idea from the Romans, and it still survives in our modern figured wallpaper.

Early Persian travelers apparently also saw this Egyptian custom of floor and wall

* See, in the National Geographic Magazine, "Greece—the Birthplace of Science and Free Speech," by Richard Stillwell, and "Greek Way," by Edith Hamilton, March, 1944.

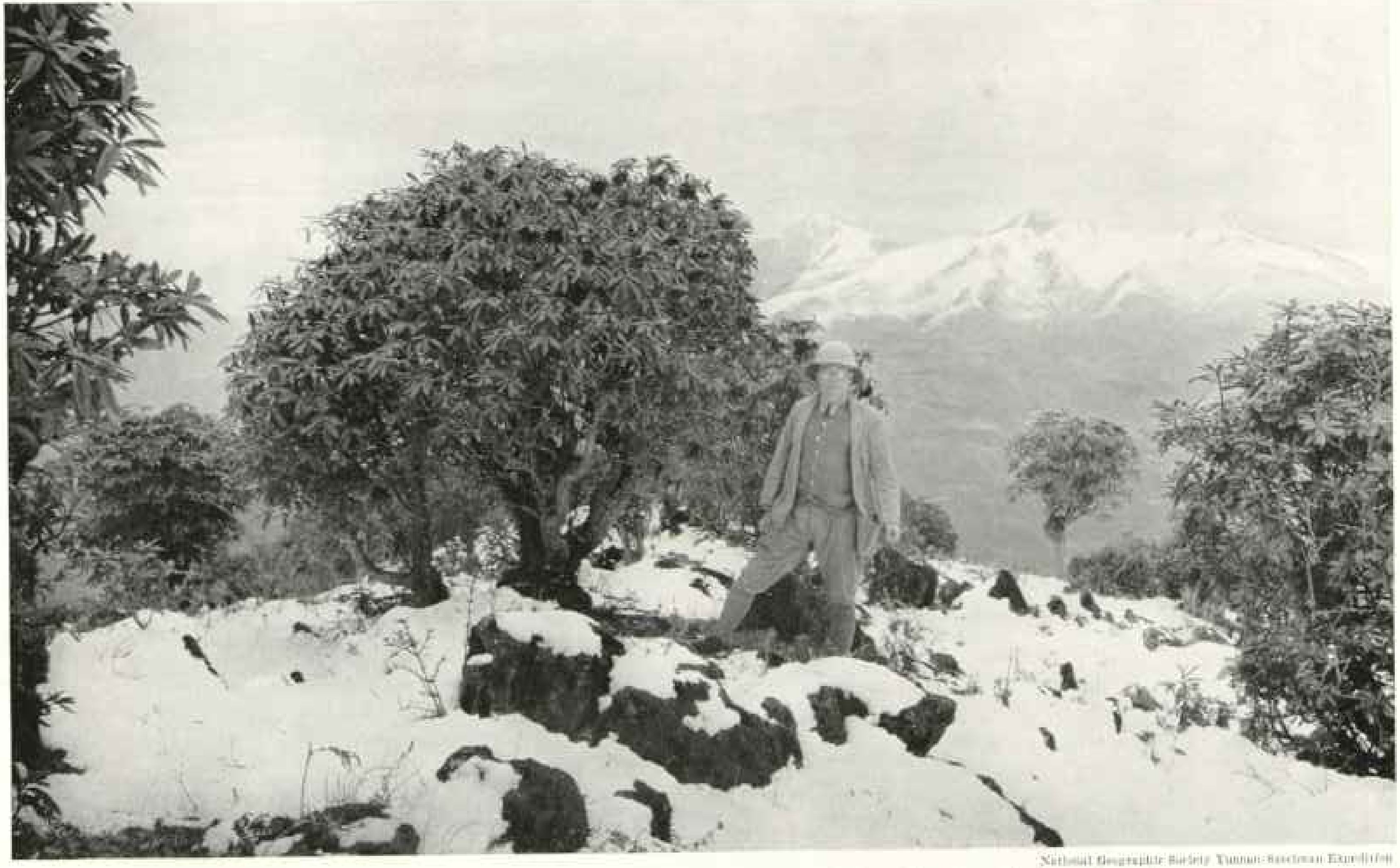
† See "Daily Life in Ancient Egypt," by William C. Hayes, National Geographic Magazine, October, 1941.



Newspictures

New York Has Its Hanging Gardens Like Nebuchadnezzar's Ancient Capital

Atop the buildings on the Fifth Avenue front of Rockefeller Center these four, with lawns, trees, shrubs, and flowers, commemorate the work of David Hosack, who, on this same site in 1801, laid out the first botanical garden in New York City (page 17). The roof was first covered with a special waterproof material, over which a thick layer of soil was added. Here spindly-stalked species, which break over easily in strong winds, are not too successful.



National Geographic Society Yunnan-Szechwan Expedition

Rhododendron Seed Gathered on This Peak, Tayin Shan, China, Was Sent Back to America

When Dr. Joseph F. Rock led the National Geographic Society's Yunnan Province Expedition in 1923, he forwarded to Washington, D. C., seed of many varieties previously unknown to the United States, this deep crimson-flowered *Rhododendron Delavayi* included. While such items may not prove hardy here, expert growers sometimes coddle them long enough to get them to flower. Hybridists then can cross them with such things as the native *Rhododendron catawbiense*. A few descendants would have this new color combined with the hardiness of the native.

Ewing Galloway

Prodigal Nature Cloaks with Rhododendrons the Spruce-rimmed Glades of Great Smoky Mountains National Park

Before the eye of the Park-to-Park traveler in June spread out mile after mile of these gorgeous hardy flowering shrubs. The mountainsides sometimes are literally covered with them. Closely related species are found on the U. S. West Coast; from Portugal to the Caucasus Mountains; and from the Himalayas to Japan.

Metropolitan Museum of Art

Explorers Brought Plants to Queen Hatshepsut's Garden 3,442 Years Ago

This painted cast now in the Metropolitan Museum of Art shows live frankincense (*Boswellia*) trees, roots packed in baskets or cloth, being carried to the Egyptian ruler's ships at Punt, believed to be a land on the Somali coast (page 8). The voyage took place in 1495 B. C. These reliefs are reproductions from the so-called "Punt Colonnade" of Hatshepsut's temple at Thebes, Egypt, carved about 1487 B. C.

painting and copied it. But with the chilly Persian winters bringing cold walls and clammy tile floors, they had their own garden scenes woven into warm rugs to be used both as wall hangings and as floor coverings.

Since many of the basic elements of rug design go back to the Persians, it therefore is obvious that our modern figured rugs actually trace their lineage back to the paintings on their floors and walls which the Egyptians had made so as to bring their gardens indoors (page 30).

Eden Comes to Manhattan

Some time ago I stepped inside a Fifth Avenue flower shop to examine a display of miniature gardens in glass bowls. I was curious only to see the kinds of plants they contained. When the salesgirl asked if I wished to purchase one, I astonished her by replying that I really didn't think I wanted to invest in a Garden of Eden.

About the time that Hammurabi was founding the first Babylonian Empire, a group of peoples, migrating eastward from what is now Persia, entered India and conquered it. This was more than a thousand years before Assurbanipal brought back with him the idea of the formalized Egyptian garden (page 7). Consequently, these early emigrants took along with them the original style of informal, park-like planted garden, often with its animals.

Those who have visited India recently will have noted that the Indian garden at present is rather formal. Under later conquerors who overran the region from the seventh to the

thirteenth centuries of our own era, the Persian garden for the second time was brought to India, this time with its straight rows and formalized planting.

Much earlier, some time between 600 and 500 B. C., Siddhartha Gautama, founder of Buddhism, was born in what now is an overgrown jungle region on the borders of Nepal. After his revelation under the bo-tree (botanically a species of fig called *Ficus religiosa*, commonly planted along streets and in gardens in warm regions), Gautama went to Benares. There he and his first converts built shelters for themselves in the "deer park," a garden in the style of the old game preserve.

Gardens of Buddha

From the first, the teachings of Gautama had been carried on in the quiet of a naturalistic garden, and from this arose the tradition among his followers that their most effective work would be accomplished in the same environment. Therefore the missionaries took with them not only the teachings of Buddhism but the tradition of the informal garden as well.

By the latter part of the third century B. C., Buddhist missionaries were pushing across the passes into central Asia and ultimately into China. In China the Buddhist garden underwent a great development through the centuries. When Marco Polo visited China (between A. D. 1272 and 1293)* and saw such royal gardens as those of Kublai Khan at Xanadu and at Cambaluc he was astonished at their magnificence.

Lacking space, the lesser folk of China copied these royal gardens but reduced them in size, employing artificially dwarfed trees to keep the over-all landscape in scale. And if one had no plot of ground, then one bought a dish and in it planted an even smaller model which could be grown in a sunny window.

When the Chinese garden was introduced into Japan by later Buddhist missionaries, the miniature garden went along, there to be even more ritualistically arranged.

If you happen to own one of these overcrowded and usually poorly arranged imitation Chinese dish gardens, at least you will have the satisfaction of knowing that your little garden-in-a-fishbowl is a direct lineal descendant—by way of the Chinese gardens which Marco Polo saw and of the Indian garden in which Gautama preached—of the royal game preserve and hunting park which already was common in Mesopotamia when Abraham left Ur of the Chaldees to go over into the land of Canaan. It is, therefore, a miniature of the Garden of Eden.

The History of Two Gardens

Two acquaintances of mine, who also are neighbors, are fast friends. They agree on almost everything except their gardens.

One has a garden with a central stretch of lawn, at the end of which is a pool shaded by a graceful birch tree. At the border of the lawn is a mixture of flowering shrubs and herbaceous perennials, with here and there sprightly touches from small groups of annuals. It is a completely informal affair, yet there is not a time between April and October that one cannot find some floral surprise peeping out from an odd corner.

On the other side of the dividing line one finds in the other friend's garden closely clipped hedges and planted beds in geometric form. The beds contain flowers, but only those sorts which will not interfere with the neatness of the design. Near the corners stand four yews, so carefully trimmed and trained that they scarcely are recognizable as such until closely examined. At the center of this formal garden a birdbath stands on a pedestal.

Each of my friends has followed an ancient custom in garden making.

From carvings it seems that the Egyptians sometimes clipped and trained their shrubs and trees. Apparently the Romans picked up this idea from the Egyptians (certainly it was not from the Persians) and carried it to great lengths.† In its ultimate form, this topiary work in the Roman garden was such that clumps of trees and shrubs were trimmed to resemble such things as ships in full sail, or hunting scenes, complete with the stag and hounds in full flight.

Then, for about a thousand years, Europe was wrapped in the Dark Ages.

Six years after the printing presses were set up in Italy, or in 1471, a manuscript written a century earlier by Piero Crescenzi of Bologna was published. This *Opus Ruralium Commodorum* had been compiled from the old works of such Roman horticultural writers as Varro, Columella, and Cato, but Crescenzi added his own ideas about garden matters.

Soon translated into Italian, French, and German popular editions, Crescenzi's book opened up a whole new vista of gardening. It was so influential that its publication can be said to mark the beginning of the Renais-

* See "World's Greatest Overland Explorer," by J. R. Hildebrand, NATIONAL GEOGRAPHIC MAGAZINE, November, 1928.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Ancient Rome Brought to Life," by Rhys Carpenter, and "The Roman Way," by Edith Hamilton, November, 1946.

sance, so far as gardens are concerned. While in it the humble and middle-class folk were encouraged to have gardens if at all possible, it was the upper class and nobility who were enjoined to sponsor the building of gardens—and on a magnificent scale.

The culmination of the development of the formal gardens of the Renaissance—a form which was based on the Roman garden—was reached in the gardens at Versailles developed by André Le Nôtre for Louis XIV.*

The Dutch garden, although unlike the French garden with its great vistas, was also formal, being cut up into small flower beds. These types both went to England and there the two styles were mingled. The English formal garden also usually exhibited considerable "bush barbering," or topiary work and clipped hedges. This type came to colonial American gardens.

Thus we trace the geographical wanderings of the formal garden from Egypt to some of our own back yards.

Odyssey of the Informal Garden

Following the odyssey of the informal ornamental garden will take us farther. As we already have noted, it began in Mesopotamia. From there it went to India and on to China.

Between the years 1735 and 1772 a series of books on Chinese and other Oriental gardens, written by keen observers who had been there and seen them, appeared in England. While some who tried to imitate and follow these descriptions got no further than sticking mock pagodas into their gardens, others caught the spirit of the studied informality of the Chinese garden and put it to excellent use.

Coupled with greensward, this Anglo-Chinese garden became what we now call the typical English garden—a lawn surrounded by a mixed border of ornamental plants in an informal but pleasing array. More recently, this type of garden has become increasingly popular in America.

Different as are these two garden types, they still have one thing in common—the ancient water supply.

When gardening first began, it was noted that there were occasional periods when the plants needed water. For convenience the gardens were located near a spring or pool.

In spite of our hoses and automatic sprinkler systems, we still almost always manage to slip the time-honored water supply into our gardens in some form. The pool will still be there, or a combination fountain and pool. In this instance the fountain represents the original bubbling spring.

There is a pool in the garden of my one friend. My other friend stoutly denies that he has a pool. But it is there just the same. All he has done is to raise it into the air, put a pedestal under it, and call it a birdbath.

Californians have every reason to be proud of their patio gardens. Imitations have been attempted in the North, but they come short of expectation because the plants characterizing them usually will not stand cold.

But this interesting garden type is not Californian. And, for that matter, it is not Mexican. It goes back much further.

The Persian garden was carried on the crest of the wave of Moslem conquest across North Africa and ultimately into Spain, where the Moors built great gardens. The first Spanish Emir, Abd-ar-Rahman, chose Cordova as his capital in 755. There he fashioned a garden such as he had known in his youth in Damascus.

It is said that he sent agents and plant explorers from Spain as far east as Syria, to the borders of China in Turkistan, and even into India, to collect plants for this garden. It was not until 1492 that the last of the Moslem strongholds in Spain surrendered to Ferdinand and Isabella.

A fertility and blessing-of-the-crops rite was celebrated among the ancient Babylonians and Assyrians. This spread to an offshoot of this culture, to the Phoenicians. It was taken to Cyprus, an old Phoenician colony, and later to Greece where, about the seventh century B. C., we find it celebrated as the Adonis festival.

How Potted House Plants Began

At first in this festival, quick-growing plants such as lettuce were put in pots. Later more permanent and decorative plants were used. And so began the custom of raising plants in pots around the house. This custom was picked up by the Romans and taken to Spain. There it was welded into the Mohammedan garden and became the Spanish type.

When Cortés conquered Mexico, he found excellent gardens, much better, in fact, than anything at that time in Europe. But these Aztecan gardens were destroyed by the Conquistadores, so that today only slight vestiges of them remain.

Consequently, when the Spanish settlers and clergy began to flock to Mexico, they had to start their gardens all over again. Naturally they used the type with which they were most familiar—the garden they had left behind in Spain.

* See "Palace of Versailles—Its Park and the Trianons," by Franklin L. Fisher, National Geographic Magazine, January, 1925.

W. Atlee Burpee Company

Human "Bees" Perform a Delicate Task

Girls at Burpee's Floradale Farms must pollinate by hand every blossom of the giant petunias so that they will produce seed. This carefully controlled hand-pollination also assures the gardener that the seed he buys should be true to name. It also explains why seed of such sorts is scarce.

Thus strong elements of the Moslem garden, which fitted into the Moorish style of architecture also brought to this hemisphere, came to Mexico. Its features were a well—the old water supply again—with small flower beds near by, a few trees, and almost always some potted plants.

Rock Gardens Get Under Way

This characteristic but simple type of patio garden was taken from Mexico into California by Padre Serra when he established his system of missions. And that is how the Persian garden, plus a fertility rite represented by the potted plants, came to California.

There are some who see a beginning of the rock garden in the grottoes popular in Greek and Roman gardens. There may be a touch of grottoism in them, but the modern rock garden can be given an exact starting date.

Clusius, the old Dutch herbalist, became interested in Alpine plants while in Austria (we shall meet him later puttering about with his tulips; page 28). Others tried to raise this specialized type of plant, but also without any great success. We now know that these Alpine plants require special types of drainage and soil conditions.

Apparently the first person to have any real success with these plants was the English botanist and plant explorer, Sir Joseph Banks. He had some slabs of lava rock which he had brought back from Iceland on one of his expeditions. These, together with some old stones dumped out from repairs then being made on the Tower of London, and some locally collected flints and chalk rock, as well as a quantity of broken brick, constituted the basis of the "rockery" which he constructed in the old Chelsea Physic Garden in 1772.

Plant Explorers and Hybridists

With the opening of the 18th century the intellectual ferment of the Renaissance revived the ancient profession of plant explorer.

From China, Japan, Ceylon, India, Australia, Africa, the Near East, from the West Indies, North America and South America—from the whole world—plants began pouring into the botanical centers of Europe, and botanists and gardeners were in a constant furor over the procession of exciting new finds. It was the Golden Age of the plant explorer, for it was a poor one who did not return with a goodly portion of his findings new ones. Those of us who now poke into

Staff Photographer B. Anthony Stewart

In a New York Studio Mrs. Else Bostelmann "Grew" The Geographic's 24-page Flower Garden

The plants, selected in consultation with Dr. W. H. Camp of the New York Botanical Garden, represent all parts of the world (page 17). Many outstanding series of paintings by Mrs. Bostelmann have appeared in the National Geographic. Readers will remember series such as: "Whales, Porpoises, and Dolphins" (January, 1940), "Undersea Gardens of the North Atlantic Coast" (August, 1936), and other aquatic subjects.

the odd corners of the world for plants sigh for "the good old days."

On this side of the Atlantic for a long time there had been gardens scattered along the seaboard wherever settlements had sprung up. And the plant explorers were not far behind. John Clayton (for whom our spring-beauty, *Claytonia*, was named) was on these shores for the first time in 1705.

Men like Mark Catesby followed (he is remembered in *Lilium Catesbaei*). Peter Kalm the Swede visited our shores and took many plants back to Europe (his memory is kept fresh in the name *Kalmia*, the mountain laurel). But to John Bartram, the Quaker plowman, we make our deepest bow.

This native of Darby (near Philadelphia) became so interested in botany that he neglected his farm, studied Latin so that he could read the early texts, and set about learning all he could about plants. It was he who, about 1730, founded one of the first botanical gardens in America and scoured the region from Florida to Lake Erie for plants to fill it. So far as we can learn, it was Bartram in this garden who did the first controlled hybridizing of garden flowers in America.

Bartram had a wide correspondence with the learned botanists and best gardeners of Europe. Scarcely a boat left Philadelphia which did not contain a parcel of seed or living plants collected by him; in return, people sent him many rare plants from various parts of the world. A considerable selection of the plants now common was grown first in America in this garden. Soon nurseries sprang up, and the Philadelphia region became the garden center of North America.

Nor was the South lagging. At Charleston, Henry Laurens was introducing many exotic

plants fitted for that climate.* At Otranto, Alexander Garden, physician and plantsman, was carrying on a correspondence with Linnaeus, the great Swedish botanist. The *Gardenia* was named for him. And it was at Charleston that André Michaux, that peer of early American plant explorers (page 6), had one of his nurseries and collecting stations.

Another Charlestonian—but of a somewhat later period—is especially remembered during our winter holiday season, for the Poinsettia was introduced by and named in honor of Joel R. Poinsett.

The Virginians were not behind their neighbors. Those who visit Mount Vernon can easily see in the restored garden, laid out according to the diary and notes kept by George Washington, that he was a lover of plants and a gardener of no mean ability. With a scientific turn of mind, Thomas Jefferson—who wrote on matters of natural history as well as on government, had, like Bartram, a wide correspondence and introduced many new plants and garden methods.†

Other gardens were springing up. In 1801 Dr. David Hosack acquired a plot of 20 acres from the City of New York and laid out a botanical garden. The Elgin Gardens, as he called the plot, lay on what now is 5th Avenue between 50th and 51st Streets, where Rockefeller Center stands. The roof and terrace gardens now atop this modern structure, commemorating Dr. Hosack's efforts, are reminiscent of the "hanging gardens" which Nebuchadnezzar built in Babylon (page 9).

Since the days of the early Dutch, French, and English colonists, botanical gardens have been active in the discovery and development of new garden materials in all parts of the world.

Large and famous private nurseries had been springing up because of the increased interest in gardens. And many of them had their own botanical explorers who brought together stocks of additional garden material. Furthermore, especially in Europe, these nurseries became the centers of hybridization and selection of new forms of ornamentals.

This activity eventually came to this side of the Atlantic; and American nurserymen, with the newer techniques supplied by recent advances in the knowledge of the breeding of plants, are now taking the lead in this necessary and basic phase of floriculture.

Today one cannot walk into a garden without seeing on every side the results of the work of the plant breeder. It is the job of the plant explorer to bring the material out of the world's far places. The hybridist and selector then work over it, sometimes for years, finally to pass it on to us in the form of choice garden flowers, often quite different from what they originally were in the wild.

Selection of Plants for This Series

Some time ago Mrs. Bostelmann, already well known to me through her paintings, came into my office and asked if I would give her a list of about a hundred kinds of flowering plants commonly grown in American ornamental gardens, together with the countries where they originally were native. It seemed like a simple affair; that is, until I really got into the job.

Today man cultivates about 25,000 species of plants. Of these about 10,000 are cherished for the ornamental value of their flowers. Of this latter number, several thousand might be classed as being fairly "common" in America.

In making up this list, we selected a representative number. The name and country of origin of each was put on a card, and cards were sorted by the geographic regions of origin so as to give some idea of the proportion of the paintings to be devoted to each region.

Then by a process of further selection the list was reduced to only two hundred species—still twice too large. Discarding that last hundred seemed almost like turning one's back on one's best friends.

As a last resort, in certain instances the cards were turned face downward, shuffled, and the number which Mrs. Bostelmann needed to complete a plate selected at random.

If your favorite garden flower happens to have been omitted, it very likely was among those which were not pulled out of the pile.

This also will explain to gardeners why species with greatly dissimilar climatic and soil requirements, or of different blooming periods, sometimes appear in the same picture.

For perhaps six months a most miraculous thing happened. All I did was to lay out the plot. The artist planted the garden and tended it; and there on her easel these plants bloomed.

The following series of paintings—"Mrs. Bostelmann's garden," as her friends called it—is certain evidence of the marvelous climate and growing conditions which can be found in an artist's studio in Manhattan.

* See, in the National Geographic Magazine: "Ashley River and Its Gardens," by E. T. H. Shaffer, May, 1926; and "Charleston: Where Mellow Past and Present Meet," by DuBose Heyward, March, 1939.

† See, in the National Geographic Magazine: "Home of the First Farmer in America (Mount Vernon)," by Worth E. Shoults, National Geographic Magazine, May, 1928; and "Jefferson's Little Mountain," by Paul Wilstach, April, 1929.

Painting by Else Bostelmann

European Weeds Became Ornamentals in Medieval Courtyards. Turf Seat Abuts the Wall

Pot Marigolds surmount the cluster. Bellflowers rise on fragile stems. English Daisies grow in the lower left. Modern and wild Pansies occupy the center. Wild Cowslip—"Cow's-lip"—and garden Polyanthus, lower right.

From Medieval European Gardens

THE far-flung empire of the Caesars had at last crumbled and the *pax Romana* was a thing of the past. Political and economic chaos reigned in much of the then civilized world. Brigandage was rife. The common folk deserted their farms and crowded their cottages beneath the overhanging battlements of the great fortified castles to be near protection in case of raids.

The Dark Ages descended upon Europe. During the constant turmoils and alarms many of the vegetables and flowers previously introduced by the Romans were lost and, having no access to the gardens of the outside world, the people of medieval Europe turned to the plants of their own woods and pastures as a source of garden materials.

The first of these "garden introductions," such as the daisy, primrose, pansy, and bellflower, were purely accidental, probably having come in as weeds or been brought in with the turf used to construct rude seats beside the castle walls. One of these turf seats is shown in the accompanying picture.

Sometimes the roots of a cherished fruit tree or flowering shrub were protected from the trampling hoofs of the horses by wickerwork. Amid the noisome odors and insanitary surroundings of a medieval castle courtyard these flowers cast a welcome fragrance and brought a note of gaiety and freshness to an otherwise drab scene.

Although they had not heard of nutritional deficiencies, these peoples early learned the value of green material in the diet. Many of the wild herbs, as the pot marigold, also had colorful flowers and found their way into the early castle gardens where for a long time they did double duty, furnishing both beauty and vitamins. A haunch of venison seasoned with marigold and mint, together with a stew of roses and primroses, and garnished with a chopped salad of wild onions and violets, graced the board at many a knightly feast.

The edifice on the far hill in the accompanying plate is not entirely imaginary. It is taken from an actual castle, built in the 9th century, but now in ruins. It is the ancestral home of the artist who has given us this series of garden flowers.

POT MARIGOLD (*Calendula officinalis*): Grown originally as a potherb as well as for its supposed medicinal properties and religious connotations (whence the name Mary's Gold), the flowering heads still are occasionally used as a savory. Selected garden forms with large "double-flowered" yellow or orange heads are now mostly cultivated.

BELLFLOWER (*Campanula*, various species): The Bluebell (*C. rotundifolia*) is still common in turf and must have been introduced early. The Chimney Bellflower (*C. pyramidalis*) also came into gardens by this same route. Another member of this large genus of nearly 250 species which must first have been accidentally introduced is the Canterbury Bells (*C. Medium*). Today its wild form is rarely seen in cultivation, the common garden forms being the hose-in-hose, wherein the calyx is modified and enlarged and encloses the corolla, and the popular cup-and-saucer form, in which the much-enlarged and colored calyx is widely flared.

DAISY (*Bellis perennis*): This charming little plant, the True or English Daisy, was and still is a weed in European fields and meadows; many excellent garden selections are now in cultivation. Chaucer referred to this plant as the "ee of the daie," and by Ben Jonson's time it was called "Day's Eye."

PANSY or HEARTSEASE (*Viola tricolor*): Our garden pansy has been derived from the weedy "three-colored violet" of Europe; hence the scientific name, *Viola tricolor*. It seems likely that several other species, through hybridization, have contributed to the modern forms of this plant. The English words "pansy" and "pensive" come from the French word *pensée*.

PRIMROSE (*Primula*, various species): Such species as the Field Primrose (*P. vulgaris*), the Ox-lip (*P. elatior*), and the Cow's-lip (*P. veris*) are common in European pastures and also must have been brought in with the sods from which the turf seats were made. A plant of the wild, yellowish-flowered Cow's-lip (not "Cow-slip" as most of us pronounce it) is shown opposite. With it is part of a truss of flowers of a plant now more often grown, the garden "Polyanthas," a colorful group derived by selection from among the many hybrid combinations between the Field Primrose, the Cow's-lip, and the Ox-lip.

ROSE (*Rosa*, various species): At least three wild species were available to the people of medieval Europe, the French rose (*R. gallica*), the Dog rose (*R. canina*), and the Eglantine or Sweetbrier (*R. Eglanteria*). The last of these was enshrined in song and story. It may be a surprise, but the Rose was valued for food before its beauty was appreciated. The fruits, especially, were eaten; we now know that they are very rich in vitamins.

Painting by Elsa Bostelmann

The 19th-century European Cottage Was Complete with Thatched Roof and Garden

Tallest flower is Foxglove, source of digitalis. Double garden Stocks come next. Lower center: the reddish, wild form of Stock. Right: Wallflower. At either lower margin grows Sweet Scabious.

Europe Contributed Flowers and Words

EUROPEAN languages changed and developed as ideas and vocabularies enlarged through the broader contacts with other peoples. Yet, although often greatly modified, the names for familiar objects still contained word-roots derived from their former association with folklore and ancient uses, as well as indications of the early sources of the names themselves. These still are reflected in the modern names of many of our common garden plants.

FOXGLOVE (*Digitalis purpurea*): So popular is this decorative garden plant with its dramatic spikes of flowers in varied colors that we sometimes forget that it also is the source of the ancient and still much used medicine, digitalis. In the Old English folklore this plant was called *Foxes glófa*, a poetical and fanciful term which means the same as the modern name.

STOCK or GILLIFLOWER (*Matthiola incana*): In its wild form this species is a coarse shrubby perennial with single reddish or dull purplish flowers. A sprig of the original reddish wild type is shown in the lower central part of the opposite plate. Through the years another form of this plant has been selected and now is the one usually grown. This is the variety *annua*, or Ten-week-stock, which comes in various colors and degrees of doubling, several of which are shown in the central part of the plate.

The name Stock—which seems to be only a few centuries old—probably was derived from the fancied resemblance of the stiffly flared petals to the distinctive collars, called "stocks," which men used to wear. The name Gilliflower, also often applied to this plant, has had a much longer history. We first pick it up in the Greek as *karyóphullon* or "carinate-leaf," a name applied to some plant (possibly the progenitor of our modern Carnation) whose "leaves were shaped like the keel of a boat."

The Romans conquered the Greeks and absorbed many of their words. This one was among those taken and, with their own linguistic modifications, applied to plants with similar leaves. The Roman legionaries marched into Gaul and carried the equivalent Latin word with them, where it was taken up by the native peoples, further modified, and applied to various plants, among them being what we now call the Clove Pink or Carnation, Wallflower, Stock, and doubtless others.

By that time the original Greek name had been so changed and mutilated by its passage through classical Latin into the everyday Latin of the common people, and from thence into the early French language, that it had become "Giroflée."

With a curious transposition of the "r" and "l," the word got into England, where it seems first to have appeared as "Gilofre."

By later modification this became "Gilofer." As the language developed, "Gilofer" gradually changed, probably into "Giloflor," then "Gilliflour," and finally "Gilliflower," which, in its modern English compound form, means nothing at all. However, it stands as a constant reminder of the devious routes and curious changes through which so many of our English words have come to us.

WALLFLOWER (*Cheiranthus Cheiri*): Originally a native of southern Europe where the climate is seasonally warm and dry, this little plant did not favor the cooler and moister soils of the more northern regions. However, as man began to build houses, castles, and earthworks in central and northern Europe, their walls afforded sunny nooks with warm and dry niches where this little weed could flourish, and so it migrated northward. The origin of the common name, therefore, is obvious. A single tuft of the wild form of the Wallflower is shown toward the right margin of the plate. It now is cultivated in various colors; double-flowered forms also are known.

Both the Stock and Wallflower are members of the Mustard, or Crucifer Family. The word "crucifer" refers to the crosslike appearance of the four petals of the usual wild type of flower. The word "mustard" traces back to a time when this ancient condiment, derived from yet another member of this large family of plants, was prepared by mixing it with "must," or new, unfermented wine.

SWEET SCABIOUS (*Scabiosa atropurpurea*): Of the many colors in which this species is now grown, only three are shown here, the blue, deep red, and pink. The deep purple (almost black) forms are often called Mourning Brides. The plant also is sometimes called Pincushion-flower, but the old name Scabious still seems to be preferred, a linguistic legacy of that lusty period in our history when bathing was both a luxury and a social affectation. In those days an old European garden was not complete without its plot of Scabious; the flowers may have been pretty, but the plant was more valued as a cure for the "scabious," or itch.

Here in this charming modern garden plant we have a reminder of a rather earthy and unwashed period in our ancestral history, as well as a link with the language of the past.

Painting by Elsa Bostelmann

Spring's Magic Touch on Winter's Dormant Bulbs Glorifies an Alpine Meadow

Blue and yellow Spring Crocus (left) leap full-blown from storage mechanisms in which they have hibernated. Snakes-Head (center) bears the descriptive alias, Checkered-Lily. Right: Snowdrop, an early bloomer.

European Meadows and Our Lawns

WHEN botanists trace such things as those shown on the opposite page back to their ancestral forms, it is found that originally, millions of years ago, they were neither bulbous plants nor spring bloomers. Instead, their ancient progenitors usually were plants of the equable Tropics, which either were overtaken by large-scale climatic changes in their original home or began venturing into areas where climatic conditions were seasonally unfavorable. It is impossible here to trace the story step by step, but eventually various types of storage mechanisms were developed —among them bulbs—which permitted the plants to tide themselves over unfavorable seasons. However, the next period favorable to growth might be too brief to permit the production of a complete set of leaves and flowers and also to bring the fruit and seed to a fully mature condition.

In the untold millions of years during which this natural experimentation on how best to survive and perpetuate their kind under fluctuating seasonal conditions was going on, the problem was attacked in various ways. Plants which had acquired the bulbous habit frequently solved it by telescoping operations and producing the leaves and flowers for the next season at the end of the previous season's growth. All this is accomplished, usually with the new structures nearly complete and packed into a minimum of space within the protective covering of the bulb, before the plant goes into its dormant period.

These preformed parts are easily seen if one cuts carefully down through a large bulb such as that of a tulip or hyacinth. They are so nearly complete that little more is needed than for the storage part of the bulb to pump water into them and blow them up to full size. The way this complicated process is regulated and the feat accomplished is another story. But the foregoing explains why bulbous plants such as those in the opposite picture can come into bloom so early in the spring.

Of the plants shown opposite, the Crocus is perhaps the most easily naturalized in lawns. In this work care should be taken that we do not get the lawnmower out too early. For some weeks after the flowers have passed, the leaves are busy manufacturing the food necessary for the production of the next year's flowers. By then the first mowing will be a little more difficult, but the Crocuses will be better for this delay.

SPRING CROCUS (*Crocus vernus*): Of the nearly 75 species of this interesting genus, this one is most commonly planted. Being a native of southern and central Europe and frequently found in profusion in Alpine meadows, it is perhaps more at home in our northern lawns than various of the other species, most of which are native in the Mediterranean region or in western Asia. However, it is not unusual also to see sprinkled across a lawn an infiltration of the yellow tints of the Balkan Crocus (*C. moesiacus*—the specific name means "from the land of the Moesians," or Balkans), or the Cloth-of-gold Crocus (*C. susianus*), a native of the Crimea, but introduced into modern culture from the gardens of the ancient city of Susa in Persia.

"Crocus" is the Greek name of the Saffron, another species of this genus. Unlike the plants of this group with which we are most familiar, the Saffron (*Crocus sativus*) blooms in the autumn; it is the source of a substance long used both as a textile dye and as a table condiment in Asia Minor. As a source of saffron, only the small, 3-parted style branches from the center of the flower are gathered. Crocuses belong to the Iris Family.

SNAKES-HEAD or CHECKERED-LILY (*Fritillaria meleagris*): There are perhaps 70 species of Fritillary scattered around the world in the North Temperate regions, some being native in North America. The European species shown here, possibly because of its long domestication, seems to do as well as any in our gardens and is interesting because of its curiously mottled flowers. The shape of the flower led to the generic name; it was derived from *fritillus*, a dice box. The specific name, *meleagris*, means "speckled like a guinea hen." The fritillaries belong to the Lily Family; we shall encounter another and different species of this genus in our Persian garden (p. 30).

SNOWDROP (*Galanthus nivalis*): This impatient little member of the Amaryllis Family is not to be trusted as a seasonal indicator, for it is likely to push up during any warmish spell after the middle of January, just in time to get itself covered again with snow. The generic name, *Galanthus*, means "milk-flower"; the specific name, *nivalis*, is apt, for it means "snowy." A somewhat similar species, the Snowflake (*Leucojum vernum*), a member of the same plant family, also a native of Europe and often planted in gardens, is sometimes confused with the Snowdrop. In the Snowdrop the flowering stem is solid, and the three inner flower segments are much shorter than the three outer ones; in the Snowflake the flowering stem is hollow, and the six flower segments are essentially alike.

Painting by Elsie Bostelmann

A Mediterranean Garden Ruin Recalls the Floral Legacies of Dead Civilizations

Grape-Hyacinth (left) looks like a miniature cluster of grapes. Beside it, Star-of-Bethlehem escapes to become a weed. Roman Hyacinth (center) and Common Hyacinth (right) complete the picture.

The Mediterranean Region Has Many "Bulbs"

FROM the abundant evidences of ancient man found there, it would seem that what now is mostly an arid wasteland across much of North Africa was once a well-watered region supporting a large population. Also, geologists tell us that about the same time what is now the basin of the Mediterranean Sea was a broad valley formed by a slow down-buckling of the earth's crust. Long before the dawn of written history—not less than 10,000 years ago, but probably not more than 25,000 years ago—the Atlantic Ocean spilled over into this natural basin and filled it. Thus did the Mediterranean Sea in its present form come into being.

What manner of people inhabited this valley prior to the Great Flood we may never know, but those who lived on the higher ground around its rim left enough clues in the form of rubbish heaps and cast-off oddments of everyday existence that we can get some insight into their lives.

These early peoples of the Mediterranean basin had domesticated some of the animals they formerly had hunted. Probably the first was the dog, once a hunting companion but later an assistant in herding. Goats and sheep they had as well as cows. They were also tillers of the soil, for they were well acquainted with such things as wheat, barley, millet, and peas. Flax was grown for fiber.

Of their leafy vegetables we know little except by inference. However, one of these, a member of the Mustard Family, has been in cultivation so long that it has given rise to such different-looking things as Kale, Brussels Sprouts, Cabbage, Cauliflower, Broccoli, and Kohlrabi, all of which are no more than garden varieties of a single species, *Brassica oleracea*. This species is still wild in its primitive form on the cliffs along the northern rim of this old valley.

Following the advent of vegetable growing came the cultivation of flowers. When we first pick up the thread of one of the great civilizations which later sprang up around the Mediterranean, that of Egypt, these people already had a highly developed sense of gardening. Funeral wreaths found in the Egyptian tombs indicate that they were growing such flowers as the Lily, Cornflower, Mignonette, and Narcissus, and their carvings and paintings show many more.

Other centers of culture arose. There were gardens at Cnossus in Crete and at Tyre, the Greeks and early Carthaginians grew flowers, and the Romans finally took up ornamental gardening. These civilizations have long since perished and their architectural marvels mostly turned to rubble; yet the flowers selected and carefully nurtured by those ancient floriculturists lived on, eventually to find their way into our gardens. The modern forms are very different from the early types.

Like all regions which have considerable seasonal fluctuation in available moisture, the Mediterranean and contiguous areas are unusually rich in bulbous plants. Bulbous forms are most common in the Lily and Amaryllis Families. Members of the Amaryllis Family native around the Mediterranean which also might have been included in this series are the Jonquil and Poets Narcissus. The plants on the opposite page belong to the Lily Family.

GRAPE-HYACINTH (*Muscari*, various species): The 40 or more wild species of Grape-Hyacinth are most abundant in the Mediterranean region, ranging eastward into Asia Minor and slightly beyond. One of these, *Muscari botryoides*, a native of the European segment of the Mediterranean basin, has made itself at home in our gardens and frequently escapes into lawns and waste places. The species differ considerably in flower size and density of cluster, and to some extent in color.

STAR-OF-BETHLEHEM (*Ornithogalum*, various species): The Ornithogalums first came into cultivation by way of the vegetable garden, the fleshy bulbs being the part used. It is a large genus, with about 100 species in various parts of the Old World. The true Star-of-Bethlehem, *O. umbellatum*, native around the Mediterranean, is now widespread and often escapes, sometimes becoming a pestiferous weed.

COMMON HYACINTH (*Hyacinthus orientalis*): The 30 or more species of Hyacinth are scattered mainly from the Mediterranean region into tropical and South Africa. It is not clear, when Linnaeus christened our species, whether he thought it was from eastern Asia or from Asia Minor, in those days sometimes called the "Orient." Actually, it seems to be native from Greece eastward along the Mediterranean into Asia. Probably originally purplish, the Common Hyacinth now comes in many colors. The rather sparse-flowered white form also shown is the Roman Hyacinth, botanically known as *Hyacinthus orientalis* variety *albulus*, which also may be light blue. This Roman Hyacinth with its striking blooms is especially popular for winter forcing. It is said to be native along the Mediterranean, westward of the basic species, from Italy into southern France.

Other Mediterranean Species

BY THE time of the Emperor Trajan (A. D. 98–117) the Roman Empire had expanded so that it reached from Britain into Africa and eastward to Egypt, the Persian Gulf, and the Caspian Sea. Its commerce went still farther. Tin came from the Cornish mines and other metals from Spain.

Asia was tapped by camel caravan through the Persian gateway. And each year fleets set sail from an Egyptian port on the Red Sea for India and Ceylon. They would return about six months later laden with the wonders of the Orient. Carried overland by camel train to the Nile, thence downriver to Alexandria, those precious cargoes were then transshipped and sent on to Rome.

Before the stirring days of Julius Caesar the Romans had gardens of sorts, but they were as nothing compared with those which developed later. After the Roman legionaries had seen the cultivation of strange plants in Egypt, as well as the marvelous floral displays in Asia Minor, their leaders coveted such gardens. But even as late as the time of Pliny the Younger (A. D. c. 62–113), who left us excellent accounts of his several gardens, the strictly ornamental plants were few and almost limited to those which were native in adjacent regions.

With the accumulation of wealth, the acquisition of great estates, and the building of public parks, and because of the rapidly expanding commerce of the time, living plants and seed from the faraway places of the world began to flow to Rome. In turn, Roman officials ordered to the distant parts of the Empire took garden materials along with them. In this manner many exotics got to western Europe for the first time.

For three centuries after the time of Pliny horticulture developed and Rome became a city of magnificent gardens; also, as the city became congested, many summer vacation villas were built outside the town or near the sea, where one could sit on the terraces and look out over the blue waters of the Mediterranean. Such seaside villas soon became fashionable throughout the Empire.

However, at the same time, because of faulty understanding of government, the Romans were sowing the seeds of their own destruction. The peoples to the north were becoming unusually restless and, in the year 410, Alaric the Goth marched through Italy and captured Rome. Later the Vandals left Spain, took Carthage, and from that base, in A. D. 455, sacked Rome. With that the Dark Ages settled over Europe.

Being abandoned, the great gardens and villas fell into disrepair, and without the necessary care the great majority of the exotic plants perished. Nor was there any real attempt to reintroduce them for almost another thousand years. Except for a few pockets of culture (the Arabs were developing their own style of gardening which they later introduced into Spain), ornamental gardening around the European edge of the Mediterranean during the Dark Ages was curtailed and almost limited to species, such as the following, which were native there.

OLEANDER (*Nerium Oleander*): This shrub is often grown indoors in the North to be set out in the summer; in the South it is quite hardy. The botanical name combines two very old ones. *Nerium* is the Greek name for the plant; *Oleander* is a Roman folk-name and refers to the resemblance of the leaves of this plant to those of the Olive Tree or *Olea*, its name in classical Latin. Our word "oil" stems from the same root-word.

SNAPDRAGON (*Antirrhinum majus*): When the sides of one of these flowers is pressed, the two lips snap open; hence the English common name. The name *Antirrhinum* is derived from the Greek and means "shaped like a nose."

CANDYTUFT (*Iberis*, various species): The 35 or so species of Candytuft are scattered around the Mediterranean region. The dwarfish, annual, white-flowered Rocket Candytuft, *I. amara* (from *amarus*, referring to its bitter flavor), is often grown and may become weedy. The closely related *I. umbellata* (in reference to its flower cluster) is somewhat larger and comes in shades of rose, red, and purplish. Another group of species represented in our picture by *I. sempervirens* is perennial and evergreen ("semper-virens"); other species of this group come in varying colors. *Iberis* is the ancient name for Spain, from whence came several cultivated species. The English common name does not refer to something eaten but is a corruption of Candé (Candia), the ancient name for the island of Crete, where another species is native; hence the "tufted plant from Candé," or "Candé-tuft."

On the terrace are two other Mediterranean plants often grown in warm regions. One is the Italian Stone Pine, *Pinus Pinea*, the source of the commercial European "pine nuts" used as food. The other is the True Aloe, *Aloe Vera*. It has been found recently that the juice from the succulent leaves of this Aloe is helpful in the treatment of X-ray burns.

Painting by Elsa Bostelmann

Various Native Plants Persisted in Seaside Villas Abandoned by the Romans

Candytuft, at the lower left margin, looks up at Snapdragon and (top) Oleander. Fleshy-leaved plants with yellow spikes on the terrace are True Aloes. Above, an Italian Stone Pine spreads its branches.

Turkey and the Tulips

THE gardeners of Asia Minor long have favored the tulip, for its culture is admirably fitted to their short springs tucked briefly between bleak winters and parched summers. By putting the tulips on a Turkey page there is no intention to imply that the species are all native there, although many are. The fifty or so known wild species are scattered from the Mediterranean region eastward into Asia, and wherever they grow wild they have been brought into cultivation.

However, let it be said to the everlasting credit of the early Turkish gardeners that they brought the best collections together, hybridized and selected them, and really started the tulip on its way into our gardens.

The later trail of these plants is fairly clear. Busbequius, Austrian ambassador at the court of the Sultan of Turkey, there saw and admired the tulip and brought seed back with him when he returned to Vienna in 1554. From 1573 to 1587 the Dutch herbalist Clusius was the court gardener to Maximilian II at Vienna. There this excellent student of things botanical must have come into contact with the plant. Later, Clusius was professor at the University of Leiden (he died in 1609) and it was he who introduced a fine collection and popularized the tulip in Holland.

In Holland tulips soon became fashionable, so much so that by the early 1630's they had become the rage. Bidding for bulbs of the newly developed varieties was so spirited that it ended in a period of wild speculation. When the Dutch Government finally clamped down on this foolishness, certain rare bulbs were selling for as much as ten thousand dollars apiece. The worst period of this Dutch "tulipomania" lasted from 1634 to 1637. After the "crash" the growing of tulips settled down and became an honorable horticultural industry.

During the recent war it was reported that, because of the food shortage, the Hollanders were reduced to eating tulip bulbs. Unfortunate as were the circumstances which made this necessary, it did demonstrate what many of us have forgotten—that, like so many others, the tulip originally was valued as a food plant rather than for its flowers.

TULIP: The tulips we grow today are of two general classes, the "garden" and "species" tulips. Stated briefly, this means only that the "garden" tulips have been so mixed up by hybridization that plants of this group will not "come true" if raised from seed, whereas the "species" tulips, being somewhat nearer the wild types, will "come true" from seed. The differentiation no longer is completely true, but gardeners still retain this general classification. *Tulipa Kaufmanniana* and *T. Clusiana* (the latter named in honor of Clusius) have long been favorites in the "species class."

The "garden" tulips are of various types. Among the earliest-blooming of these are the "Duc van Thol" group, thought perhaps to have been derived mainly from *Tulipa suaveolens*. The other types, the graceful "cottage" and stately "Darwin" tulips, are classified as *Tulipa Gesneriana*, but their real origin seems to be shrouded in the mystery of the various unknown wild forms brought together and hybridized in the early Turkish gardens. The "cottage" group takes its name from the fact that it has been the type popularly grown around European cottages since the introduction of the plant. The "Darwins" are more recent developments and were named in honor of Charles Darwin, who, among other things, was an experimenter and hybridizer of plants.

"Breeder" tulips also are often offered for sale and by some students of the genus *Tulipa* are thought to be a distinct group. Historically, however, the term "breeder" was applied to a self-color tulip (that is, to a tulip having a single color with no stripes, markings, or marginal frills) and produced directly by hybridization. Also, it is this type which usually is used in further hybridization or breeding. One of the mysteries of tulip culture is the fact that, after some years of staid behavior in the garden, a "breeder" sometimes is likely to "break up" into stripes and variegated markings. For example, the particolored "Rembrandt" group is no more than a series of "breaks" which have occurred to various members of the single-colored "breeders" of the Darwin type. Having once "broken," the plant seems unable to return to the single-color "breeder" form. Another form is the bizarre "parrot" type; this is an ordinary tulip of the *Gesneriana* section with curiously frilled and often multicolored parts.

It has been impossible to present anything like a representative sample of the multitude of varieties of "garden" and "species" tulips now offered in the trade. Consequently, we shall not even name the ones shown on the opposite plate; some are old and some are new as next year's catalogue. If you are buying bulbs for your own garden, you will select them by the colored pictures in the catalogues anyway, where the different classes and varieties will be fully named. The word "tulip" was derived from a word meaning "turban," and that is enough to remind us that the turbaned Turks of centuries ago really started them on the long road to our own gardens.

Painting by Else Bostelmann

Long Before Holland, Turkey Cultivated the Tulip, Whose Name Means "Turban"

Various "garden" types are depicted, the more unusual being the bizarre, multicolored "parrot" Tulip (left); several "species" Tulips (center); and, toward the right with reflexed parts, an early garden form.

"In a Persian Garden"

WITH the steady increase in aridity throughout western Asia during the last 5,000 years or more, the peoples of this region were more and more forced to depend on irrigation for success with their plants. Pleasure plots of trees and flowers, when clearly apart from the irrigated fruit and vegetable gardens, of necessity had to be somewhat restricted in size.

This led to experimentation on the most economical spacing of the plants employed as well as considerable attention to the combination of species so that no part of a garden would long be devoid of bloom. Concentration on these details could lead to only one thing—raising of the art of gardening to an exceedingly high level.

Religion also often has played an important part in directing the trend of garden practices, and there certainly is no exception to this in western Asia. Those who held to the ancient faith of Zoroaster firmly believed that the Heaven to which they eventually would go was a Garden or Paradise. And the much later teachings of Mohammed did nothing to dispel this fundamental faith; in fact, Mohammed increased the number of Heavenly Gardens considerably. In addition to sparkling fountains, shade trees with wide-spreading branches, and banks of fragrant flowers, it was promised the Faithful that one of these Persian Paradises would have attendants "with complexions like rubies and pearls"; another was scheduled to be attended by brunettes "with fine black eyes."

To the old Persian, a Garden and Paradise were the same thing. And that is why Omar the Tentmaker could pay no prettier compliment to his ladylove than to say that if she would but sit beside him singing in the wilderness it would be Paradise enough. Being an Oriental lady, she probably understood his desire for further solace from a loaf of bread and jug of wine.

One thing the Koran forbade; that was the making of images. Therefore the gardens of the Mohammedan period were neither cluttered with statuary nor tortured with examples of clipped topiary work. The innate love of design and form which the Persians had was entirely concentrated on the working out of intricate patterns in the garden itself. Usually rectangular in shape, the garden almost invariably centered around a well, or storage pool—a necessity in a dry region.

Generally there were four main paths meeting at the well, these bordered by water canals. From these the smaller irrigation channels in turn led directly to the various plots. Because of this necessary irrigation system in a relatively small space, the entire garden became geometric in form.

But those cold Persian winters and the clammy tile floors of the homes! What, then, would be more natural than to cover those chilly tiles with warm rugs "when the rose is dead and the last bird flown"? To one who loved to stroll through his garden, the months ahead would indeed be drear. And so we can easily imagine some aged satrap ordering his rug weavers to make a copy of his summer garden, this to be placed upon the cold tile floor to bring him comfort and pleasure through the bleak winter months.

Such old Persian rugs still exist and may be seen in museums. In execution they are complete from the central pool, or well, to the paths and irrigation ditches, even to the individual trees and flowering plants. Some of these are so well done that we can recognize the species. Later these lesser details were stylized and became only parts of the general geometric pattern.

Many modern rugs, made today on mechanical looms, still retain the basic design of a central "pool" with the four main paths, two leading to the pool from the sides and two from the ends. If the border of the rug is of one type, it represents the tiled or pebble-strewn path which surrounded the garden; if the border is of another type, its design goes back to the original pattern of trees and rose arbors which bounded the garden itself. Of the many kinds of flowers which the Persians grew, only two are shown on the opposite page; both are native in the Persian hills.

CROWN IMPERIAL (*Fritillaria imperialis*): Lifting its "crown" of green leaves to the height of two or three feet, this bulbous member of the Lily Family is a striking plant when in bloom. Originally the flowers were a rather dull yellowish red, but deep brick-red and almost yellow garden forms are now known.

ORIENTAL POPPY (*Papaver orientale*): In the wild state, this showy and easily grown perennial has scarlet flowers with black centers. Garden forms now occur in various patterns and colors; some of these have been derived by hybridization with *Papaver bracteatum*, another species which occurs wild in Persia. Unlike other species of garden poppy, this group can be propagated from root cuttings. This has led to the production of a large series of handsome named varieties, many of which are offered by the trade.

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Painting by Elsa Bostelmann

Persian Rugs Derive Their Geometric Designs from the Gardener's Quartered Paradise

To endure winter's cold, ancient Iranians sought comfort in carpets woven to resemble summer's gardens with a well in the center. Here Crown Imperial lifts its showy head above scarlet and white Oriental Poppies.

The Dutch and South Africa

THE Dutch East India Company was chartered in the year 1602. Its purpose was to open up trade between Holland and the Far East. All of this commerce was by sea around the Cape of Good Hope. In 1648 the *Haarlem*, a ship of the Company, was wrecked in Table Bay. The survivors landed near what is now Capetown. (They were picked up later by a boat returning to Holland from the Far East.) Fortunately saving a little seed which they chanced to have, during the five months of their enforced stay these shipwrecked sailors were able to have a small garden.

Scurvy was then common on long voyages, and the connection between a supply of fresh green material and freedom from scurvy and kindred ills was realized but not understood. We now know that vitamin deficiency is the cause, but all those old sailors knew was that they were more healthy on long voyages if they could get some fruit and vegetables from time to time. Realizing the potentialities of the Table Bay region, on their return to Holland they recommended that a garden be established at this halfway place where ships' crews could obtain these fresh foods. In 1652, two ships' companies set out from Holland with this object in mind.

Landing at Table Bay, they made a fortification and laid out a garden. The gardeners they brought along must have been good, for the project flourished. Being gardeners, they were interested also in the unknown plants they found growing naturally about them. They began moving these plants into odd corners of the vegetable plots.

And so began the real cultivation of the plants of South Africa, a region destined to play an important part in the development of modern ornamental gardening. By 1679 the original garden had been greatly enlarged so as to be able to include the host of ornamental materials flooding in from the up-country regions of Africa as well as the edible and ornamental plants brought by sea from China, Java, Zanzibar, and other points along the way. As early as 1700 these plants from the garden at Table Bay were common in Holland; from there they later found their way to gardens in other parts of the world.

CALLA (*Zantedeschia aethiopica*): For convenience in our series this plant has been called "Calla," following the usage of many who grow it; but the name really belongs to another member of the same family, *Calla palustris*, a delightful little plant of our northern swamps, often grown in bog-gardens. More often it is called "Calla-Lily," but this is worse. Most certainly the plant is not a lily; it belongs to the Arum Family, of which our lowly Skunk Cabbage is a member in good standing, as also are the Jack-in-the-Pulpit, Elephant's-Ear, Taro, Caladium, and more than 1,500 other species.

Also, the showy thing which looks like a flower is not a flower at all; it is a highly modified leaf surrounding a central spike on which are found the numerous small, closely packed flowers. But no matter what troubles this plant has getting us mortals to understand its structure and give it a proper name, it still is one of Africa's best contributions to our gardens. Several other African species of this genus with silver-spotted leaves, or with reddish or yellow spathes, are also grown. The genus was named for Francesco Zantedeschi, an Italian student of plants of over a century ago.

BIRD-OF-PARADISE FLOWER (*Strelitzia Reginae*): At first sight one of these bizarre plants in bloom is a botanical puzzle. The several flowers on each stem are enclosed by a much modified, boat-shaped leaf and come popping up in series, one after another. The three sepals of each flower are yellow, or in cultivated forms sometimes orangey. There also are three petals, one very small; the other two have been modified, swung forward into line, and form the blue "tongue," in the groove of which lie the ends of the reproductive structures. This plant, a not-too-distant relative of the Banana, was named in honor of Queen Charlotte Sophia, of the house of Mecklenburg-Strelitz, wife of George III.

IMPATIENS (*Impatiens Holstii*): A native of tropical East Africa, this increasingly popular garden plant originally had brick-red flowers. Using its more vigorous and rapid growth, earlier blooming habit, and larger flowers as a base, hybridists have now given this species a wider range of tints, ranging from scarlet to salmony, pink and white, by hybridizing it with the otherwise less desirable *Impatiens Sultani* of the Zanzibar coast. As noted, this species is taking the place of the old Garden Balsam, *Impatiens Balsamina*, a native of tropical Asia, which unfortunately hides its flowers under the leaves, requiring almost a worm's-eye view to see them properly. *Impatiens Holstii* does not have this too-modest garden habit and so puts on a real show. Anyone who has pinched a ripe fruit pod of this group knows why the genus was named *Impatiens*.

Painting by Elsa Bostelmann

Shipwreck and Scurvy Fastened the Globe's Attention on Africa's Rich Flora

Dutch navigators, who founded a garden at Table Bay to combat scurvy, began the introduction of African plants almost three centuries ago. Calla (top), Bird-of-Paradise Flower, and Impatiens (right).

A "Jolly Botanical Band" from Africa

WHEN the plant explorer sets down a record of his travels, he is fortunate to have some well-known personage to write a really appropriate Foreword. Consequently, when John Hutchinson, that distinguished student of African plants, now Keeper of Museums of Botany, Royal Botanic Gardens, Kew, England, was writing an account of various of his journeys in Africa—published in 1946 under the title of *A Botanist in Southern Africa*—he was doubly fortunate in having a friend who had been with him on one of these botanical expeditions who did this pleasant chore.

In the company of soldiers this personage is addressed as "Field Marshal"; around the council table in the deliberations of nations this elder statesman is referred to as "The Right Honorable"; among botanists, who know and respect him as a keen and enthusiastic student of the plants of his homeland, he is called "Doctor." And so I quote from this foreword which Field Marshal the Right Honorable Dr. Jan Christiaan Smuts, Prime Minister of the Union of South Africa, wrote for Hutchinson's book.

In referring to a particular expedition he recounts: "What a jolly botanical band we were! . . . What busy days of collecting, swimming the rivers, climbing the mountains; nights by the veld fire, with the native dances to the beating of Africa drums; sleeping under the stars . . .; camping by the ruins of Zimbabwe, by the smoke-mist of the Victoria Falls, by the shores of Lake Tanganyika and the banks of the Luanzua torrent rushing headlong into it. What joy to find plants never found before. . . .! It was a thrilling time, and some of us were invited into the mysteries of Africa in an experience which will surely never be forgotten."

What a "jolly botanical band" indeed! And how the good Dr. Smuts and his friend Hutchinson are to be envied this exciting trip together, hunting the remarkable plants of Africa.

POKER-PLANT (*Kniphofia*, several species): Of the more than 50 species of this tropical and South African genus available, the large-flowered *K. uvaria* type and the small-flowered *K. foliosa* type are most often grown. It is unlikely that these species now are to be found in their original forms in gardens, for they have been hybridized with others of the genus and show considerable variation. The reddish forms are often called Red-hot-pokers or Torch-flowers. This genus belongs to the Lily Family.

GERBERA (*Gerbera Jamesonii*): Originally with predominantly orange heads, this spectacular member of the Sunflower Family has been broken up into many different color forms, a few of which are shown toward the left of the picture.

CAPE MARIGOLD (*Dimorphotheca aurantiaca*): Among the 20-odd species in this group of showy South African plants, some are annuals, some perennial herbs, and still others are shrubby. In our northern gardens this popular species comes into flower soon enough that it can be treated as an annual; farther south, where frost does not touch it, some strains persist and become somewhat shrubby. Thought originally to be yellow or orange, the flower heads of this species now exhibit a wide range of color; it seems likely that this is the result of hybridization between it and the much more variably colored *D. annua*.

LOBELIA (*Lobelia Erinus*): There is scarcely a region in the world where one is not likely to stumble on one or more of the 250 species of Lobelia known to botanists. In color they range from red, orange, and yellowish to violet, blue, and even white. Our native American Cardinal-Flower (*L. cardinalis*) is an example of one of the red ends of this floral spectrum. The smaller, dwarfish species seem to run more to blues than any other color and this South African species (*L. Erinus*) is no exception. Originally a rather diffuse and untidy plant, numerous low, compact, and floriferous forms have been selected so that today it is one of our most effective plants for edgings. Varieties of this now may be had in deep or light blue, purplish, rose, crimson, or white. The foliage also ranges from pale to deep green, with some forms bronzy or reddish-tinged.

CASTOR-OIL-PLANT (*Ricinus communis*): There would be no excuse for sneaking this primarily economic plant into our series were it not for the fact that it is also popular as an ornamental object. In rich soil the plants grow rapidly and bring a truly exotic tropical note into our northern gardens. In the frost-free Tropics the plants become treelike, specimens up to 40 feet high having been recorded. One of these is shown growing beside the compound wall in its native setting. The stem and leaf vary somewhat in color in the different forms; in Mexico, where the plant is grown commercially, the forms with red-streaked, deeply divided leaves are called "Palma Christi"—Palm of Christ.

Painting by Else Bostelmann

Among the "Mysteries" of Africa Are Botanical Secrets Yet to Be Discovered

These species are well known. Poker-Plant holds its flower spike erect. Gerbera blooms on the left. Lower center: Lobelia; right: Cape Marigold. Castor oil comes from the beanlike seeds of the "tree" beside the village.

More Africans, "Brought Back Alive"

IN MANY ways the plant hunter is very fortunate, for, unlike the animal collector, his "game" does not require elaborate traps. Furthermore, instead of hiding furtively or running away at the approach of the hunter, it often waves its multicolored banners in the air, seemingly attracting as much attention as possible, as, in fact, it is. Fortunately, the plant hunter usually has better eyesight even than the bees.

FRINGED HIBISCUS (*Hibiscus schizopetalus*): The usually sparse branches and scattered leaves of this shrub from tropical East Africa of themselves would scarcely be attractive enough to cause it to be grown in our frost-free gardens. Also, it is to be admitted that the flowers are not particularly abundant. But when even one of those buds, swaying on its long, pendent stalk, swells up and bursts open, the result is recompense enough for having carefully tended the plant.

PELARGONIUM or "GERANIUM" (*Pelargonium*, various species): There are upward of 250 species in the genus *Pelargonium*, most of them occurring in South Africa. But first let us try to clear up several items concerning the proper name for these plants. Although popularly termed "Geraniums," this group actually should have another name. *Geranium* comes from the Greek word for "crane" and refers to the shape of the fruit; the true geraniums are often called Cranesbill.

Many of us are familiar with the common woodland *Geranium maculatum*, which sometimes is brought into gardens with success, and the even more familiar garden plant, *Geranium sanguineum*, a native of Eurasia. *Pelargonium* was derived from the Greek word for "stork"; again, the shape of the fruit has led to another common name, Storksbill. Although similar in general appearance, there is a technical difference between the flowers of *Geranium* and *Pelargonium* sufficient for botanists to keep the species in separate genera. Realizing this state of affairs and desiring greater precision, many gardeners are turning to the scientific names and call their plants either Geraniums or Pelargoniums to avoid confusion. It is a good idea; consequently, for the remainder of this note, I shall try to refer to these plants as "Pelargoniums."

A collection of wild Pelargoniums is interesting to examine. Many of them will look much like those with which we are familiar. Others will not. Since the group is native in South Africa, some species have ventured into the drier and semidesert areas and there taken on different characters. Some of these have coarse, clubby, even spiny stems, looking very much like cacti. Also, like the cacti, some of these desert Pelargoniums have almost lost their leaves, the thickened green stems having taken over the function of leaves and also acting as water-storage organs during periods of drought. Other species which favored moister conditions became leafy, trailing, or scrambling vinelike plants.

In many of the erect-growing leafy species the plants have a strong odor, leading to such names as Apple-, Rose-, Lemon-, and Nutmeg-"Geraniums" (or Pelargoniums!). Because of considerable hybridization in the past, it now is extremely difficult to decide just which of the wild species were ancestral to our cultivated forms. The most frequently grown is the Fish-Pelargonium; this is the common "Geranium" of pot and window-box culture. Today in its many color phases it is used also as an effective bedding-out plant. In southern Florida and California it will grow year after year, forming great woody plants which, if carefully pruned and trained, can be made to cover fences and trellises.

GLADIOLUS (*Gladiolus*, various species): The 200 or more species of this important garden group are scattered from the Mediterranean southward through Africa, the greatest concentration being in the Cape region. Except in a few collections brought together from the wild, none of the material grown today looks very much like the original species. Like *Pelargonium*, the genus *Gladiolus* has been a fertile field for the hybridist so that, today, they come in such a wide variety of forms and colors that there is no use here to attempt even an introduction to a subject about which a whole book could be written. When Linnaeus christened this genus about 200 years ago, he did not have our modern showy-flowered plants to study and apparently was more impressed with the shape of the "swordlike" leaves; consequently, he used the name *Gladiolus*, from the Latin, meaning "little sword." The word "gladiator" comes from the same base.

AFRICAN-VIOLET (*Saintpaulia ionantha*): This charming blue-flowered African plant was named in honor of its discoverer, Baron Walter von Saint Paul. The plants may be grown from seed but usually are propagated from leaf cuttings. Although Africa does have its native true violets, this is not one of them; the African- or Usambara-"Violet" is a member of the Gesneria Family.

Painting by Else Bostelmann

Darkest Africa Contributes These Brilliant Colors to the World's Gardens

Pelargonium, mistakenly called Geranium, peeps in from the left margin. Gladiolus (center) has many forms. Fringed Hibiscus (right) swings like a pendulum. African-Violet (below) is not a true violet.

Plant Marvels of Madagascar

BROWSING through certain "travel" books of a century or more ago, written from hearsay and legend with no personal knowledge of the countries concerned, the reader is likely to stumble upon weird fables such as: "Madagascar, home of the Poison-gas-bush; a shrub which exhales so insidiously poisonous a vapor that birds, merely flying through its branches, fall dead." Or, "Mysterious Madagascar, land of the voracious strangler-tree; a tree whose prehensile branches quickly encircle the unwary passers-by, holding and crushing them until they die; then the tree slowly proceeds to devour the victims, leaving only bleached and whitened bones." This yarn keeps bobbing up frequently and only recently I got numerous inquiries, asking if it really were true, for it had been alluded to in a well-known radio program.

Naturally, plant explorers long ago exploded these wholly untrue myths. Even so, Madagascar does have many vegetable curiosities; perhaps nowhere is there a land more full of botanical surprises. Unfortunately, relatively few of them are amenable to garden culture.

FLAMBOYANT or ROYAL POINCIANA (*Delonix regia*): Being sensitive to frost, this magnificent flowering tree is mainly a plant of the Tropics; yet it is commonly found in gardens, parks, and along the streets in the southern parts of Florida and California. Fortunate, indeed, are those who can grow it in their gardens. Some years ago when I lived in Haiti there was an old Flamboyant beside the house, a gnarled relic of French colonial days. Seemingly overnight its contorted and mostly bare branches burst into what looked like scarlet-orange flame.

One day as I stood there looking up in wonder at the sheer magnificence of the scene, a flock of small birds came tumbling out of the sky and settled for a while among the gorgeous flowers. It was early spring, and I recognized them as warblers hurrying northward by way of the island steppingstones of the Caribbean from their winter homes in the South American jungles. After a pause to catch their breath, as well as a good meal of insects, the warblers flew on toward their nesting places in the cool forests of New England and Canada. The old Flamboyant stayed behind, as it had for countless other springtimes, nodding its head drowsily in the Haitian sun, almost as if it were dreaming of its real home on the faraway, hot plains of Madagascar.

CROWN-OF-THORNS (*Euphorbia Milii; E. splendens* of florists): This species is grown as a pot-plant in our homes in winter, to be set outside in the summer months. In our southern gardens, where protection from frost is assured, it takes its place with other decorative, sun-loving plants. The gray spiny stems with their few green leaves would be interesting of themselves, but the pert scarlet or orange-crimson "flowers" are the real attraction. The word "flowers" must be used with caution in this group of plants, for, like all Euphorbias, the objects which look like petals are bracts, in reality highly modified and sometimes gaudily colored leaves surrounding the real flowers. We shall meet another Euphorbia with an even more showy display of these petal-like leaves when we come to the Mexican Poinsettia (pages 56, 57).

The Crown-of-Thorns has long been associated with an interesting legend, for, as its common name implies, it is supposed to have played a part in the humiliation of Christ just before His crucifixion. With its name and linking tradition we therefore find that artists not infrequently include this plant when depicting scenes of Biblical times. Although the plant is found today in gardens in the Holy Land, there are excellent reasons to suppose that it was not present there 1,900 years ago.

Such botanically unwary artists also are fond of including pictures of cacti when painting the rough and thorny paths trod by the saints and prophets of old. The cacti are wholly American and, like the Crown-of-Thorns from Madagascar, were introduced into gardens. Finding the climate suitable there, they since have escaped from cultivation and now are well established in parts of Palestine, appearing to be parts of the native flora.

TRAVELERS-TREE (*Ravenala madagascariensis*): Because of its curious appearance and remarkable two-ranked leaves, the Travelers-Tree is grown in many of our frost-free gardens. It is a close relative of the Strelitzias, a species of which appears in one of the African pictures of this series (page 33). Unfortunately, the flowers of the Travelers-Tree are not so showy as those of its relative. The common name of this plant is suggestive of its use, for, if one will bore a hole through a leaf-base near its juncture with the stem, up to a pint of reasonably good drinking water will come welling out. The Flamboyant, the Crown-of-Thorns, and now the Travelers-Tree —truly an exotic trio from faraway Madagascar, land of botanical surprises!

Painting by Elsa Bostelmann

Madagascar, Land of Botanical Surprises, Yields These Three Exotics for Frost-free Gardens

When thirsty Madagascans tap the fan-shaped Travelers-Tree, a pint of water wells from each leaf base. Crown-of-Thorns has spiny stems. Flamboyant Tree in the distance; its blossoms are shown close-up at top.

Painting by Elsa Bialalokorn

Long Ago Tropical East Asia Grew These Gorgeous Foods to Satisfy Man's Hunger

Hibiscus, or Rose-of-China (left), still lends its buds to curries. East Indian Lotus (center) calls to mind the Lotus-Eaters, who did not consume this form. Yellow Hibiscus (upper right) has an edible relative.

From Tropical Southeastern Asia

MANY evidences point to the conclusion that man has lived in southeastern tropical Asia for a very long time. In the jungles of Cambodia, Burma, and elsewhere are ruins of ancient temples, indicating a once-great civilization. Yet even before these temples were built, the peoples of southeastern Asia and adjacent island areas had been cultivating plants for thousands of years.

Since it is a trial-and-error affair, it is impossible to estimate the length of time necessary for a primitive people to find and domesticate the plants necessary to support a civilization. Yet when history first opens on these peoples, already they had found and developed such basic food plants as rice, sugar cane, various beans, the egg-plant, cucumber, taro, yam (the true yam, not the sweet potato), plantain, and coconut. And for fruits they had such things as the banana, pomelo (the ancestor of our grapefruit), and mango. On the opposite page are three highly ornamental plants, all of which seem to have been associated with the peoples of southeastern Asia first as foods.

EAST INDIAN LOTUS—(*Nelumbium Nelumbo*): This majestic water-lily goes under many erroneous names in garden catalogues, one of the most frequent being "Egyptian Lotus." The real Egyptian Lotus is a different plant, with large *floating* leaves; botanically, this native African water-lily is a species of *Nymphaea*. Furthermore, even this plant is wrongly named, for the fruits supposed to have been eaten by the Lōtophāgoi, or Lotus-Eaters of Greek legend, did not come from the "Egyptian Lotus" but from a shrub apparently of the Cirenaican coast on the south shore of the Mediterranean. What the original true Lotus might have been is quite another matter, which need not concern us here. But it does seem rather a pity that we struggle along with all sorts of silly invented names for this plant (I have seen some really weird ones in catalogues in the last 15 years) when all the time we have had a perfectly good one concealed in its scientific name. For the botanical name *Nelumbo* was directly derived from its native name in Ceylon.

It is doubtful whether the early primitive peoples of southeastern Asia were greatly interested in the beauty of this flower. They first cultivated the plant as food, and the people there still make considerable culinary use of both the large tuberous rootstocks and the nutlike seeds. The appreciation of the plant for its beauty came only after the rise of the great Asiatic cultures and their interest in the growing of flowers. This plant now grows in Egypt, but seems to have been introduced there from tropical Asia by the ancient Roman rulers as a food source for the people during famines.

HIBISCUS (*Hibiscus*, several species): The red flower in the upper corner of our picture is *Hibiscus Rosa-sinensis*, or Rose-of-China, the buds of which are still used in curries and soups. Early travelers found this plant growing in the gardens of southern Cathay and other parts of southeastern Asia and prized it for its beauty. Much later the East African Fringed Hibiscus, *H. schizopetalus* (page 37), was taken to Asia, where these two species became hybridized. Today, in tropical and semitropical regions the offspring of these plants are grown in their original forms, as well as all imaginable hybrid combinations with fluted and crinkled petals.

However, those of us who sigh for such colorful plants in our northern gardens need not be discouraged. We have three or four species native in eastern North America which, in their modern garden forms, put on a show possibly even surpassing that of their tropical relatives. Why these completely hardy and brilliantly colored American forms of *Hibiscus* (called Rosemallow in the trade) are not more often grown is a puzzle. Probably if they came from some distant land nurserymen would be unable to keep enough in stock to supply the demand.

The other flower peeping into our picture is the Yellow Hibiscus, *H. Manihot*. This one can be grown from seed and handled as an annual in our gardens; with proper care certain selections will produce flowers six to nine inches in diameter. One of the short pods of this species is shown. In the Old World Tropics there is another very closely related plant which has relatively small flowers and much longer pods. I think that these both once were the same species and that the peoples of southeastern Asia grew the ancestral form in their vegetable gardens. Then, in the dim past, variant strains were selected, one for the size of its flowers, the other for the size of its edible pods. This small-flowered, large-podded plant, now classified as *Hibiscus esculentus*, is the popular garden vegetable which we grow under the name of Okra or Gumbo.

Modern chickens trace back to the wild jungle fowl of this same region, and rice is also native there. Our gumbo-chicken-rice soup is not American in origin; it is a lineal descendant of one of the native dishes of these ancient peoples of southeastern Asia.

Painting by Elsa Bostelmann

Mountains of China Sent These Beauties to Grace Our Gardens

China's Regal Lily crowns the painting. Peony (below) displays a double-flowered garden form. Hard-working Abelia (right), a relative of the Honeysuckles, blooms until heavy frost.

Chinese Mountainsides Yield Treasures

SOME years ago in tracing the origins of certain economic and medicinal plants I had translated parts of an ancient volume written by Sheng-Nung, an estimable Chinese gentleman who lived somewhat over 4,600 years ago. What struck me so forcibly was not that the Chinese were cultivating plants at so early a date, for theirs is an ancient civilization, but that already they had selected and named so many varieties. This could mean only that they had been cultivating these plants for many centuries before the time of Sheng-Nung.

We know little of the early development of ornamental gardening in China, but when Marco Polo, the Venetian, journeyed to China between A. D. 1272 and 1293 and visited the court of Kublai Khan at Xanadu he was amazed at the splendor of the gardens and the wealth of plant material they contained. During previous centuries many of these plants had wandered down the old trade routes to Persia, from whence they had been introduced to Europe. Even so, on his return the people of Marco Polo's day refused to believe his account of what he had seen in Chinese gardens.

No civilization of any stature has yet arisen which has not developed ornamental gardens of some sort. The ancient Chinese gardeners were especially fortunate, for perhaps nowhere in the Temperate Zones is a region more rich in potential ornamental materials. Also, China is large and has a varied terrain with different soil types and contrasting climates, each with its own set of species. And that is all in our favor, for this makes it possible for us to choose from among the many excellent Chinese species those which will fit almost every type of climate and soil we have.

REGAL LILY (*Lilium regale*): Let us first "consider the lilies of the field; they toil not . . ." But how we ourselves toil bringing them into perfection in gardens! With its nearly 100 wild species there is scarcely a region in the Northern Hemisphere where the genus *Lilium* is not present. So striking is this plant that everywhere it grew wild it was brought into gardens. In choosing a lily to represent China, one might easily have taken the old Tiger Lily (*L. tigrinum*), which, with its tawny-red flowers splotched with purple black, is perhaps the most widely grown species in the genus. Or we might have chosen—but why go down through the list of Chinese species? Let us just take the Regal Lily, thought by many growers to be the Queen of the genus.

But have you ever seen Humboldt's Lily growing wild in the Sierra Nevada north of Yosemite, or the towering *Lilium superbum*—I've seen it with as many as 40 flowers on a single plant—in its natural setting in the spruce-rimmed glades of our southern Appalachians? But the Sierras and the Great Smokies are not in China.

ABELIA (*Abelia grandiflora*): In selecting a shrubby member of the Honeysuckle Family from China we might have chosen any one of several excellent flowering Honeysuckles. Also, there is the increasingly popular *Viburnum Carlesii*, with its trusses of fragrant white bloom; but actually it is Korean. And what about the showy "Weigelas"? Botanically, they are Diervillas, and *D. florida* from North China has brought real hardiness and a deep rose color to our modern garden hybrids. But the "Weigelas" bloom early and their beauty fades all too soon. Lastly we come to the Abelias. Here none of the wild species has been chosen for our painting; instead we have a garden hybrid, *Abelia grandiflora*, which combines the most desirable qualities of its several parents. Not too choosy about soils, partly evergreen, usually compact and graceful, and carrying a nearly constant display of flowers from June until heavy frost, often into November, *Abelia grandiflora* certainly is a desirable flowering shrub. It is the work-horse of the shrubby border and more than carries its load during the late summer vegetative doldrums when so many shrubs seem merely to be loafing. The genus was named in honor of Clarke Abel (1780-1826), physician and author, who lived in China.

PEONY (*Paeonia*, various species): The Chinese have been cultivating the Peony for some thousands of years and long ago selected many varieties. It was one of their favorite flowers, and writings of over 800 years ago record large collections, one Peony enthusiast having 60,000 plants in his garden. Originally with 5 or perhaps 10 petals, the double-flowered forms have been derived by the progressive sterilization of the stamens, accompanied by the enlargement of the filaments into colored petal-like structures. Two main types are grown, the common herbaceous peonies and the increasingly popular "tree" peonies, the latter actually shrubby plants seldom over four or five feet tall. Recent advances in the science of plant breeding have enabled us to make hybrid combinations never produced before, and so we now can look forward to a whole new series of forms in this genus.

Painting by Else Bostelmann

From China, Source of Tea, Come These Other Plants Now So Familiar to the West

Variegated Camellias straddle the old-fashioned Hollyhock (top). Lower left: China Aster; lower right, Blackberry-Lily. Clematis grows on the wall, Chrysanthemum at its base. Forsythia is seen through the moon gate.

More Plants from Age-old China

THERE is an old Chinese story, having to do with wanderlust, which tells us that he who lives beside a waterfall need not travel far just to listen to the ocean, for water makes much the same sound whether dashing against a rocky shore or pouring over stones. The legend ends: "Furthermore, when you are away, who will tend your garden?"

CAMELLIA: Although introduced into Western gardens mainly by way of Japan and therefore known under such historically misleading names as *Camellia japonica* and *C. Sasanqua* (the latter derived from a Japanese vernacular name), it would appear that the basic species from which our garden Camellias have been derived, for the most part, can be traced back to forms once wild in China. Botanically, the Tea Plant is very closely related to the Camellias; it also is Chinese.

HOLLYHOCK (*Althaea rosea*): Rearing its showy spikes of flowers in our midsummer gardens, this species now comes in so many shades and forms that our grandmothers scarcely would recognize this old favorite.

CHINA ASTER (*Callistephus chinensis*): In its wild form this species has a single series of petal-like, purplish-blue ray flowers around the margin and a large number of small yellow flowers in the center of the head. Cultivated "double" forms are now generally seen. Selected types vary greatly in color, but for some reason no really yellow forms are known. The name of this species is not just something invented by botanists to make things more difficult; like all scientific names for plants, it means something. *Callistephus* is the Greek for "beautiful crown" and *chinensis* means "living in, or from China." Hence this plant might well be called "The Chinese Beautiful-Crown."

BLACKBERRY-LILY (*Belamcanda chinensis*): This plant, shown in the lower foreground of our picture, once almost disappeared from gardens. Thanks to workers who now have given us a wider variety of color forms and larger, more showy flowers, this old favorite is making a comeback and promises to be popular again. Its common name is derived from the blackberrylike appearance of the ripe fruit after it splits open, exposing the black seed; one of these fruits is shown. However, the plant is neither a "blackberry" nor a "lily"—it is a member of the Iris Family. And that is why botanists often look askance at the common names of plants; not only are they sometimes incorrect and misleading, but they may vary greatly from place to place. Why not call this pretty flower by its real name? After all, it is only a slightly modified (and for us spellable and pronounceable) form of the name it has carried for untold centuries in its native home. Split the syllables—Bel-am-CAN-da—and repeat them slowly until the natural music they make becomes familiar.

CHRYSANTHEMUM: Back against the wall in our picture is a bed of Chrysanthemums, one of the countless forms in which this great group of showy plants occurs. Merely for convenience in classification, botanists have put the garden and florists' "Mums" into a single species, *Chrysanthemum morifolium*, but they have been grown and hybridized for so many centuries that there now seems but little chance of determining exactly from which of the wild species they have come. All we know is that, primarily, our modern garden "Mums" are of Chinese origin.

CLEMATIS (*Clematis lanuginosa*): Scrambling over the wall is a plant of this, the largest flowered of all known wild species of this remarkable genus. In combination with the somewhat more lively-colored species, such as the southwestern Asiatic and southern European *C. viticella* and the Japanese *C. patens*, this Chinese species has been the most important parent of the present large-flowered, hybrid garden forms, such as the long-popular Jackman's Clematis and many others. Frost-free gardens have their own special kinds.

FORSYTHIA: Although occasionally called "Golden Bells," here is an instance where the scientific name, *Forsythia*, actually is more often heard than the so-called common name and has become almost standard usage. Two species are grown, *Forsythia viridissima*, and the somewhat pendulous-branched *F. suspensa*, as well as their hybrid, *F. intermedia*. It would be difficult to explain to a gardener how the early, spring-flowering Forsythia got into this picture with mainly late summer bloomers. Actually, we got tired having him around—he's such a common and persistent fellow—and chased him away several times. But just as the picture was finished we noted that he had sneaked back again and stuck his head through the Moon Gate, almost as if he were hissing in old sibilant Mandarinese: "You don't *dare* leave me out of this! I'm Chinese too!"

Painting by Elsa Bostelmann

Japan Domesticated Its Own Wildflowers and Improved Its Neighbors'

Japanese Wisteria frames the snow-capped volcano. Bleeding Heart (lower center) and Japanese Iris (right). Dwarfed Pine and Flowering Cherry stand in pots. Japanese Azaleas grow near the distant stone lantern.

Patient Gardeners of Old Japan

IN a north-south direction the islands of Japan cover about the same amount of latitude one finds journeying from New England to Florida. Toward the south where the winters were mild there could be a continuous succession of flowers, and there the Japanese had a floral calendar marked by different species. The Japanese calendar was so arranged that New Year's Day fell in our February, just as the first Plum blossoms opened. These were followed in March by the Peach and Cherry. May brought the *fuji*, or Wisteria. June was made beautiful with Irises and Peonies. In July came the East Indian Lotus. The late summer—August and September—was marked by various kinds of Hibiscus, with autumn being heralded by the October Chrysanthemums. And the winter months, closing out the Japanese year, were the time when the Tea Plant and various Camellias bloomed.

Paragons of patience in a craft where patience is a cardinal virtue, the old Japanese gardeners with their keen eyes for selection gave to the world a long series of choice ornamental varieties. Although working primarily with their native materials, the Japanese made free use of other species, so that Japan is the actual door through which many Chinese and other Asiatic species came to us.

JAPANESE WISTERIA (*Wisteria floribunda*): This strikingly beautiful member of the Pea Family has long been a favorite and in the hands of Japanese selectors has yielded numerous garden forms. In its original state the flowers apparently were purplish and in clusters (called racemes) less than a foot long. By careful selection the basic colors have been separated, intensified, or diluted to pastel shades, and recombined by hybridization so that the tints now range from deep violet to light blue, rose, pink, and white.

Other selections yielded plants with racemes up to 3 or 4 feet long; this showy group, designated variety *macrobotrys*, also has numerous races varying in the color, size, and shape of their flowers.

Several Chinese species also are grown, such as *W. sinensis*, with its either blue-violet or white flowers, and *W. venusta*, with its large white flowers on short racemes. Native American Wisterias, as *W. frutescens* of our own Southeastern States, and *W. macrostachya* of our South-Central States are sometimes cultivated.

The genus *Wisteria* was named in honor of Caspar Wistar, 1761-1818, professor of anatomy in the University of Pennsylvania. The slight change in spelling may be no more than an attempt on the part of the original namer of the genus to arrive at a somewhat more euphonious Latinized form of the original.

BLEEDING HEART (*Dicentra spectabilis*): This Japanese member of the Fumitory Family has long been popular and is found in many American gardens. As its name rightly indicates, it is the most spectacular member of the genus. Like many North Temperate genera, *Dicentra* has wild species both in Asia and in North America, the two American species, increasingly frequent in gardens, being *D. formosa* of the Pacific coast mountains and *D. eximia* of the southern Appalachians. Another American member of this plant family, *Adlumia fungosa*, known in various regions as Allegheny-Vine, Climbing Fumitory, or Mountain Fringe, is also commonly planted.

JAPANESE IRIS (*Iris Kaempferi* and *I. laevigata*): In the wild, *Iris Kaempferi* is said to have reddish-purple flowers and *I. laevigata* blue ones. Although usually sold under the name of *Iris Kaempferi*, apparently both species (and probably others) are involved in the present races of this complex and variable group of plants. Long grown in its native home, the Japanese have hundreds of named varieties; in recent years our own Iris breeders have added many more.

AZALEA (*Rhododendron*, various species): As will be noted on page 65, the Azaleas, botanically speaking, belong in the genus *Rhododendron*. A clump of Japanese Azaleas is shown in our picture near the stone lantern. Its showing here honors those old Japanese gardeners who produced so many fine varieties, both in the evergreen and in the deciduous-leafed groups. The so-called "Japanese" Azaleas, for the most part, are the result of hybrid combinations between native Japanese species and some introduced there from China many years ago.

In our picture a few artificially dwarfed trees also are shown. One of these is the pine. Several species were used, but the Japanese Red Pine seems to have been one of the favorites. The other is the Flowering Cherry. The subject of Japanese Flowering Cherries is too large to be discussed here, but various botanically distinct species in their many garden forms and apparent hybrids were available. Japanese gardeners also made use of the Flowering Almond and the Peach, both native in China, in the production of these dwarfed flowering-tree specimens.

Painting by Elsa Bostelmann

Australia, Last Inhabited Continental Discovery, Gave the World Many Interesting Plants

Bottle-Brush hangs above Strawflowers and Swan River Daisies (below). Right: Blue Lace-Flower. Eucalyptus (background), prized for its rapid growth and ornamental foliage, has been brought to the Americas.

Australian Plants and Geography

THOSE of us whose business it is to study the natural distribution of plants are intrigued by those of Australia. Many plant groups of this continent have close connections elsewhere, for example with those of Africa, and by way of Tasmania and New Zealand with those in southern South America. These relationships are so close that we are forced to the conclusion that at one time Australia was in some way connected by land with these areas now separated by thousands of miles of ocean.

Later, Australia became isolated from the rest of the world—and for a period sufficiently long that on it were developed characteristic and often peculiar species of animals and plants. The last of the great inhabited land masses of the world to be discovered, Australia had many excellent items for gardens which now are widely grown.

In 1768 Sir Joseph Banks and his associate Daniel Solander (southern gardeners remember him in the genus *Solandra*) sailed with Captain Cook on the first of his memorable voyages. From the region about a certain bay in Australia they collected a thousand different species of plants. With a nearly blank map before them the temptation was too much and so, to commemorate this great haul, the place was named Botany Bay.

EUCALYPTUS or GUM-TREE (*Eucalyptus*, various species): The approximately 300 species of Eucalyptus—one of which is shown in the distance in our picture—are mainly Australian. Being trees primarily of warm areas, they have been widely planted in tropical and subtropical regions. Some are rapid growers and yield firewood and lumber in a comparatively few years. In parts of South America where the forests have been demolished by thousands of years of human occupation, Eucalyptus has been introduced and in various places is almost the only tree seen on the landscape for miles. Certain species, as the Blue Gum (*E. globulus*), are often grown in California and to some extent in Florida. In its home in Australia the Blue Gum may reach a height of 300 feet.

Other species are naturally lower growing and often strikingly ornamental. Some have bright scarlet or pink flowers (e.g., *E. ficifolia*), and others have curiously shaped, grayish-silvery leaves (e.g., *E. polyanthemos*).

In all, about a dozen species are regularly cultivated in California, and many more are available from nurserymen. Because of the unusual shapes and colors of the leaves, especially on young shoots, branches of various species are now harvested commercially and often seen in florists' shops. The Eucalyptus belongs to the Myrtle Family.

This large family of plants, with about 75 genera and 3,000 species, has many horticultural members, of which the true Myrtle of the Classical Period—and native around the Mediterranean—is only one. Those who live in tropical or subtropical regions are likely to have growing in their gardens such interesting fruit-trees of the Myrtle Family as the South American Pitanga or Surinam-Cherry, the Malayan Rose-Apple, the Australian Brush-Cherry, the East Indian Jambolan-Plum, and the tropical American Guava.

Cloves are the flower buds of one member of this family native in the Moluccas, and Allspice is the dried, unripe berry of another found in the West Indies and Central America, whereas bay rum is distilled from the leaves of still another native in the Caribbean and northern South America.

BOTTLE-BRUSH (*Callistemon rigidus*): This also is a member of the Myrtle Family. There are about 25 species of this showy Australian genus of shrubby trees, some with wider and others with narrower leaves than the one shown at the top of our picture. The closely related and quite similar Australian Cajuput-Tree or Punk-Tree (*Melaleuca Leucadendra*), with its dense clusters of creamy white flowers, is often planted in Florida, where it has escaped and in places become weedy.

STRAWFLOWER (*Helichrysum bracteatum*): The Strawflowers are so common that we are inclined to forget that their native home is Australia. Cut at the proper stage as they open and hung upside-down to dry, they make excellent "everlasting" winter bouquets. The name *Helichrysum* was most aptly compounded from two words meaning "sun-gold."

SWAN RIVER DAISY (*Brachycome iberidifolia*): Named for its native region in Australia, this pretty and easily grown annual is worthy of a place in any garden.

BLUE LACE-FLOWER (*Trachymene caerulea*): Sometimes erroneously listed in seed catalogues as "Didiscus caerulea," this delicate Australian is often grown as a garden decorative. It is a close relative of the European Queen-Anne's-Lace (*Daucus carota*), which is now a common weed in our vacant lots and old fields.

South America Rich in Plant Life

IF THE California coast were to be placed on the shore of the Pacific in Peru, only the projecting tips of Maine and Florida would dip into the Atlantic on the opposite side of South America. Lengthwise, Washington State would be a thousand miles south from the Caribbean and California about 2,700 miles north of Cape Horn.

The basin of the Amazon River has almost the same area as the entire United States and is rarely more than a few hundred feet above sea level; yet its western boundary is marked by one of the highest continuous mountain ranges in the world, the culminating peak, Aconcagua, being 23,081 feet above the sea. It is so high that for a distance of some 4,000 miles almost nowhere is there a pass lower than 10,000 feet.

Such is the magnificent scale upon which South America has been built. Its climates are extremely varied. Snow-capped mountains rise up out of equatorial jungles. Parts of the eastern slopes of the Andes are among the world's wettest regions, while segments of the narrow coastal strip, relatively only a few miles away on the western side of this range, are among the world's driest.

The complexity and abundance of the plant life of this great continent match its geographical diversity. Many of these plants have been brought into our gardens. In their native haunts the majority are perennials. Some, like the Fuchsia of our plate, must be treated as such and are best grown from cuttings; others, such as the rest of those shown opposite, although still potential perennials, bloom soon enough from seed so that we can handle them as "annuals" during our short growing season in the north. As a result, they have long been popular garden subjects.

FUCHSIA (*Fuchsia*, various species): The numerous species of this member of the Evening-Primrose Family are mostly shrubby. They are primarily South American in origin, with a few venturing naturally as far north as Mexico; three or four species also are found in New Zealand. The galaxy of forms encountered in the Andes is a source of never-ending wonder to the plant collector.

Some of these have delicate little bell-like, crimson flowers less than an inch long, and I have seen plants ten feet high covered with masses of salmony-red flowers up to four or five inches long. The one shown in our picture is a form of *Fuchsia magellanica*, the original of which is native from Peru southward to the bleak hills of Tierra del Fuego; because of this, certain varieties of it, with some protection, are reasonably hardy outdoors at least as far north as New York.

Closely related forms occur northward through Central America. They will not stand frost. The majority of decorative Fuchsias which one sees are hybrids, probably between forms of *F. magellanica* and the more showy Mexican *F. fulgens*. The genus was named in honor of Leonhard Fuchs, an eminent botanist who lived from 1501 to 1566.

PETUNIA (*Petunia hybrida*): As the name implies, our garden Petunias are hybrids, the parent species being the white *P. axillaris* and the purplish-violet *P. violacea*, both originally from Argentina. A "sorting out" of the basic colors which, in combination, gave the purplish tint to the wild *P. violacea* has produced the bluish and rosy-pink forms of our modern garden plants; the white forms hark back to the *P. axillaris* ancestor.

CUP-FLOWER (*Nierembergia*, several species): Two species of this are frequently encountered in gardens, the dainty Brazilian *N. gracilis* and the more robust Chilean *N. frutescens*. The latter also is often grown as a somewhat shrubby, much branched, pot plant. The genus was named in honor of John Eusebius Nieremberg, first professor of natural history at the University of Madrid.

The Nierembergias and Petunias belong to the same plant family as the Potato, Tomato, and Tobacco. Other South American members of this same family which might have been included here are Salpiglossis, Schizanthus, Browallia, and the sometimes foot-long Angels Trumpet.

GARDEN VERBENA (*Verbena hortensis*): Again, as is so often the case, the garden forms of a group are not referable to any one wild species. In this instance, one of the principal parents seems to have been a scarlet-flowered species wild in Argentina and southern Brazil, but now hybridized with a purplish-flowered species from southern Brazil and Paraguay and a whitish-flowered species widespread in parts of southern South America, the result being the present wide range of available colors in the modern Garden Verbena.

SCARLET SAGE (*Salvia splendens*): In its native haunts in Brazil this common garden plant is a shrubby perennial with scarlet flowers. Quick-blooming forms with the flower color also present in adjacent parts of the plant are now available, varying from the original color to crimson, purple, or even white.

Painting by Elsa Bostelmann

Some Old Favorites Trace Their Ancestry to South America's Plains and Andes

Fuchsia (top) now has many garden varieties. Its delicate pendent bells almost touch Garden Verbena. Petunias rear their heads to the left. Cup-Flowers (left) and Scarlet Sage occupy the corners.

From South American Jungles

IT SCARCELY would be expected that the South American jungles could have anything to offer in the way of plant materials for our northern gardens; one would think that our climate is not suitable. The plant explorer sometimes has difficulty convincing others that the temperatures and humidity he encounters in the jungle usually are no greater than one sometimes endures with only minor discomfort in a midwestern harvest field or in a suburban back yard along the Atlantic coast in July or August.

Actually, our northern summers may be quite as "tropical" as much of the South American jungle; one sometimes is inclined to think even more so. And that is why a goodly number of our common garden plants, especially among the "annuals," come from there, as—alas!—do some of the pestiferous weeds which vie with them for space along our garden paths.

SPIDER FLOWER (*Cleome spinosa*): This increasingly popular garden plant is a member of the Caper family; its common name is derived from the spidery appearance of its wide-spreading stamens. Spider Flowers usually come in light, rosy-purple shades, but white and pink forms are now fairly common. The pungent foliage suggests just a little of the primal and earthy odors so characteristic of its jungle home.

MORNING GLORY (*Ipomoea*, various species): There are, around the world, about 400 species of wild Morning Glories, a large number of them being native in the American Tropics. In their native haunts many of these are rampant weeds, or soon become so if agriculture is attempted where they grow. All of the true Morning Glories belong to the genus *Ipomoea;* in color they range from red (rarely) through purple and blue to white, with occasional mottled and striped forms. Many of the wild species at one time or another have been brought into cultivation and have been used by hybridists in the production of some of our modern garden types; yet the two most often grown are the common *Ipomoea purpurea*, usually seen in purplish-blue shades, and the light blue garden form of *I. tricolor*.

Although we commonly grow another "Morning Glory" in our northern vegetable gardens and fields, it seldom is recognized as such: this plant is *Ipomoea Batatas*, the common Sweet Potato. It rarely flowers in the north, but in its home in the South American jungles the pretty blue flowers on long trailing vines are abundant and unmistakable.

CYPRESS VINE (*Quamoclit pennata*): This dainty scarlet-flowered, finely cut-leafed climber has long been a garden favorite, but it is now somewhat less common than the Cardinal Climber. The Cardinal Climber is a hybrid between the species shown here and another with course and undivided leaves, *Quamoclit coccinea*. Both of these parent species are now found in our southern States, probably as escapes from gardens. The Quamoclits are close relatives of the Morning Glories.

NASTURTIUM (*Tropaeolum majus*): There are some 50-odd species of wild Nasturtiums ranging throughout tropical America from southern Mexico to Chile. Various of these have been hybridized, usually just enough to bring in the red and orangey colors, for both a rapid growth and an early, free-flowering habit —so necessary for success in our northern gardens—have been obtained primarily from the wild, yellow-flowered *Tropaeolum majus* ancestor. Double flowered forms are now obtainable in various colors.

VICTORIA WATERLILY: Although generally sold under the botanical name of *Victoria Regia*, the plant usually turns out to be another species, *Victoria Cruziana;* both of these are South American. Although the bloom is showy, this tropical waterlily is grown more for its enormous leaves with their curiously upturned margins than for its flowers. With leaves up to 6 feet across, the Victoria Waterlily admittedly is scarcely a subject for "tub or half-barrel culture" or even the usual lily-pool in a suburban back yard; with ample space it will provide quite a show.

CANNA: Growing along streams or at the edge of the forest, as shown here in the picture, wild Cannas—of which there are quite a few species, some with red and some with yellow flowers—often form a characteristic part of the American jungle scene. The old Indian Shot (*Canna indica*, not from India but actually an American species), with its bright-red but small flowers and coarse "leggy" growth, is now passing out of our gardens, and its place is being taken by the newer large-flowered hybrid forms with their more compact growth habits. The floppy flowered *Canna flaccida*, wild in the Florida Everglades and the Georgia coastal swamps, in combination with other more tropical American species, has contributed much to the development of the modern "orchid-flowered" hybrid garden Cannas. The large parts of the Canna flower which look like petals are sterile, petal-like stamens.

Painting by Else Bostelmann

South America's Jungle Denizens Enjoy the Heat and Humidity of Our Northern Summers

Morning Glory (left) looks up at tall Spider Flower. Double-flowered Nasturtiums hug its base. Cypress Vine weaves a lacework pattern to the right. Victoria Waterlilies float six-foot rafts in the stream. Cannas border forest.

Mexican Love of Flowers

NOT so long ago I climbed to the top of the great pyramid shown in the lower corner of the opposite plate and looked out across that great mountain-rimmed plain on which are strewn the relics of what certainly was a most remarkable civilization.

Standing there, one could but wonder what the appearance of those temples and palaces really was when peopled by their proud builders. Did they stand there resplendent, but bare, beneath a burnished sun? Probably not. Historians seeking to reconstruct the past so often are prone to interpret life in terms of dated battles that they sometimes forget what must have been the everyday items of living. It is no accident that, today, one finds the average Mexican *patio* filled with potted plants or cluttered with hanging baskets drooling startling assemblages of ferns, trailing vines, or succulents. And it is a mean hut indeed which does not have some sort of cherished decorative plant, even if grown in nothing more than an old tin can.

This love of plants is so widespread and goes so deeply into the lives of the Mexican people that it certainly must be a heritage out of the antique past. I have watched Mexican gardeners tending their plants. There was no fumbling as if it were something new to them: theirs was a deftness such as is not to be acquired in one man's lifetime—theirs was an understanding of plants stemming from centuries of accumulated garden lore passed from father to son in a long chain of generations. We know that the ancient Mexicans had extensive gardens, even before the coming of the Conquistadores, for Cortés encountered veritable botanical gardens and stood in awe before their floral splendors.

And so I should like to think that those old Aztecan warriors, cruel as they must have been, had the wide avenues of their cities lined with trees and that their temple and palace grounds were planted to pleasant shrubs and flowering herbs. It must have been so; otherwise the love of green growing things would not have persisted so strongly in their descendants. Gone now are the crested warriors, gone are the pompous ceremonies of the ancient priests and kings, gone are their terraced gardens—all turned to dust and rubble.

Out of this ancient way of life the only thing that really lasted was the love of beauty and of flowers, cherished through all the bitter years in the hearts of the Mexican people. There surely must be a moral somewhere here, but I am not philosopher enough to point it out and so can only light my pipe and go about my business.

DAHLIA: Unlike so many plants, the first Dahlia introduced into European gardens was not of the wild or "single" type, one example of which is shown in the opposite picture. Already the old Aztecan gardeners had so hybridized and selected the garden Dahlia for unusual forms that, even today, we are undecided which of the various wild species were its ancestors. More recently, hybridists have made available a wide variety of forms, and it can be truly said that the Dahlia is King of our late summer gardens.

Grown in large quantity, the winter storage of the tubers is sometimes a problem if one is not properly equipped. However, many gardeners have learned that certain types of Dahlia can be grown from seed each year. Seed sown in a sunny window in late February or in March will produce plants for setting out at the usual time; if "pinched back" several times to make them branch, these will grow into quite sizable bushes by midsummer and produce a wealth of bloom. The flowers probably will not be of the massive "double decorative" type but will abound in interesting shades and forms, usually being of the "single" or "semiwild" type.

Dahlia seed is now being offered by commercial seedsmen. Should some individual seedling plant prove particularly interesting, its tubers can be lifted and stored in the usual manner, to be planted out the next year. The genus *Dahlia* was named in honor of Andreas Dahl, a Swedish botanist and pupil of the great Linnaeus.

Decorative as they are, Dahlias first were used by the ancient Mexicans as a source of food. The tubers contain a healthful starch-like substance called inulin.

TIGER-FLOWER (*Tigridia Pavonia*): Gaudily spotted, the Tiger-Flower must have been common in Aztecan gardens, for it was sacred to the jaguar ("tigre") cult. The lower of the two examples shown is nearest the wild type in color; garden forms now also come in varying shades and patterns of lilac, yellow, and even white.

It is a mystery to me why this unusual and striking member of the Iris Family is not more often seen in gardens, for it is not difficult to grow. There is no reason why any gardener, even with limited space, cannot make his own hybrids and select those color forms he likes best. Grown from seed, Tigridia plants flower freely about the third year. The corms are lifted in the autumn and stored; in fact, Tigridia culture is so similar to that of the Gladiolus that it should cause no trouble.

 Painting by Elsa Bostelmann

Mexico Offers Flowers of the Aztecs, Who Worshiped at the Temple of the Sun (Right)

Before Cortés, native gardeners selected double Dahlias; two forms are shown at the top. Slightly below these the wild single type appears. Gaudy Tiger-Flowers, sacred to the jaguar cult, stand on the right.

Mexico, Happy Hunting Ground for Botanists

IN A lower corner of the opposite page our artist has shown the typical home of a Zapotecan Indian surrounded by its living cactus fence. This is not just any house; it is in the State of Oaxaca in southern Mexico in the little village of Mitla. It was from Mitla some years ago that Goopar, my Zapotecan friend and companion, and I set out on a journey to the great mountain called Zempoaltepec; it was to Mitla and his home that we returned weeks later, our pack-mules laden with pressed museum specimens, living plants, and seeds. If by some curious chance Goopar should see this picture he, too, will recall the incident of the Poinsettia bush which grew beside his house. But that is a story much too long to tell here; besides, the joke concerns only Goopar and me—and a certain old fool of a cargo mule.

COSMOS: The genus *Cosmos*, with about 20 species, is entirely tropical American. The two species most frequently grown in our gardens are both Mexican. The more common of these is *Cosmos bipinnatus*, well known in its various crimson, pink, and white forms. The other species, less common, is *Cosmos sulphureus*, which, as its specific name would indicate, has yellow flowers. Today apparent hybrid garden forms exist, but the true *C. sulphureus* is easily recognized by having somewhat longer central (disc) flowers with their dark colored stamens sticking out farther than those of *C. bipinnatus*.

I have often thought it a pity that gardeners, especially those in the north, nowadays rarely see the Cosmos in its full splendor. Recently a friend of mine boasted how, at last, he had learned to "handle" his Cosmos so that they didn't "get out of hand." I saw his plants and they were miserable, spindly things less than two feet high, with scarcely a half dozen blooms on any plant open at the same time. Being a little old-fashioned, perhaps, I would start mine earlier in the season, grow them in well enriched soil so that by late summer the plants would be wide-branched and not less than six feet tall. If "handled" properly sometimes they can be forced to as much as ten feet. Grown thus, they will ordinarily be covered with as many as a hundred blooms at once. Cosmos, naturally, are not suited for low bedding purposes in the garden, and anybody who tries to treat them thus robs himself of the magnificent show which this group of gay and colorful plants can produce.

ZINNIA (*Zinnia elegans*): The wild material of this well-known garden plant has rather uninteresting dull-purplish blooms: in this form they were first introduced into European and American gardens, as the early pictures show. What has happened since is a living monument to the science—one is here impelled also to say the "art"—of the hybridist and selector for, as Dr. L. H. Bailey, revered dean of American horticulture, has pungently remarked, they now are "of nearly every color except blue and green."

I strongly suspect that another Mexican species, *Zinnia Haageana*, through hybridization, has contributed something in the way of red and orange to the color forms of *elegans*. This latter species, usually more dwarf and with smaller blooms than *elegans*, is also offered by many seedsmen in various colors and shapes.

Like the Cosmos, Dahlia, Daisy, and various other kinds included in this series, the Zinnia belongs to the Sunflower Family, or Compositae. If one examines the "flower" of a Zinnia carefully, it will be noted that actually it is not a single flower. In the wild, or "single," forms there generally are two types of flowers present, the inner or "disc" flowers and the outer, highly modified and petal-like "ray" flowers. In the Zinnia, as in other members of this family, the so-called "double" forms are merely those in which the disc flowers have taken on the characteristics of the ray flowers. This may readily be seen by examining one of the "half-double" types. Various types of garden Zinnias are shown in the accompanying picture. Sometimes in an unnamed "mixture" a plant with flowers like the one farthest to the right will appear. Such plants are "throwbacks" which approach the wild type.

POINSETTIA (*Euphorbia pulcherrima*): In our high school Latin class probably one of the first adjectives we learned was *pulcher*—meaning "beautiful" or "handsome." Later we also learned that the Romans had intensifiers which they tacked on to their adjectives. Thus it was that when the old botanist Karl Ludwig Willdenow was searching for a suitable name for his new species of Euphorbia about 150 years ago—and scientific botanical names are in Latin, or a Latinized form of Greek—he scarcely could avoid calling it "the *very* beautiful Euphorbia," or *Euphorbia pulcherrima*.

In the discussion of another species of this genus, the Crown-of-Thorns from Madagascar (pages 38, 39), it was noted that the bright scarlet objects which make the Poinsettia of Mexico so handsome actually are not parts of the flower; instead, they are highly modified petal-like leaves, which the botanist calls bracts.

Painting by Else Bostelmann

Living Cactus Fence Guards a Zapotec Indian's Home in Oaxaca, Mexico

Several species of Cosmos sway across the top. Below them grow Zinnias of modern garden form; a wild type stems out to right. The handsome scarlet bracts of the Poinsettia of Mexico brighten the lower right corner.

More Native Mexicans

HERE are more native Mexicans and something of the way in which they got their present common names.

FRANGIPANI (*Plumeria rubra*): In attempting some detective work on the origin of the word Frangipani as applied to our plant, it was learned that the name was that of a French pastry made from almonds, sugar, and cream. This seemed to lead nowhere, for the pastry was named for its inventor, the Marquis Frangipani, a French general. But Frangipani (or Frangipanni) is not a French name; it is basically Italian, and we also learned that it goes back to an old Roman family that first came into prominence during the Middle Ages. This might seem to be a dead end in our search if it were not for another clue.

There was an old perfume called Frangipani distilled from the flowers of a red jasmine. Then in another work we discovered that the subject of this sketch once was called "Tree Jasmine." Here is the link. Now let us try to fit the facts together.

First it should be noted that the very fragrant red jasmines most likely to have been used in perfumes seem to be Asiatic; but is it too impossible to suppose that a fragrant red jasmine might not have been brought to Rome from Asia during the days of the Empire? On previous pages we have dealt briefly with the history of the introduction of such plants into Roman gardens. From old writings we know there was keen rivalry among the Romans for the acquisition of these exotics and so, if such a remarkable plant were being grown by a particular family, what would be more natural than for their friends to ask: "Have you seen the new plant which the Frangipanni's have blooming in their garden? Such red flowers! And so fragrant!"

Having come from distant Asia and lacking a local name, it would become "Frangipanni's plant," later to be shortened to "Frangipani." There is nothing unusual in this, for it is a common practice. Forsythia honors an English horticulturist, William Forsyth, and Wisteria (with a slight change in spelling) commemorates the name of the Wistar family of Philadelphia (page 47).

How the name Frangipani became transferred from the perfume-yielding red jasmine to the sweet-scented, reddish-flowered tree of the opposite picture probably never will be known, but there are literally hundreds of such instances. Among these many name-transfers is that of the Marigold. There is only one true Marigold, the Pot Marigold of Europe (page 19); yet the yellow and orangey Mexican flowers on the opposite page also are called "marigolds." And we must not forget that there was a time when *our* Frangipani also was called "Tree Jasmine." While some of this may seem to be speculation, there are so many similar cases that I have come to the conclusion that the word Frangipani traces back to quite a different plant once grown by that old Roman family and named for it.

The species shown here is native in Mexico; it occurs wild also in Central America and northern South America. It is commonly planted in tropical regions and often has escaped, especially in the West Indies. Other tropical American species of *Plumeria* with white or yellow flowers are known (again, one of them is Mexican). These also are often planted, and hybrids are grown.

FRENCH AND AFRICAN MARIGOLDS (*Tagetes*, several species): The trail of the French and African Marigolds is less encumbered with speculation than that of the Frangipani. The genus *Tagetes* is entirely American, its twenty or so species ranging from New Mexico and Arizona southward into Argentina. Those which immediately concern us are native in Mexico. From various evidences it seems most likely that these plants were grown in the old pre-Conquest gardens. Also we know that they found their way into the early Spanish-American gardens and soon were sent to Spain, from whence they were carried to monastery gardens in Africa and France. By the time these plants reached northern European gardens all knowledge of their real origin had been lost. Being yellowish orange, in England they were called Marigolds (from "Mary's Gold"); but to differentiate them from the native European Marigold (now called Pot Marigold) they became French Marigolds and African Marigolds; these names then came to us from England.

Several modern garden forms of the taller "African" Marigold (*Tagetes erecta*) with its larger flower heads and the smaller, usually reddish-suffused "French" Marigold (*T. patula*) are shown here as well as a few of the wild species of the genus, some of which also occasionally find their way into our gardens.

I once was in a Mexican store as a shipment of seed from the States was being unpacked. Two of the gaily-colored packets interested me, especially when the proprietor proudly assured me they were "new in Mexico." I smiled inwardly, for I had seen them wild in the hills. After centuries of travel and two Atlantic crossings, the "African" and "French" Marigolds had come home.

Painting by Elsa Knakstedt

Mexico's Floral Album Contains Exotic Names; Our Genealogist Clears Their Titles

Top: Frangipani, originally the name of an Asiatic jasmine. Left: large "African" Marigolds and (below and center) single and double "French" Marigolds, all native Mexicans. At the right margin: wild Marigolds.

Western North America as a Source

NORTH America is rich in potential ornamentals. But ours is a comparatively new country and its present culture came ready-made. With their faces turned westward, the early settlers faced an unknown wilderness. When clearings were made for crops, all else had to go; any shoot which sprang up was a weed to be destroyed. But as the settlements grew and life became secure, flower gardens were planted.

Because of the strong cultural ties, the first flowers raised were mostly European in origin; rarely in the early American writings does one encounter mention of a native plant being grown. The plant explorers who soon followed realized the potentialities of our native species and sent them back in large quantities to Europe. Many of these have since come back to us, quite different in form and in many beautiful selected varieties. Naturally, the plants of the eastern seaboard were introduced first into European gardens, and many of them have been in common cultivation there for well over two centuries.

The plants of western North America began coming into gardens only about a century ago, and the majority of them even more recently. As a result, only occasionally do we see them in anything other than their original wild forms. Because of this they are less plastic, demanding conditions very similar to those under which they exist in nature. This makes them somewhat difficult subjects for general gardening. This is also why these plants, and especially those from the Pacific Northwest, rarely are found in southern, midwestern, or eastern gardens, whereas they are much more often grown in England where the climate is more like that of northern California, Oregon, and Washington.

Anyone who has ridden the trails between the Great Plains and the Pacific will realize how deep is our regret that as yet we are unable to class more than a few of these worthy species as "common and widespread" garden flowers. The Bitter Roots (*Lewisia*): how some of them resent being moved! Acres of Avalanche Lilies (*Erythronium montanum*) in the Cascades, sometimes pushing up through the last three inches of snow so as to bloom on schedule; only to dwindle to nothing a few years after being brought into a garden. The tufted Eriogonums with their bursts of yellow, orange, pink, and white flowers—hosts of them growing naturally under all sorts of difficult and seemingly impossible conditions; yet how relatively few of them do well, even with the best of care and attention. And the Mariposas or Butterfly-Tulips (*Calochortus*); except for a few forms, they mostly spurn permanent sanctuary with humans.

These and a hundred others ought to be widespread in gardens but seemingly refuse to be fully tamed, tolerating domestication usually only under very special conditions. But let us be a little patient; many will yet be broken of their wild habits, even as some already have been. For example, most of the newer blue garden Columbines are descended from the wild *Aquilegia caerulea* of the Rocky Mountains. And there are others with equal promise. Here, however, are a few Westerners already common in our gardens.

CLARKIA (*Clarkia elegans*): This excellent annual now comes in several shades and also in frilly double forms; it is native in California. The generic name commemorates William Clark, associate of Meriwether Lewis (for whom *Lewisia* was named), both explorers sent out by Thomas Jefferson to examine the country westward to the Pacific.

CALIFORNIA POPPY (*Eschscholzia californica*): Originally yellow or orangey, this popular garden plant now displays several other colors. It was named in honor of J. F. Eschscholtz, a botanist on the Russian expedition led by Kotzebue into the Pacific, 1823-1826.

BLANKET-FLOWER (*Gaillardia pulchella*): This gaudy annual is native from the Ozarks south to the Gulf and westward across the Great Plains to Arizona; it is now established more widely. Introduced into Europe from Louisiana during early colonial days, it was named in honor of M. Gaillard, French patron of botany. When one sees this plant in profuse, spreading masses in its native haunts, the origin of its common name becomes obvious.

LUPINE (*Lupinus*, various species): Except for a relatively few kinds in Europe, Asia Minor, and Africa, the 300 species of Lupine are all native in the Western Hemisphere. Capable of making great displays, almost carpets, as shown in the background of our picture, or as the Bluebonnets do on the Texas plains, the wild species often are introduced into gardens. Also, various of them have been hybridized. Our more common perennial garden forms seem to have been derived primarily from West Coast species, whereas the more showy annuals are descended from species wild in Mexico, Central America, and Andean South America.

Painting by Elsa Bostelmann

Many Flowers of Western United States Refuse to Be Tamed—These Tolerate Gardeners

Clarkia (left) is one of the namesakes of the Lewis and Clark Expedition. Center: Blanket-Flowers stand below California Poppies. Lupines, thick as Texas Bluebonnets, cover the hillside.

Wild Flower, or Garden Plant?

IT IS sometimes difficult to distinguish between a wild flower and a weed. But when either is brought into a garden it ceases to be "wild" and becomes a horticultural object. To the farmer in various parts of eastern North America, the plants on the opposite page may sometimes be weeds; to the field naturalist they are wild flowers; and to the gardener they are cherished subjects in the perennial border. This last is especially true when, in the skilled hands of the hybridist and selector, they yield a series of striking and unusual garden forms.

OSWEGO TEA (*Monarda didyma*): On page 25 we touched briefly on the ancient civilizations which rose up around the Mediterranean. During the long period of the development of their various cultures these peoples had experimented with the native plants and discovered those which were most useful. Among the spicy condiments and medicinal herbs of the Mediterranean and closely adjacent regions which they found were such things as Rosemary, Common Sage, Clary, Lavender, Woundwort, Thyme, Pennyroyal, Horehound, Lemon Balm, Marjoram, Hyssop, and both Summer Savory and Winter Savory. Anyone who has an herb garden will immediately recognize these as members of the Mint Family. When the cultivation of useful plants seeped into Europe from the Mediterranean region these plants went along and became standard features in cottage, monastery, and castle gardens.

As soon as possible after the settlements were established on this side of the Atlantic the colonists brought these same plants to America. But always in this new country there were pioneers, pushing on ahead of established gardens, who were forced to seek for native substitutes. America did not fail them.

Among the many useful plants they found—most of them already in use by the Indians—were two of this same Mint Family, Oswego Tea (*Monarda didyma*), and Wild Bergamot (*Monarda fistulosa*). As the country was settled, both of these became fixtures in early American herb gardens along with their imported relatives. Later, when herb gardens went out of style (they are again becoming popular), these two moved over into the flower garden. This is particularly true of the originally reddish-scarlet Oswego Tea, shown opposite. For a time the similar but less striking, pale purplish-flowered Wild Bergamot almost went into eclipse, but is again making a strong comeback as an ornamental in perennial borders. Both of these now have variously colored garden forms.

SUMMER PERENNIAL PHLOX (*Phlox paniculata*): Although natural variations do occur in the wild, the great majority of the plants of this species growing naturally have pinkish-purple flowers. From these, salmony, rose, magenta, purple, scarlet, buff, and white garden forms have been developed. Ten or a dozen other native North American species of this genus have been introduced into gardens. Among the more popular of these today is the highly variable, spring-flowering Moss-Pink (*Phlox subulata*), much used in rockeries. An even more variable low-growing, annual species from Texas, *Phlox Drummondii*, is also often grown. European and American hybridists have produced many forms in this group.

MICHAELMAS DAISIES (*Aster*, various species): Named for St. Michael, whose festival—Michael's Mass—is celebrated on September 29, when certain forms are at the height of their blooming period, this splendid group of perennials now has great favor with gardeners. Admitting that they put on a great show in the autumn, I still suspect that part of their popularity lies in their name and in the common supposition that they come from some foreign land. Actually, they are as American as pumpkin pie or corn-on-the-cob.

The early plant explorers who came to America about two centuries or more ago seized upon these plants and took them back to Europe, where they became a garden sensation.

When the art of hybridizing became well known, these plants were used, and many new and intermediate forms were developed. Yet all the while in America farmers were mowing them down to clear their fence rows and pastures. Worse yet, for the most part, American gardeners of that period ignored them as being no more than roadside weeds. Those few gardeners who cultivated our native Asters through the years finally were vindicated when the plants became popular. But that was only after they had come back home under the name of Michaelmas Daisies.

It is useless here to attempt a listing of the species which have gone into the make-up of our present garden forms of this group. One which stands out markedly is the New England Aster (*Aster novae-angliae*) with its large flower heads, originally deep purple but now split into blue, pink, reddish, and white forms. Plants with intermediate-sized heads and forms with small, often white flower heads indicate a blending with other species. Brought together by hybridization, they have produced a distinguished group of excellent garden plants.

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Painting by Elsie Bostelmann

Easterners Did Not Appreciate American "Weeds" Until Europe Made Them Fashionable

Summer Perennial Phlox crowns the painting. Native Asters (below) came back to America with their name changed to Michaelmas Daisies. Oswego Tea (right) has moved from pioneers' herb plots into flower gardens.

Painting by Else Bostelmann

Descendants of Two Outstanding Native Americans Burgeon on a Southern Estate

Hardy and floriferous Catawba Rhododendron (left) is the basic parent of most of our showy modern garden forms. Flame Azalea (right) is rated as one of America's finest shrubs.

Gems from the Southeastern United States

RICH as is the floral life of our Southeastern States, two species are so outstanding that they deserve to be treated apart from all the rest. Both of these, the Catawba Rhododendron and Flame Azalea, belong to the same group of plants, the Ericaceae or Heath Family. Although our own eastern American species of azalea and rhododendron are quite different in general appearance, the involved and botanically complex situation in the species of our western States and in Asia makes it seem wise to classify them in the same genus.

The Heath Family is world-wide in distribution and contains such plants as heather, manzanita, mountain laurel, and trailing arbutus. In stature the 1,500 or more species of this family vary from large forest trees to plants so small that, when not in flower, they might easily be mistaken for dwarfish, trailing mosses. Yet widespread and varied as they are, there is one thing which the species of this family of plants seem unable to tolerate —and that is an alkaline or limy soil. Apparently this is because fungus threads—actually the plant body of various of our forest mushrooms—are associated with the roots of the members of this group, and without the help of these lowly organisms the plants cannot live. For some reason the fungus thrives only in acid soils, and that is why those who, perhaps unfortunately, live in alkaline or calcareous regions can grow members of this family of plants only after extensive treatment and preparation of the soil and at considerable expense.

For nearly a quarter-century the writer of these notes has been hunting in various parts of the Western Hemisphere especially for members of the Heath Family. And many a wondrous floral display he has seen beside the trail. Yet the two species shown here, growing naturally in our southern Appalachians, stand out so remarkably from all the others that nothing has yet approached them in sheer magnificence.

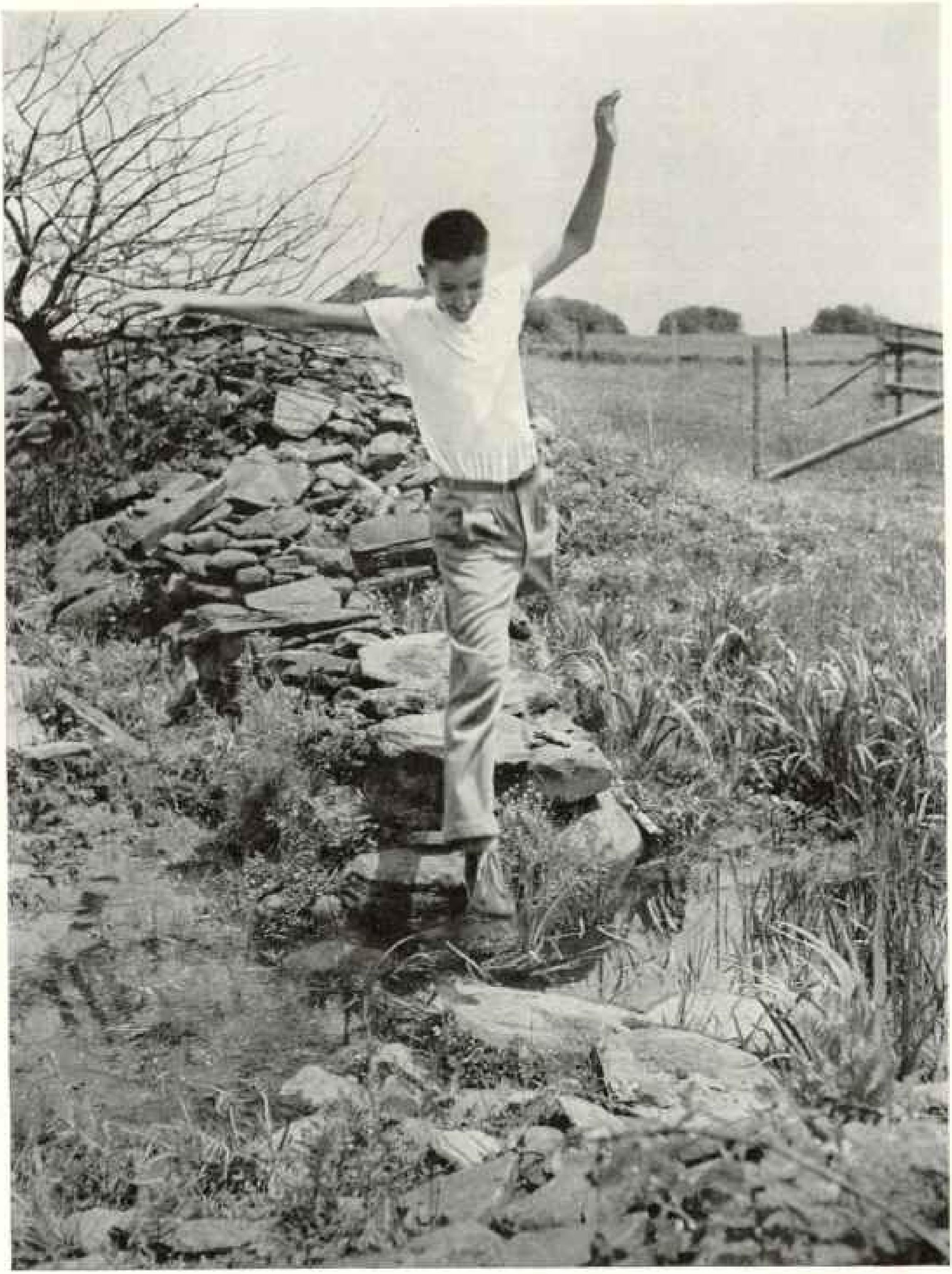
CATAWBA RHODODENDRON (*Rhododendron catawbiense*): One day on a rocky trail on the divide near the headwaters of the Catawba I came to a ledge where one could stand and view the magnificent rolling crest of the Blue Ridge. There before me, stretching ahead for a distance of nearly two miles and cascading down that slope for a vertical distance of more than five hundred feet, was a nearly pure stand of this rhododendron in full bloom. I shall not attempt to describe the scene.

With both climate and soil favorable, the British can cultivate not only our species of this genus but the host of Asiatic species as well. Because of this, British gardeners really know their rhododendrons; therefore, lest we seem to be partial and overenthusiastic about this plant, let us quote from the writings of that great English authority, W. J. Bean. In his *Trees and Shrubs Hardy in the British Isles*, he tells us that the Catawba Rhododendron "has proved perhaps the most valuable evergreen shrub for ornament ever introduced." I wonder what the usually cautious Mr. Bean would have added to his text could he have seen the display of this species in the spruce-rimmed natural gardens at the headwaters of the Catawba, on Grandfather Mountain, on Roan Mountain, or in the Great Smokies.

While some of the unusual color forms are derived by hybridization with Asiatic species, the hardiness and ability to produce a profusion of bloom in the best of our garden rhododendrons come from this parent.

FLAME AZALEA (*Rhododendron calendulaceum*): Having seen and studied the Flame Azalea many times in the southern Appalachians, and especially in the Cumberlands where it seems to reach a peak of coloring, the writer of these notes cannot trust himself to mention it in a detached or prosaic manner. In his book, *Ornamental American Shrubs*, Van Dersal rates the Flame Azalea as the finest shrub in the United States "because of the brilliant intensity of its flower color and its gorgeous display in bloom." Excellent, my friend! But let us take a broader view and compare this species with all other azaleas in the world. Lest either of us be accused of playing favorites we will turn again to the experienced Mr. Bean; his judgment will be unprejudiced. Of the Flame Azalea he pithily remarks: "This is the most brilliantly coloured of all wild azaleas."

In the hands of the hybridist and selector—and blended with species from other lands—both the Flame Azalea and the Catawba Rhododendron have given rise to a host of glorious color forms now found in many gardens. Grown as single specimens beside a cottage door, in serried ranks on some great estate, or in massed profusion in a public park, these lineal descendants of the Catawba Rhododendron and the Flame Azalea can well afford to hold their heads proudly erect, for they are among the choicest of the blooms in that great parade of flowering plants which brings the whole world into our gardens.



He Jumps Across the Mohawk River in the Pasture of Its Birth

Only a few yards to the left of this scene on lonely Mohawk Hill waves the patch of wild iris in which the busy, storied river of central New York State is born (opposite page and Color Plate IV). Swiftly growing, it joins the Barge Canal at Rome and flows through history to the Hudson.

Drums to Dynamos on the Mohawk

By Frederick G. Vosburgh

With Illustrations from Photographs by B. Anthony Stewart

HIGH on a hill north of Rome, New York, a honey-haired little farm girl filled her arms with bright "blue flag" —wild iris.

Her bare feet splashed through the Mohawk River, for here that momentous stream is born in a sky-colored patch of iris swale in the pasture below the family farmhouse (Plate IV).

"Water off my farm goes north and south," said Duane Carpenter, Barbara's soft-spoken young father. "Rain falling on the roof of the barn drains in opposite directions."

Topographic maps bear him out. Raindrops striking one side of the ridgepole go north through the Black River to Lake Ontario and the St. Lawrence. Drops falling on the other side beget the Mohawk, which flows down to the Hudson through the green heart of New York State (map, pages 76-77).

River Here a Puny Brook

A tiny stream trickling through an old stone fence, the infant Mohawk leaves the pasture in a "sudden sally," like Tennyson's brook.

"So this is your Mohawk," scoffed Photographer Tony. "Why, back home in Virginia we wouldn't even call this a run."

"Wait a while, 'Senator Claghorn,'" I advised. "It gets a little bigger."

Though widely traveled, Tony was seeing my native valley for the first time. This Mohawk country, of course, would invite comparison with other areas he had seen—England and Scotland, Egypt, Italy, Greece, as well as his native Old Dominion.

I thought I knew what his opinion would be by the time we had seen it all. Or was this confidence, I wondered, just a result of my own elation at being home again after three years overseas?

"Let's see you jump the Mohawk River, Champ," suggested Tony, setting down forty pounds of cameras and preparing for action.

"Sure," said the lanky 15-year-old whom Tony called "Champ" because of his way of doing everything with all his might. Already nearly two yards tall, he was sunned to the color of old leather (opposite page).

"But first," amended Tony, "hoist that rock out of the way. If we're going to take a picture of the Mohawk River, we want a little water to show."

We all had our turn at jumping the Mohawk. Then we followed its meandering way down the hill to learn the river's story.

Stamped indelibly on river and valley is the name of the warlike Indian nation known to enemy tribes as Mohawk, meaning "Eaters of Living Things."

These fierce and formidable fighting men long stood as Guardians of the Eastern Gate of the great Iroquois Confederacy.* But a white tide lapped at the Gate and undermined its foundations.

Bloody Past and Busy Present

Up the river came sturdy, pipe-puffing Dutch in quest of furs and farms. Down from Canada paddled and plodded intrepid black-robed Jesuit priests intent on saving savage souls and giving a new God to the Iroquois. The first of the "Black Robes" died martyrs' deaths under torture and tomahawk.

Massacre smeared the Mohawk in the long struggle between British and French which determined whether the continent should be Gallic or Anglo-Saxon. Far worse was the fighting of the Revolution, when neighbor killed neighbor and Indians scalped even children as reprisal followed reprisal.

The Revolution struck the hand of the Iroquois from New York's great gateway to the West, and in endless procession, by canoe, bateau, cart, covered wagon, pioneer families poured through the Hudson and Mohawk Valleys, the only direct water-level route through the 1,300-mile Appalachian Mountain chain.

Vision, and the brawn of hard-fighting, hard-drinking "canawlers," dug the Erie Canal.

The old Iroquois trail and King's Highway, hugging the river, gave way to rail and ribbons of road. Factories rose to smudge the Valley sky and scatter gloves and guns, typewriters and teakettles, milking machines, rugs, cotton shirts, locomotives, and giant dynamos over the land and beyond the seas.

Arrowheads and Atom Smasher

Up from the steerage and Ellis Island came thousands of Italians, Slovaks, Poles, to work in the mills and mingle their genes with those of the English, Scots, and Irish, the Dutch and the Palatine Germans. The Valley had come of age in the American way, complete

* See, in the National Geographic Magazine, "America's First Settlers, the Indians," by Matthew W. Stirling, November, 1937, and "New York—An Empire Within a Republic," by William Joseph Showalter, November, 1933.

Munson-Williams-Proctor Institute

"Look at Her Little Button Nose!" Artists Start Young in Utica

Adults as well as children discover and develop artistic talents at the Munson-Williams-Proctor Institute, a privately endowed cultural center in the largest city of the Mohawk Valley (page 791). A typical evening class in art included a beautician, an organist, farmers, teachers, housewives, clerks, factory workers, stenographers, businessmen, saleswomen, a printer's apprentice, and a chef.

with college educations and cars, billboards and neon signs.

One can spend a lifetime in the Valley now without seeing an Indian. Yet everywhere are relics of yesterday, often starkly incongruous amid the doings of today—forts and factories, tomahawks and television towers, arrowheads and General Electric's hundred-million-volt atom smasher.

All through the green and busy Valley the past sounds softly through the present, like the echo of a war whoop faintly heard through the throb of factories, rattle of trains, whistle of boats, and rush of cars.

River's Story Begins at Rome

But the infant river on Mohawk Hill gives no hint of the drama waiting in the main valley below. The river's story really begins at Rome.

There the Mohawk reaches a turning point in its life. Swinging leftward into the rising sun, it merges its identity with the Barge Canal. From now on it flows mainly east, first across the platter-flat bed of long-vanished Lake Iroquois, then through the valley carved by its ancestor, the prehistoric Mohawk, when the glacial crown of ice over the Great Lakes was melting and rivers were raging giants in a bleak and lonely land.

Fort Stanwix Site in "Copper City"

Rome marks not only "the great bend of the Mohawk" but also the old "great carrying place," where canoes of the Indians and bateaux of the whites were carried over the low divide between the Mohawk River and Wood Creek, which flows west to Oneida Lake.

Squarely in the city's masonry heart is the site of brave old Fort Stanwix, most famed of the pre-Revolutionary forts built to guard the crucial carry.

Not Moonlight on the Mohawk, but Sunset Turning the Wake to Hammered Gold

Capt. Edgar J. Beverly (left) and the author have a suppertime chat as the *Wanderwell* chugs down the Mohawk Valley, near Herkimer, through the Barge Canal (page 76). When the flashlight bulb was fired without warning, the skipper's eyes shot toward his gasoline tank. "Whew!" he exclaimed. "I thought the whole shebang was blowin' up."

Close by cluster plants making kettles, cable, and myriad other copper products (Plate V). A State School for the Deaf teaches eager youngsters to overcome their handicap (page 71). On the edge of town is a big Army Air Depot, modern equivalent of Fort Stanwix and the old U. S. arsenal at Rome.

As I rode into the busy Copper City it was June 14—Flag Day—and the radio was saying that right here in Rome the Stars and Stripes first flew in battle. Tradition says the banner was stitched from a red petticoat, a soldier's white shirt, and a captain's blue military cloak, and was broken out under the aristocratic nose of Col. Barry St. Leger at dawn on August 3, 1777, the day after his British, Hessians, Tories, and Indians laid siege to the palisaded fort.

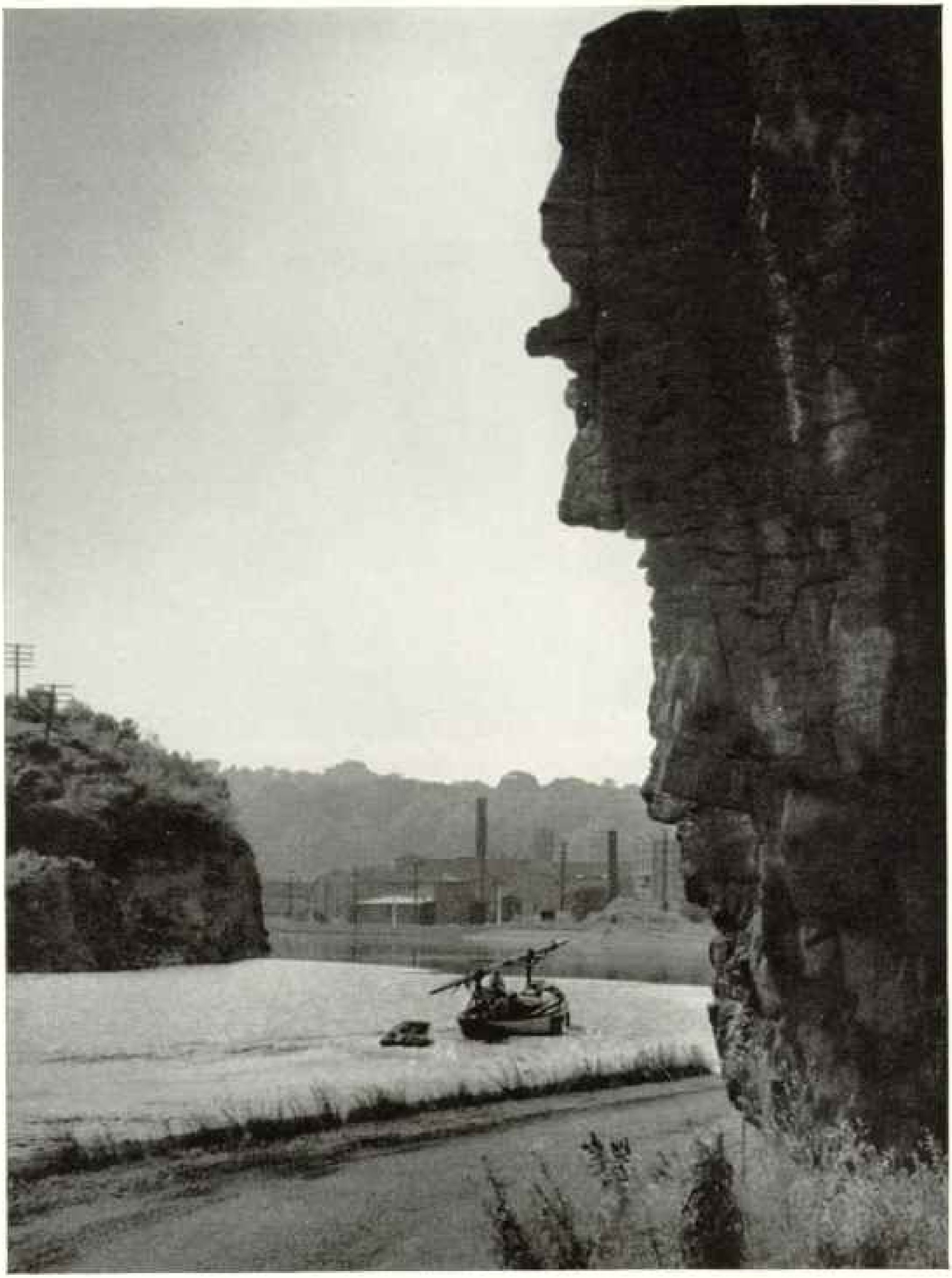
Several other places claim the honor, and some flag historians doubt the presence of stars in the Fort Stanwix flag. It is a fact, however, that on June 14, 1777, the Continental Congress, meeting in Philadelphia, adopted the following:

"Resolved, that the flag of the United States be 13 stripes, alternate red and white; that the union be 13 stars, white in a blue field, representing a new constellation."

A Philadelphia paper brought word of this, but whether or not a flag exactly as described was made and flown here, I cannot say for sure. Certain it is that such an enterprising act would have been in keeping with the morale and audacity of Col. Peter Gansevoort's garrison. Its efforts and Gen. Nicholas Herkimer's victory at near-by Oriskany turned back the enemy (Plate III).

Nine-year-old Led Symphony Orchestra

Rome was given its name in 1819 "in tribute to the heroic defense of the Republic made here," but the many Italian residents and



Under Profile Rock's Stony Stare Flows All Canal Traffic at Little Falls

Gaily towing her tender, the auxiliary yacht *Escape*, out of Mamaroneck, New York, has just emerged from Lock 17 and threads the mile-long cut, through solid rock, by which the Barge Canal by-passes the river's white, racing waters (page 74 and Plate XIV). Her destination: Niagara Falls.

"The Ears of the Deaf Shall Be Unstopped . . . and the Tongue of the Dumb Sing"

Isaiah's prophecy comes to mind as one beholds such scenes as this at the Central New York School for the Deaf, at Rome. The little girl's eyes light with joy as the sound of her own voice penetrates a wall of dreary silence. Individual "mikes" and earphones enable the class to hear and learn to speak.

spaghetti restaurants make it especially appropriate today. The rich "black earth" muck-lands around Rome are largely cultivated by Italian families whose hard work is rewarded by lush crops of celery, lettuce, and onions (Plate XI). Last year the son of an Italian pastry-shop proprietor conducted an 80-man symphony orchestra at the age of nine.

Representative of another type of American was an 80-year-old man with whom I fell into conversation near downtown Dominick Street. One of his ancestors was a Hessian soldier and others were among the early arrivals in this region from New England.

"See these wide streets," he said. "Dominick Lynch laid 'em out. Town used to be known as Lynchville."

He spoke as if of a personal friend, though Lynch was a contemporary of Washington, who called him "the handsome Irishman."

But history is hard to photograph. What Tony wanted was scenery, hills.

"Pretty flat here," he observed. "I see by the New York State *Guide* that schoolteachers in Rome used to use an anthill to show their pupils what a hill looked like."

"This is an old lake bed," I reminded him. "Farther down the Valley you'll see plenty of hills."

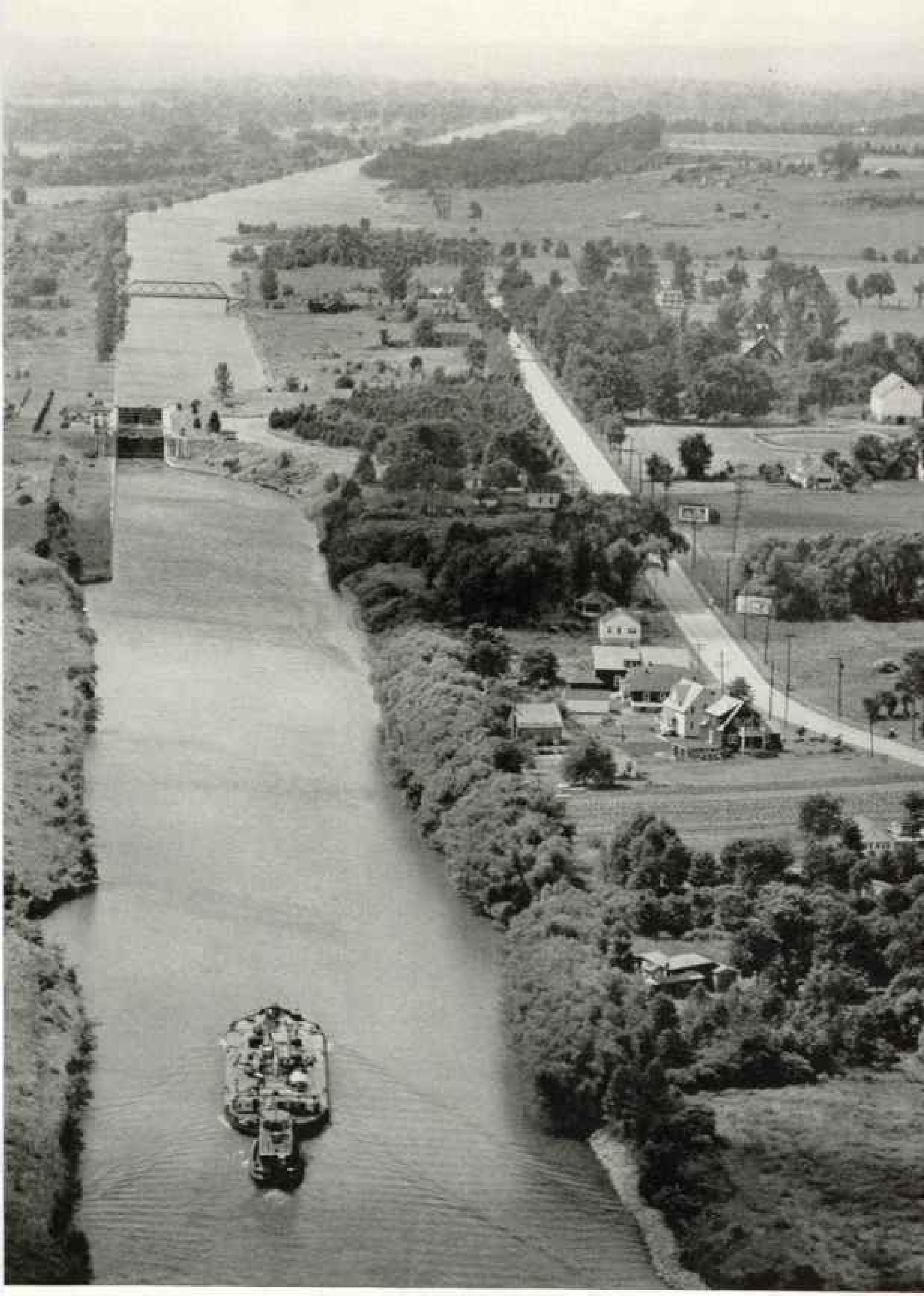
At the Army Air Depot we found an AT-11 (advanced trainer for bomber crews) taking off on a test hop. Eager for an air view of the Valley, we talked ourselves into a ride. Tony sat flat on the floor of the plane, with his toes sticking out the open door and a rope around his waist, just in case. Resting on his long-suffering lap was a big black cannon of an aerial camera weighing 42½ pounds.

Where a Vanished Niagara Roared

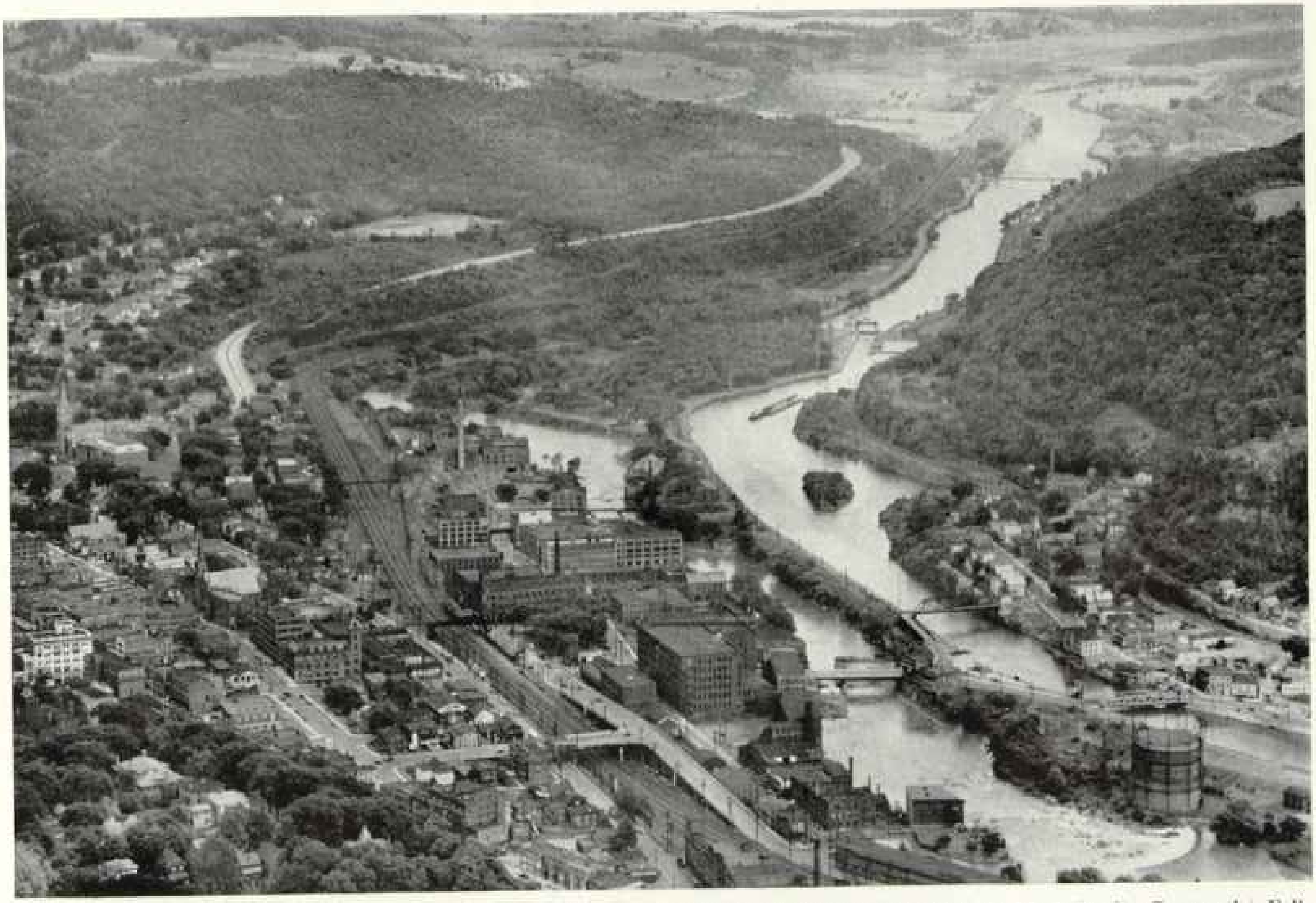
Ribbon-straight ran the canal beneath us, with an occasional skein of river near by as surplus water flowed out through spillways and briefly followed its own free will (p. 72).

Trees at Left Line the Banks of the Mohawk River, Which Feeds the Barge Canal

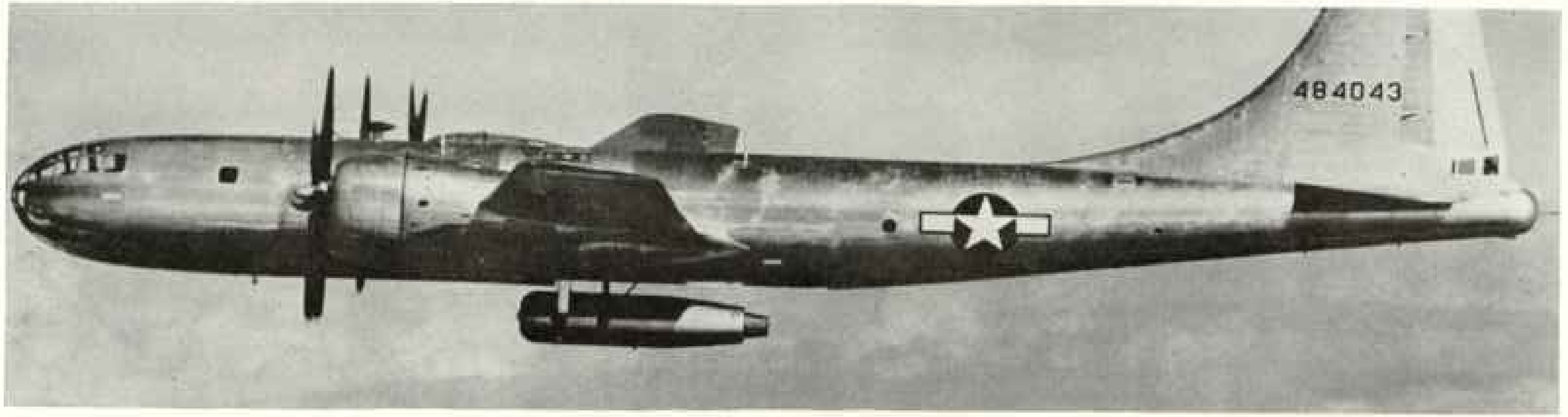
Here the young river runs free alongside. As it grows in girth and grandeur, canal and river become one.



Like a Big Water Beetle, a Barge and Tug Plow Along the Liquid Road to Rome
West of Utica they approach a lock. Platter-flat is the country here, the bed of a prehistoric lake.



Little Falls Nestles in a Gorge Where a Prehistoric Niagara Thundered; at Right the Barge Canal Skirts the Much Smaller Present-day Falls

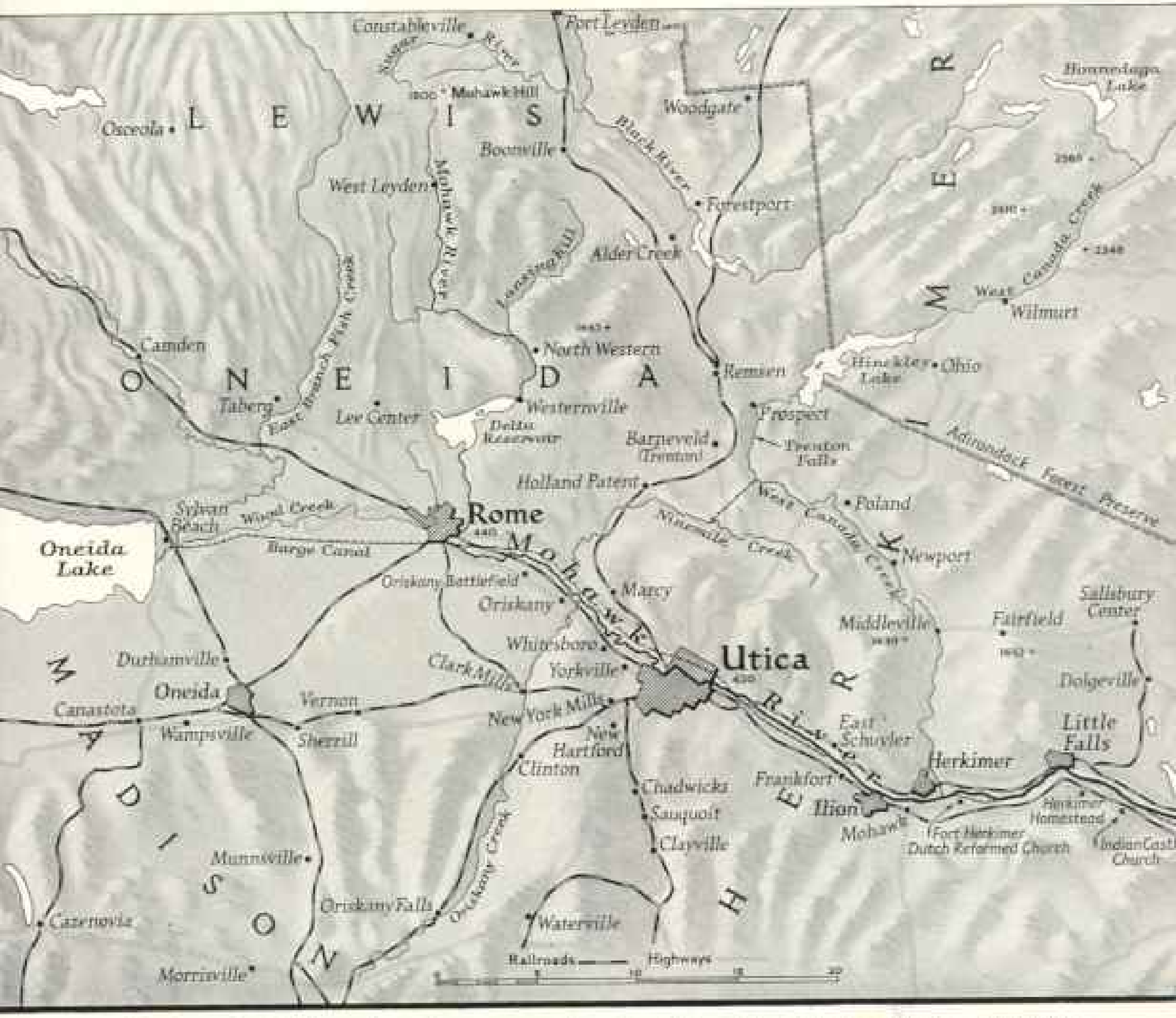


General Electric Company

Beneath a B-29 "Flying Laboratory," a New Jet-airplane Engine Undergoes Tests in Flight at Schenectady

Suspended beneath the bomb bay is the torpedo-shaped axial-flow turbojet engine developed by General Electric to drive military and civilian planes at high speed.

Wanderwell Bears Sun Bathers along a Broad Highway of Water, the New York State Barge Canal Between Utica and Rome



"Look at that!" Tony shouted as we passed Utica, the Valley metropolis.

Ahead he had seen the mighty trench through which the prehistoric Mohawk drained a chain of great interior lakes. At what is now Little Falls the icy waters of Lake Iroquois, predecessor of Lake Ontario, plunged over a mountain barrier in a volume at least as great as that of Niagara. Through the deep resulting gorge now tumbles the shrunken modern Mohawk while the highest lift lock on the Barge Canal carries boats up and down (page 74 and Plate XIV).

Twenty-five miles downstream we saw where the river had cut straight through another Adirondack spur, its whimsical waters carving the bluffs called Big Nose and Little Nose.

From high in the air we could see the flow of automobiles, trains, and barges, all following this great east-west crease created by running water.

At Schenectady the 250 big buildings of the General Electric Company's plant sprawl like a city within a city. Here the river spreads and meanders over the bed of another old lake, then winds east to the Hudson.

There we saw the Mohawk end in a mammoth anticlimax—a waterless waterfall. Except in winter, all but a tiny trickle is diverted to the Barge Canal, and the thundering torrent of Cohoes Falls—which moved the Irish bard Thomas Moore to poetry—is only a mass of brownish rock as dry as a thirsty throat.

For a closer acquaintance with the river and canal, we found a boat, the *Wanderwell*, a 25-footer used for fishing on Oneida Lake.

The skipper was the type with whom it would have been a delight to sail around the

world (page 69). Crowned with sparse gray hair and tanned to the top of his wise head, he had twinkling china-blue eyes and a laugh which lighted up his face like a running light.

As we stopped at a canal-side gasoline station where a girl pumped fuel and water aboard, the captain chuckled reminiscently.

"One time," he said, "a fellow stopped for gas and drinking water and got the hoses mixed up. Filled his gasoline tank with water and his water tank with gasoline. He sure had to be careful not to do any smoking when he cleaned out his bilge."

From Oneida Lake we chugged toward Rome through the broad canal that has replaced the old canoe route up Wood Creek.

Our first lock delighted the Champ, who had come along to help handle the boat. As water boiled up around us to fill the lock, he exclaimed, "Gee, if you were going down, the water would be pouring out the same way. Think what would happen if you fell overboard!"

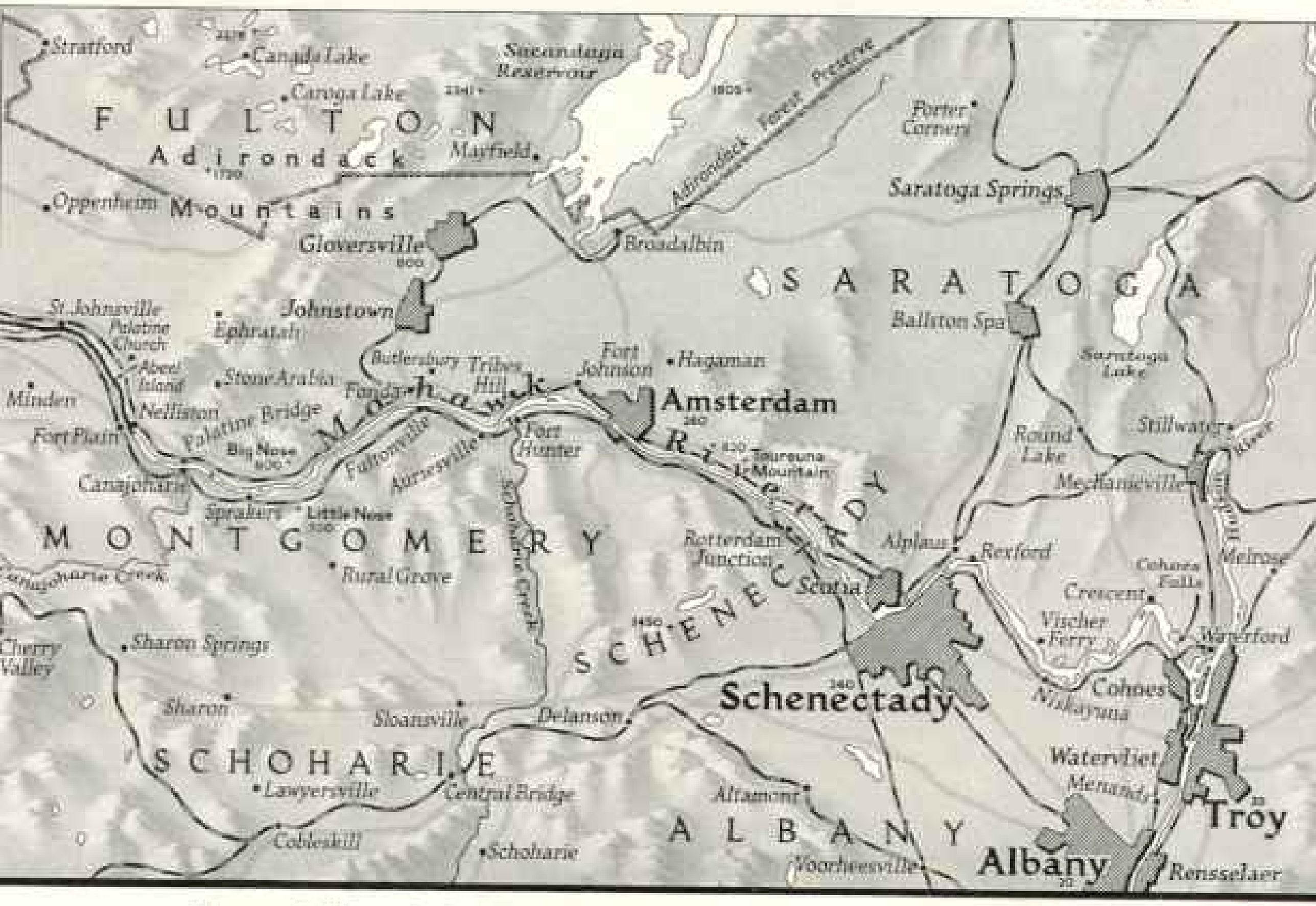
"Yep, you'd go right out, just like a fish," said the captain cheerfully.

Except for drinking cows, a few swimming boys, and an occasional statuelike fisherman, we had this liquid superhighway largely to ourselves. Only rarely did we see a barge.

"No," said a lock keeper, "there aren't many barges; but look at their size. That one, for instance, carries as much gasoline as a 50-car train of tank cars."

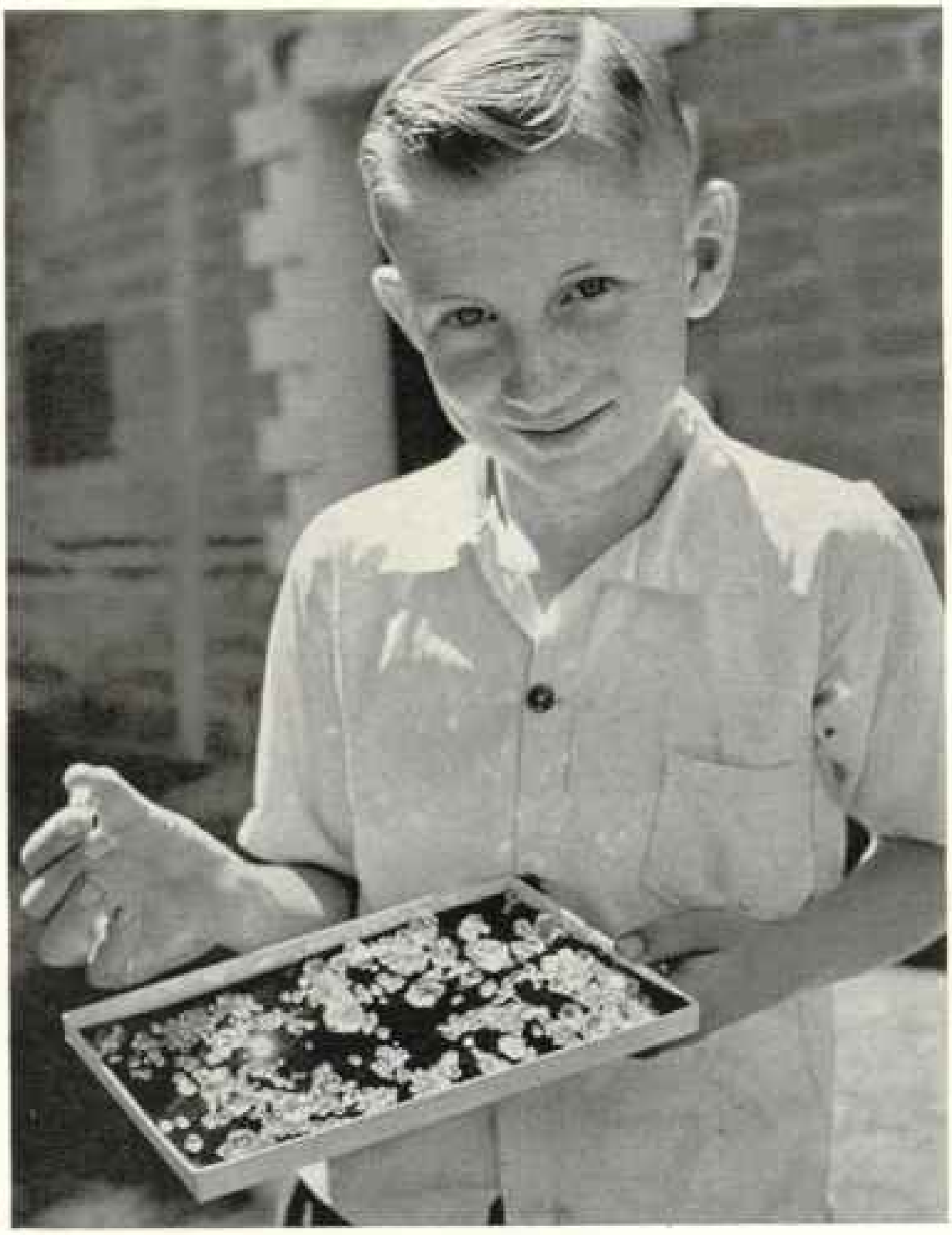
Like an iceberg, these ponderous burden-bearers hide most of their bulk under water. They are generally loaded to a draft of 10 feet forward and 10½ feet aft, thus clearing the bottom at some points by only a foot and a half, since the statutory minimum depth of the canal is 12 feet.

Old canal men say that when you try to load a boat to 11 feet on a 12-foot depth, it



Westward Through the Mohawk Valley the Course of Empire Took Its Way

Today the Valley is home to half a million people, and millions of other Americans know it as the rail and highway route between the Hudson and the West. Through here each day roll 300 freight and passenger trains over New York Central's "Water Level Route." Along the river will run the new Mohawk Thruway, part of the vast system of express highways which New York State began building last summer in what it calls its greatest engineering project since construction of the Erie Canal, predecessor of the Barge Canal.



In the Hoary Rocks, Boys Find "Little Falls Diamonds"

So many generations have combed the cliffs around Little Falls that the gleaming gemlike stones now are becoming scarce. Though only quartz crystals, they can be cut like diamonds and set in rings or other jewelry. This collection reposes in the Old Stone Fort at Schoharie.

"smells the bottom." Mud is stirred up, suctions and currents are formed, and steering becomes harder.

"You Gotta Be a Sharpshooter"

An everlasting marvel to us was the needle-threading skill with which the puffing tugs pushed their ponderous barges into locks barely big enough to contain them. The largest barges have a beam of 43½ feet and the locks are 45 feet wide. A six-inch fender on each side of the barge cuts the total clearance to six inches—three inches on each side!

"You gotta be a sharpshooter," observed a veteran canal man. "As you may have noticed, we veer to one side and slide 'em in."

We had noticed indeed. The steel side of the heavy barge sometimes kisses the steel-edged concrete wall with a glancing but mighty momentum which sends up an angry grating sound and a little cloud of cement dust.

"Must be a bit hard on the nerves," remarked Tony, "to be riding one of those big babies carrying seven or eight hundred thousand gallons of gasoline and have it do that."

But canal men told us there was no great danger. The serious accidents in locks, they said, have resulted chiefly from ignition of fumes from gasoline in jettisoned ballast water. Smoking in and near the locks is strictly forbidden.

Working River Has Moments of Glamour

At the mouths of tributary streams we saw dredges rooting up sand and gravel.

"The Mohawk Valley is a quick watershed," explained the operator of one, "and whenever we get heavy rains these streams really go to town."

Exploring the Valley by boat, car, and foot, we realized how rigidly the Mohawk is held in bondage.

Steel lift dams, with heavy gates and chains turn the river into a series of pools linked by locks. At each lock the river generates enough power to operate the gates and winches. Far downstream, at Vischer Ferry and Crescent, the flow produces such a surplus of power that it yields the State an average of more than $300,000 a year.

Yet at many points the sinuous river is brooding and glamorous. Lush trees and shrubs hang heavy heads above its curving charms.

Mohawk Valley folk have plenty of elbow-

room, except on the drabber "side of the tracks" in some of the industrial towns. Farms carpet the flats and hills; cows graze in rich meadows; and towns are islands in a sea of green.

Though it claims no fame on the ground of mere numbers, the Valley is the home of half a million people—more than Vermont and Nevada combined.

Utica's Name Plucked from a Hat

Utica, largest of the Valley cities, plucked its classical name from a pioneer's hat. The settlement at the ford of the Mohawk was known as Old Fort Schuyler and numbered 50 houses and 200 inhabitants when in 1798 "Utica" was drawn from a hatful of names at a convivial gathering in Baggs' Tavern.

A city more unlike its ancient North African namesake could hardly be imagined. This typically American manufacturing and trading center has 225 industrial plants turning out cotton cloth, knit goods, underwear, sheets, pillowcases, rayon yarn, and a variety of other goods, including heating and ventilating apparatus, air compressors, guns, fishing tackle, buffing wheels, paper products.

Utica's 1940 population of 100,518 made it the State's seventh city in size. A heavy inflow of Italians and Poles for its factories reached its peak about 1910, and 17 out of 100 residents are of foreign birth.

Of all the city's foreign groups, none makes its voice heard more melodiously than the Welsh. Worthy of Wales itself is the annual Eisteddfod given on New Year's Day by the finest singers among Utica's many residents whose roots are in that land of song.

Wide thoroughfares radiate from this old hub of Indian trails, and the city has an air of aspiration.

65 Years of Experience Go into These Fine White Gloves

Some of the many stages in the evolution of a glove are demonstrated by "Alf" Tutchings, 78, who has worked for the same Johnstown firm since he was a lad of 13. From carefully tanned imported skins, skilled cutters produce the tranks (left), which are slit (center) by dies and sewn up, or "seamed" (right). Thumbs are sewn in and the quirks and fourchettes—small pieces between the fingers—inserted. The finished glove is "laid off" on a steam-heated form.

"They have something here that you won't want to miss," said Tony, who had arrived before me. "It's the Munson-Williams-Proctor Institute in those two yellow-brick houses on Genesee Street near the Library."

In one of these Victorian mansions grew up Maria and Rachel Williams, daughters of Helen Munson and James Watson Williams, Utica capitalist. The sisters eventually married two brothers, Thomas R. and Frederick T. Proctor, and lived here side by side. Their homes and the bulk of their estates were bequeathed for establishment of the Institute,

which became active in 1935 upon the death of the last surviving founder.

Now the fine old houses, with their stables transformed into School of Art studios, form a cultural center of Utica (page 68). Its art classes, exhibitions, tours, and lectures; its motion pictures and library of musical records; its summer and Saturday classes for children in handicrafts, music, dancing, speech, and art drew a total attendance last year of 59,597.

Utica has now become a seat of higher education. The Utica College of Syracuse University opened last fall with about 700 students, and the State-underwritten Mohawk College, an emergency educational setup, began operations with an enrollment of 1,200, which grew in six months to 1,831.

Mohawk College occupies a vast collection of more than 180 cantonment-type buildings, formerly the Army's Rhoads General Hospital, on the outskirts of Utica. More than 90 percent of the students are veterans (p. 91).

The State has also established in Utica the Institute of Applied Arts and Sciences, specializing in retail management and other business training.

In Utica, incidentally, F. W. Woolworth opened his first five-and-ten-cent store in 1879. It failed!

"Where Truth and Honor Dwelt"

At near-by Clinton, seat of Hamilton College, was born the statesman Elihu Root, Secretary of War and State and United States Senator. And there, as the shadows lengthened, he chose to return "to a plain old home in the Oneida hills, overlooking the valley of the Mohawk, where truth and honor dwelt in my youth."

Hamilton, alma mater of sons so diverse as Root and Alexander Woollcott, is one of America's most distinguished small colleges. Named for Alexander Hamilton, it was founded as a school for white and Indian boys by the Reverend Samuel Kirkland, whose great influence held the Oneidas loyal to the colonists in the Revolution.

Beside the missionary in the college cemetery lies the Oneida chief Skenandoah, who died at 110 with the request that he be buried beside his friend so that he might "climb into Heaven holding on to the Dominie's coattails."

West of Utica, at Oneida and Sherrill, a thriving modern industry stands as a monument to one of America's many communal utopian experiments.

To Oneida from New England 99 years ago came a colony of "Perfectionists" led by John Humphrey Noyes, whose daring ideas included abandonment of individual, sentimental love in favor of matings directed by the community. The practice he advocated died young, but the silver-plating industry established by the energetic Perfectionists has flowered into Oneida, Ltd., making Community Plate, the "silverware for brides" (Plate XIII).

North of Utica stretch the vast pine-scented Adirondacks, with their wooded slopes and myriad lakes and streams.* Instead of yielding to their appeal we kept our rendezvous with the river and rolled on down its south shore.

On the boundary between the Oneida country to the west and the lands to the east where the Mohawks held sway stands the industrial town of Frankfort, which pioneered in making matches but now has turned to milk products, road machinery, and farm tools.

Farmers Fathered Ilion's Industries

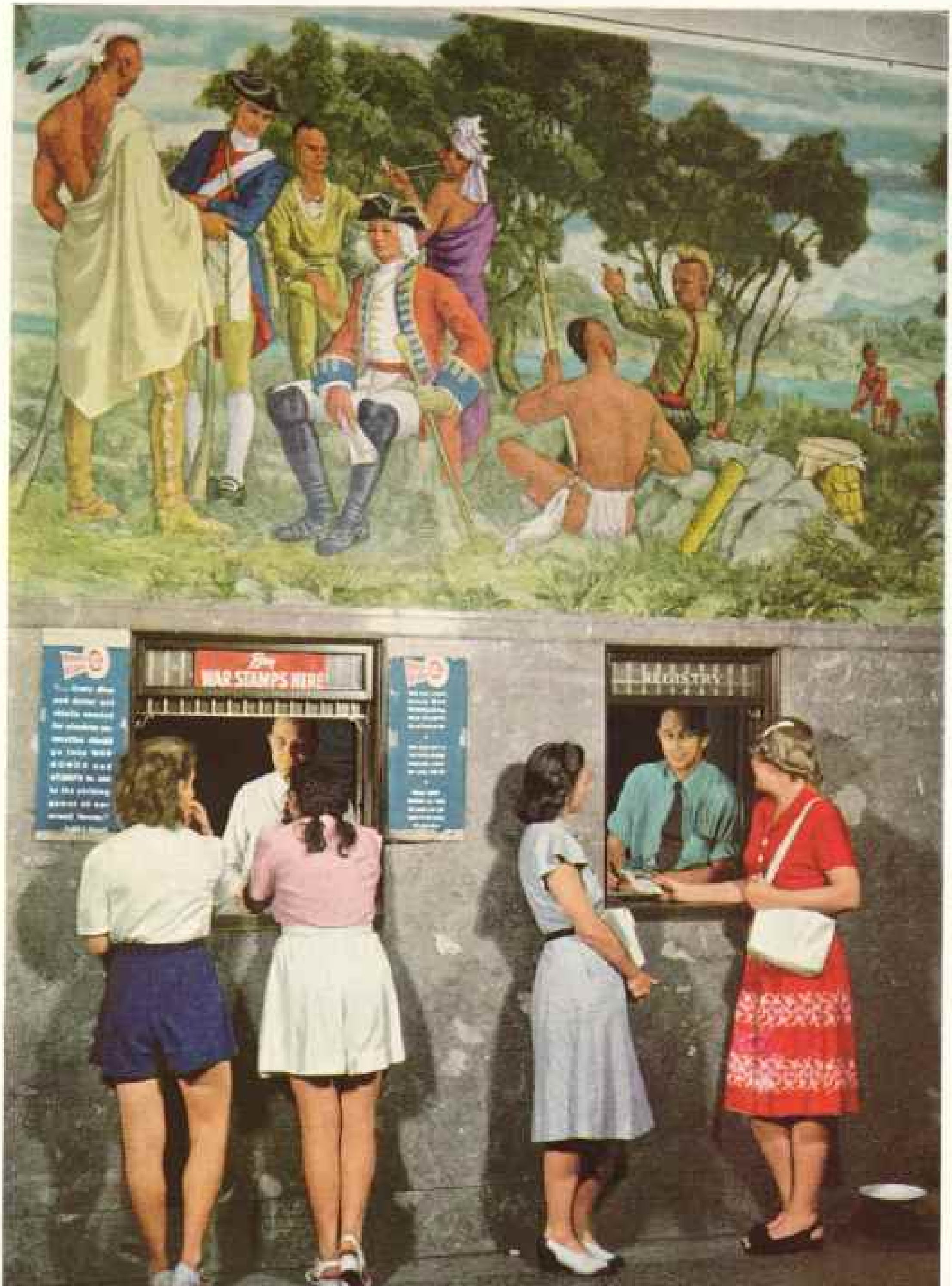
If a match is the symbol of Frankfort, a gun and a typewriter should represent Ilion. This busy town's lifelong livelihood stems largely from the talents of the Eliphalet Remingtons, father and son, farmer-mechanics both, who came here from Connecticut in 1800. Young Eli made himself a rifle, and when neighbors clamored for one as good he and his father began manufacture of firearms. Later, in 1873, their descendants produced the first successful commercial typewriter.

Up in Ilion Gorge above the town stand remnants of the old Remington forge, ancestor of the Remington Arms plant and the Remington-Rand factory making typewriters, office equipment, and filing systems. These plants, with a normal total of more than 6,000 workers, form the industrial heart of the Frankfort-Ilion-Mohawk community.

Almost any employee of Remington Arms, now under control of Du Pont, can tell you that Remington rifles rode west on oxcart and covered wagon, were standard equipment on pony express, and teamed with ax and plow to build our Nation. Remington has made arms for every war the United States has fought since 1847 (page 91).

In near-by Mohawk, third of these triplet towns, stands the old Shoemaker Tavern, still doing business. Past the tavern panted the scout Adam Helmer on a September day in 1778 as he neared the end of his 44-mile run to warn the settlers that Joseph Brant and his Indians were at his heels. His fellow scouts watching the southern hills had all been killed and scalped in the chase.

* See "New York State's Air-conditioned Roof" (Adirondacks), by Frederick G. Vosburgh, in the National Geographic Magazine, June, 1938.



Kodachrome by B. Anthony Stewart

From Savages to Girls in Shorts in Less than 200 Years

Like a double exposure of past and present is this scene in the Amsterdam, New York, Post Office. The mural by H. E. Schnakenberg shows Sir William Johnson (1715-1774), Mohawk Valley squire and Superintendent of Indian Affairs, receiving a wampum belt of friendship.

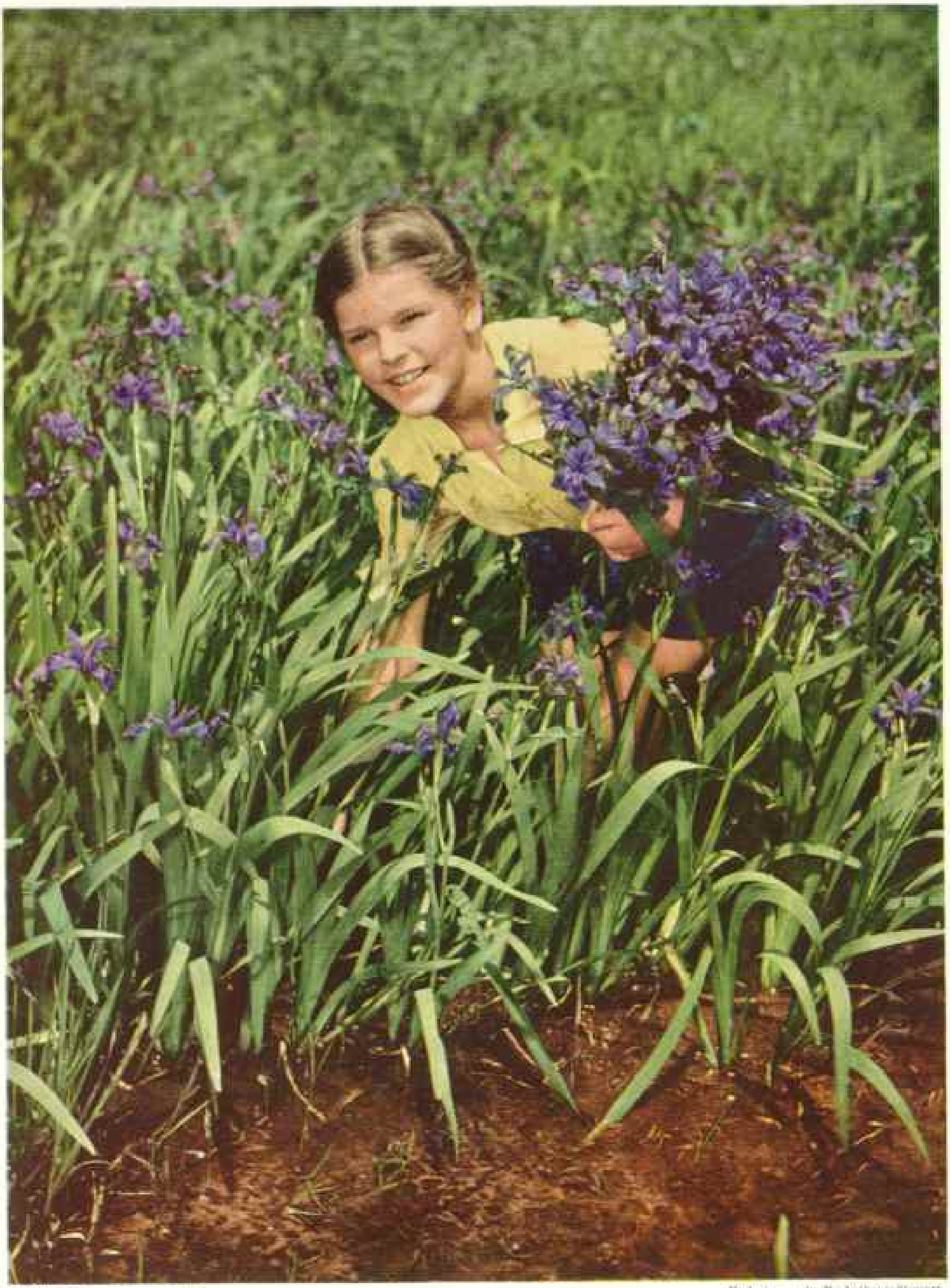
Kodachrome by B. Anthony Stewart

A New Idol Beside the Old—Union College Men Judging a Fashion Show Name This "Fireman's Red" Wool Dress the Winner

Styles chosen by Junior Dress Creators of New York were telecast over Schenectady's Station WRGB, which also exhibited them before these college connoisseurs. Union's Chinese "Idol," gift of a missionary graduate, is smeared with red or green by sophomore or freshman winners of the annual paint fight.

"Post Two Men Behind Each Tree!" General Herkimer Directing the Battle of Oriskany

When he saw that the Indians would wait for a shot, then rush their man before he could reload, the General ordered his troops to fight in pairs. With blood staining the bandage on his wounded leg, the stouthearted leader sits on his saddle with his back against a beech tree in Frederick C. Yohn's famous painting, reproduced by courtesy of the Utica Public Library. "I will face the enemy," he said.



Kodachrome by B. Anthony Stewart

In the Middle of the Mohawk at Its Source She Gathers Wild Iris

Barefooted Barbara Carpenter needs no geography book to tell her where central New York's historic river rises. Its birthplace is a patch of "blue flag" swale where her father's farm adjoins two others on Mohawk Hill, north of Rome. Thence it flows 160 miles to its union with the Hudson.

Wash Boilers Instead of Weapons Now Issue from Rome, "The Copper City"
Turning from rockets, projectiles, and airplane parts, this plant pours out pots, pans, boilers, and thousands of teakettles a day. Here a solderer seals the seams in a newborn copper washtub.

"How Do You Like My Table amid the Cable?"
Wire made by this cable company at Rome ranges from hairlike strands for Christmas tree decoration to high-tension cables for carrying heavy loads of electric power. Bright colors aid electricians in identifying wires.

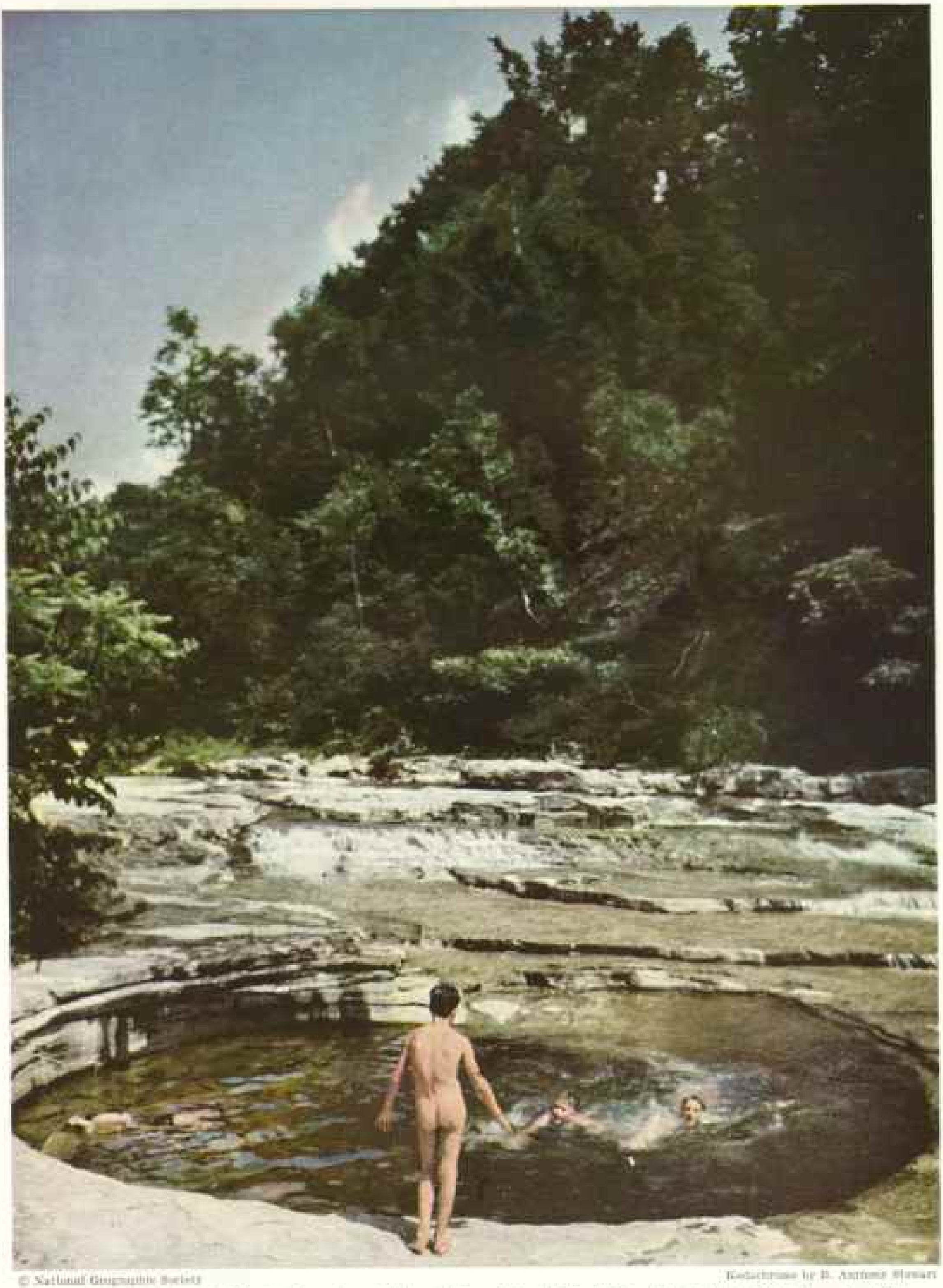
Kodachrome by B. Anthony Stewart

Bacon Adds Its Fragrance to the Misty Morning as the Crew of the *Wanderwell* Cooks Breakfast on an Old Wrecked Barge

Kodachrome by B. Anthony Stewart

Day Breaks Like a Dewy Benediction over a Mohawk Valley Farm

First rays of summer sunlight presage the barnyard chores and burn away the mists of night hanging over the hills beyond the river. This scene of pastoral peace is the Nicholas Schuyler farm near Little Falls.



 Kodachrome by B. Anthony Stewart

Indians Called This Swimming Hole "Canajoharie"—"The Pot That Washes Itself"

The rhythmical name is borne by the creek and the Mohawk Valley town at its mouth, home of the Beech-Nut Packing Company. As if wearied by years, the swirling waters no longer keep the pothole clean, but the silt on the bottom provides added safety for swimming boys.

Thanks to Helmer, the settlers reached the forts in time. But black behind them rose the smoke of their hopes as the Indians burned their homes and crops.

In Mohawk lived the man who launched the profession of "Government girl." Gen. Francis E. Spinner, appointed United States Treasurer by Lincoln in 1861, was the first to employ women in Government offices. Appropriately, his first appointee, Miss Jane Douglass, was from Ilion, whence came the machine which was to call the nimble fingers of millions of women into the offices of the land.

At Herkimer, across the river, grateful women employees of the Treasury Department erected a statue of this brave man. In the same park a vital, arresting bronze shows General Herkimer directing the Battle of Oriskany and bears his name the way he wrote it: "Herchheimer."

Stony, brawling West Canada Creek, one of the Mohawk's chief tributaries, pours into it at Herkimer, and here several industries have developed—office furniture, women's clothes, nutcrackers, air guns, gloves, paper, milk coolers.

Milk Rides Big "Vacuum Bottle" Trucks

From a Herkimer milk station a tank truck was taking off for New York with 3,580 gallons of milk only one or two degrees above freezing. Supplementing milk trains, these giant vacuum bottles on wheels make the 220-mile trip in eight hours. Some of the milk gets from cow to New York consumer in half a day.

Much of the milking machinery comes from Little Falls, six miles downriver, where the Mohawk pays toll in water power as it races through its narrow gorge (page 74 and Plate XIV). Other factories add bicycles, velocipedes, tissue paper, breakfast foods, knit articles, and felt products to the Valley's outpouring of varied industrial goods.

Dolgeville, to the north, pioneered in felt manufacture and in the earning-sharing system of employee benefits.

Below Little Falls, on the south side of the river, the old homestead of General Herkimer gazes out at passing trains and the mirror of the Mohawk. Beside this red-brick farmhouse, maintained by the State, rises a monument to the general, who died here ten days after Oriskany from amputation of his leg.

Near by dozes the Indian Castle Church, built as a Mohawk mission in 1769. Here Joseph Brant, future great war chief, translated the Gospel of St. Mark into Mohawk. He and Nicholas Herkimer, neighbors, were later to be foes to the death in the dark defile of Oriskany (Plate III).

Nine miles upriver is one of the rocks against which the red tide dashed in vain—the sturdy old limestone Dutch Reformed Church which served as a fort in the Revolution. Over the original entrance, now walled up, is carved "J. H. E. 1767," meaning "Johan Herkimer Erbaut (built)." Old Johan was the general's father.

In this vicinity centered much of the action of Walter D. Edmonds's *Drums Along the Mohawk*. Almost every well-built stone house was a fort.

Below the felt shoe and underwear manufacturing town of St. Johnsville stands the old Palatine Church, solid and sturdy as the Lutheran pioneers who built it in 1770.

Among the families that helped erect this church were the Nellises, for whom near-by Nelliston is named. When Indians shot blazing arrows at the roof during the 1780 raid, one of the Loyalist Nellises, a lieutenant in Butler's Rangers, stayed their hand. Now, in normal times, members of the family from Canada, the Valley, and far afield flock here for an annual reunion.

Transriver twin of Nelliston is Fort Plain, whose now-vanished fort on the south shore hills was a key to the Valley's defenses. Historic old homes stand on river-built terraces, and here Nelson Greene, Valley historian, dwells in a house so buried in shrubbery that his wife once said she lived "at the bottom of a green well."

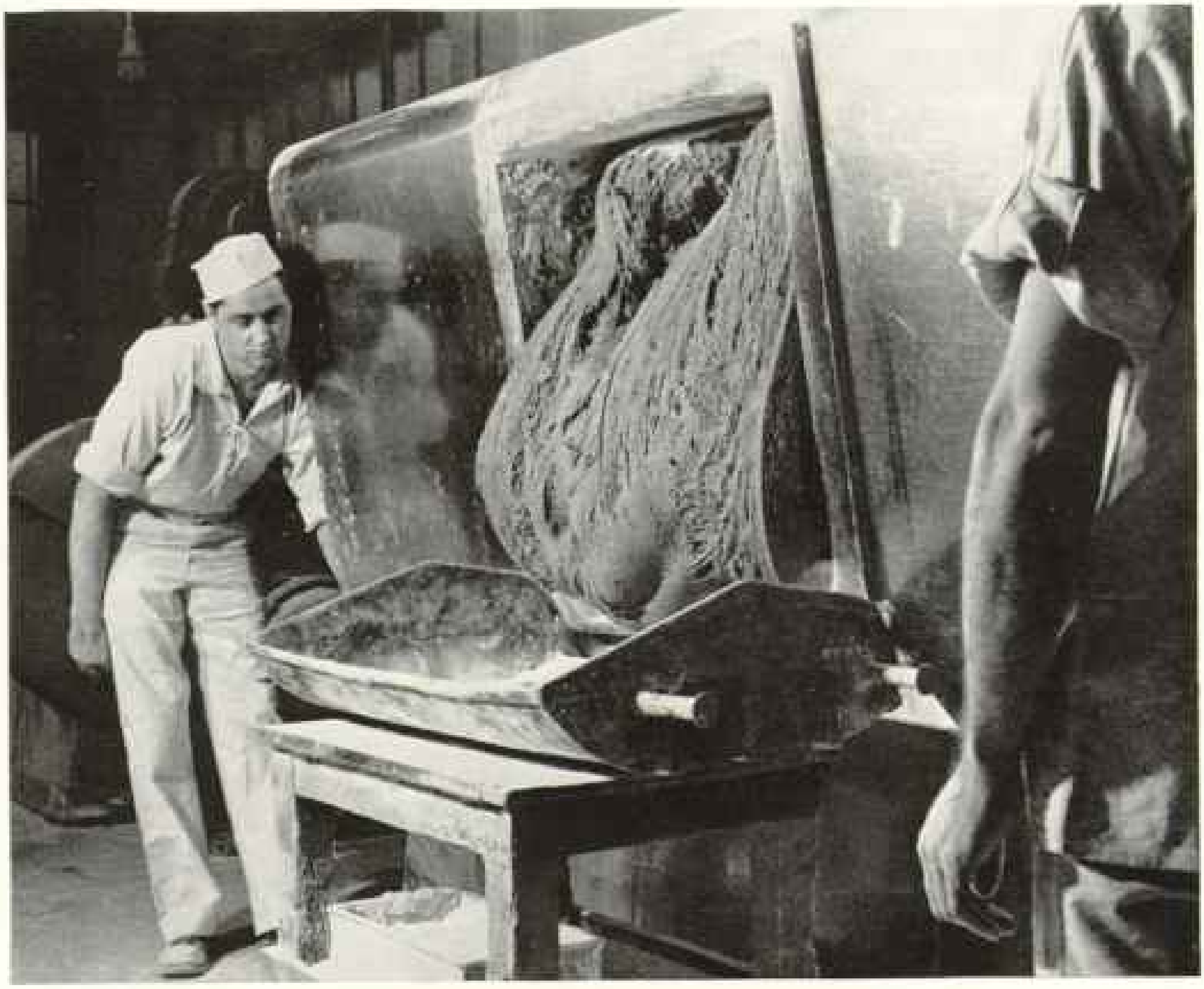
Abeel Island, just north of town, is named for the Dutch trader, John Abeel, who fathered—by two different Indian women—both the Seneca chief Cornplanter and Handsome Lake, reformed drunkard and 19th-century prophet, whose doctrines are still religiously followed by many Indians on New York State reservations.

Gums along the Mohawk

In Canajoharie, three miles downriver from Fort Plain, we tried an experiment. The town's Indian name, meaning "the Pot that Washes Itself," comes from a pothole in Canajoharie Creek which was kept continually clean by the swirling motion of the water. How many residents, we wondered, knew the name's origin and could point out that aboriginal washing machine?

"Can you direct me to the Pot that Washes Itself?" I asked a young man I met on the street. "The what?" He looked at me as if he thought I myself might be a pot slightly cracked.

But the next half-dozen residents knew,



Gum Gets a Mechanical Chewing—a Mouthful for a Giant

Chicle, sugar, corn syrup, and flavoring are combined in this mixer at the Beech-Nut Packing Company plant in Canajoharie, New York. Next, the mixture flows through rolling machines—a continuous belt of gum on a blanket of sugar.

especially a small boy. "Sure, I go swimmin' there," he said, and led us to it (Plate VIII).

"Beech-Nut Town" is a good alternative name for Canajoharie, since everything revolves around the Beech-Nut Packing Company, founded here 56 years ago to commercialize a home recipe for barrel-smoking Mohawk Valley hams. Thus Beech-Nut, first known as the Imperial Packing Company, had its origin in a barrel.

Today the Beech-Nut tree has so grown that its branches spread from coast to coast, with plants at Brooklyn and Rochester, New York, and San Jose, California, as well as Canajoharie.

From the big, clean, red-brick-and-white-concrete buildings of the parent plant pour peanut butter, baby foods, and chewing gum. All the gum is made in air-cooled rooms to keep the product from getting sticky and gumming up the works. Rooms bore distinctive flavors—peppermint, spearmint, cinnamon.

"These girls must smell sweet," said Tony, "even off duty. I can imagine some swain writing to the company: 'Please change Nellie to the peppermint department. I'm getting tired of spearmint.'"

Another department was heavy with the odor of Virginia and Spanish-type peanuts blended to give the right flavor to peanut butter. A third was flavorful of vegetables and fruits as deft-handed workers, mostly women, turned out small, scrupulously sanitary glass jars of strained and diced foods for the Nation's bumper crops of postwar children. Beech-Nut, emphasizing purity above all else, was one of the first food companies to hire a manicurist.

But Beech-Nut and the late Bartlett Arkell, its president for 50 years, have ministered to other tastes than that of the tongue. In the Arkell Memorial Building across the street is the Canajoharie Library and Art Gallery, containing several originals by the great New

Guns in This Picture Span a Hundred Years of Remington Arms

Behind a shining array of modern sporting weapons, a veteran of 35 years at the Remington plant in Ilion aims a new pump shotgun. On the bench are a 19th-century sporting gun with German silver mountings and the Jenks and Geiger carbines made for the war with Mexico and the War Between the States.

Associated Colleges of Upper New York

"How Do You Say 'I Love You' in Spanish?"

Married students team up on their lessons at coeducational Mohawk College, Utica, one of the three Associated Colleges of Upper New York organized in 12 hectic weeks to meet demand for a "GI university."

Scourge of the Valley Was the War Chief Joseph Brant

Well educated and commissioned an officer by the British, the imperious, resourceful son of a full-blood Mohawk and possibly a part-white mother led the Iroquois in raid after raid upon the bleeding Mohawk Valley during the Revolution. He was known to the Indians as Thayendanegea—"He Places Two Bets Together"—in reference to the custom of fastening together the articles wagered in tribal contests. One of the most remarkable Indians of the 18th century, Brant was feted in England, where this Romney portrait was painted.

England painter of marine scenes, Winslow Homer, and many other masterpieces.

One action-filled canvas by Edward P. Buyck shows men of Gen. James Clinton's brigade hauling their bateaux and supplies up from the Mohawk and over the beetling hills above Canajoharie on their way to Otsego Lake in 1779 for the punitive Sullivan-Clinton Expedition. In grim retaliation for raids on the Valley, this dogged, powerful force—a great "blue snake" to the Indians—laid waste their villages in the Finger Lakes region and dealt the Iroquois a fatal blow.

On the site of Reuff's Tavern—General Clinton's headquarters—is the Beech-Nut-owned Canajoharie Hotel with its Valley-famed dining room. Beech-Nut's Fort Rensselaer Club, in the nearly two-century-old Van Alstyne House, is a virtual museum of Mohawk Valley history.

Amid the elms of German-settled Palatine Bridge, across the river, are such diverse structures as Fort Frey, built in 1739, and the elaborate Victorian mansion of the inventor Webster Wagner (1817-1882). One-time wagon-maker and village freight agent, he invented a sleeping car and a drawing room, or "palace," car. Ironically, he died in a railroad wreck.

Beyond the bluffs of the Noses, where rattlesnakes lurk, we came to the site of old Caughnawaga, a fortified village or "castle" of the Mohawks, which was totally destroyed by French soldiers and Canadian Indians in 1693.

With plow, spade, and metal-detector, scholarly Father Thomas Grassmann, Franciscan Father in charge of the Tekakwitha Friary, has unearthed numerous Indian relics. Aerial photographs have helped him locate the exact site of the ill-fated Indian village, which stood about a half mile west of present-day Fonda, seat of Montgomery County.

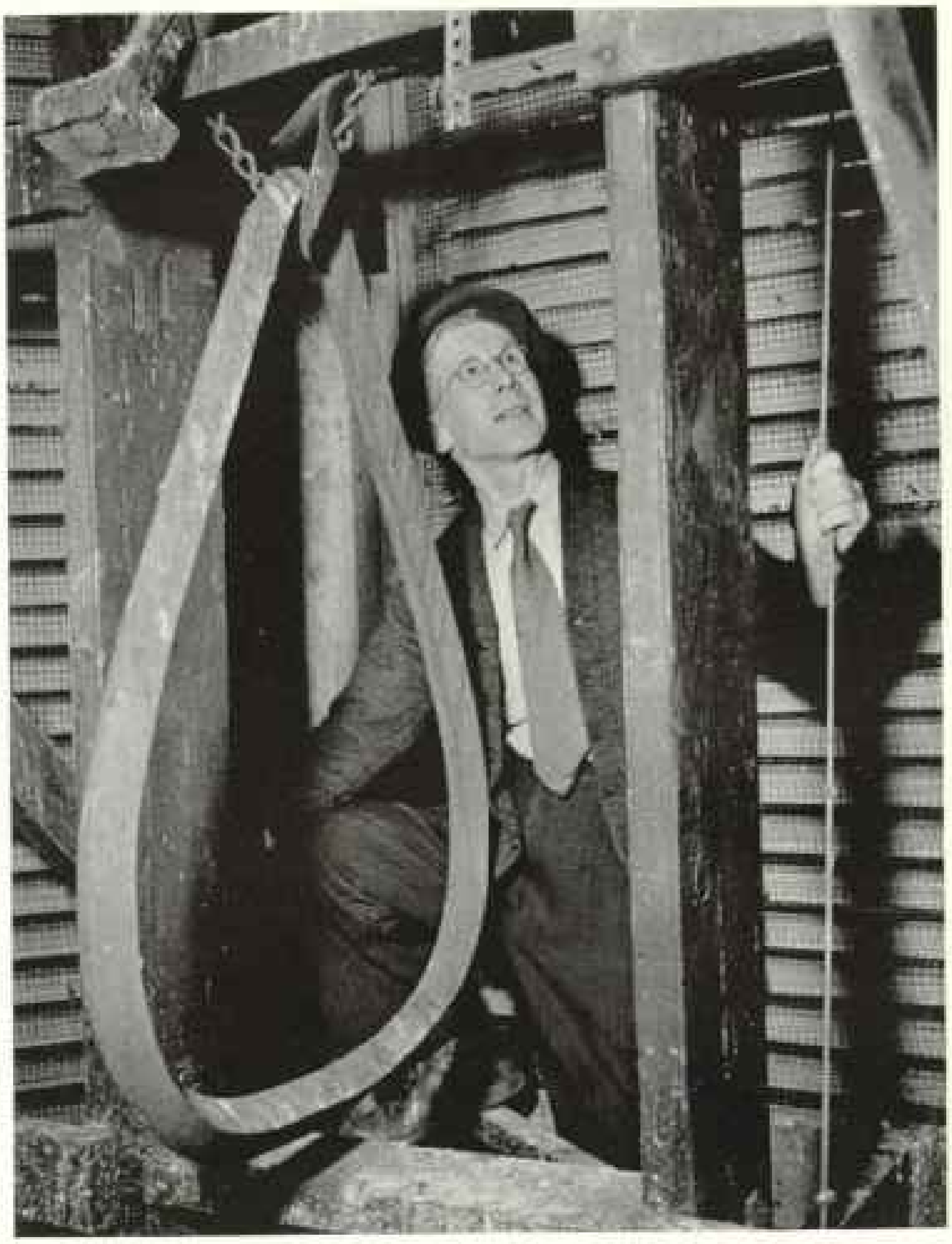
At the Fonda fairgrounds, near the bridge to the twin town of Fultonville, is another of those contrasts which make the present-day visitor to the Valley so keenly aware of its history. In the center of the race track where sulkies whirl is a weed-grown patch of stone—the foundation of the home of old Douw Fonda, who refused to flee from the Tory and

"Hold Fast That Which Is Good" Might Well Be the Motto of the Older Generation

In Grandma Baker's living room at Johnstown, four generations enjoy an old-fashioned game of Crokinole—"Gram," 89; her daughter (right), grandson, and great-grandson (left), with a neighbor girl as his partner.

At Fort Johnson, Weird Faces Peer out of the Past

Children don Indian ceremonial masks from the fortlike early home of Sir William Johnson (pp. 94, 103). Left to right are medicine man's and pipe fighter's masks and the "beggar's mask" of children seeking gifts.



Johnstown's "Eternal Triangle" Announces Sessions of Court

For generations its bell-like tones have summoned lawyers and litigants to the neat red-brick Fulton County Courthouse, erected in 1772 by Sir William Johnson (page 96). In the pigeon-inhabited belfry Tom Dawes inspects the rope which operates the hammer at upper left.

Indian raiders of 1780. They took his life and scalp and put his home to the torch.

Today little Fonda makes glove linings and serves as an outlet for the "glove cities"—Johnstown and Gloversville—to the north.

Legends Cluster about "Sir Bill"

At Johnstown stands Johnson Hall, the blockhouse-defended baronial mansion of Sir William Johnson, pre-Revolutionary Superintendent of Indian Affairs in most of British North America (Plate I and p. 106). The remarkable Irishman is buried in St. John's churchyard in this city he founded and named. Around him stories and legends cluster, though "Sir Bill" has been dead these 173 years.

One relates to a deal with his friend "King" Hendrick, the Mohawk war chief later killed fighting the French at Lake George in the battle which won Johnson his baronetcy.

Admiring a richly embroidered coat belonging to Johnson, the Indian said to him next day, "Brother, me dream last night."

"Indeed," replied Johnson. "What did my brother dream?"

"Me dream that coat be mine."

Without hesitation Johnson answered, "My friend has dreamed truly. That coat is his."

But to Hendrick the following day Johnson said, "My brother, I dreamed last night."

"And what did my white brother dream?" asked Hendrick, doubtless already suspecting it had been an expensive coat.

"I dreamed this land belonged to me," said Johnson, indicating on a map a 66,000-acre tract between present-day Herkimer and Johnstown.

"My brother dream truly. The land is his," replied the chief. "But he must not dream again!"

Johnson was equally successful in acquiring wives. One was a niece of Hendrick, and the last was Molly Brant, the redoubtable Joseph's sister. He fathered many half-breed children, but his best-known offspring were by his first wife, Catherine Weissenburg.

A pretty German girl, she was "bound out" to a Valley man named Phillips when the rising squire, Johnson, admired her. As Phillips is supposed to have told it: "Johnson, that tamned Irishman, came t'other day and offered me five pounds for her, threatening to horsewhip me and steal her if I would not sell her. I thought five pounds petter than a flogging and took it, and he's got the gal."

Catherine became Johnson's housekeeper, and later his wife, bore him a son and two daughters, and died at 25. The son became Sir John Johnson, who fled to Canada early in the Revolution and led raids on the Valley.

To the Indians Sir William was a combination of ambassador, father confessor, and Santa Claus. His gifts —and an Irish gift of the tongue—kept the Iroquois off the necks of the English, and actually fighting on their side when needed, throughout Sir William's lifetime. When he finally collapsed of apoplexy in the midst of a long speech to complaining tribesmen at Johnstown in 1774, his last words were an appeal to Joseph Brant to control his people.

A Descendant of Joseph Brant Enters Historic Johnson Hall

In Mohawk costume, Mrs. Ethel Brant Monture, of Rochester, New York, great-great-granddaughter of the chief, seems the reincarnation of Molly Brant, Indian wife of Sir William Johnson, who presided at the stately baronial mansion still standing in elm-shaded, historic Johnstown. Lecturer, teacher, and research worker in biology, Mrs. Monture collaborated with Harvey Chalmers, 2d, of Amsterdam, in writing the recent Joseph Brant biographical novel, *West to the Setting Sun*.

One Brant Burned, Another Builds

Though schooled in the white man's ways, Brant was a Mohawk above all. Sick at heart, his depleted people had taken to staring into the fire as settlers took their hunting grounds and traders debauched them with rum. Brant roused them for one last fight.

Taking his Mohawks to Canada and stirring up other Iroquois tribes, he raided the Valley again and again with an unswerving twofold purpose: to destroy the farms and crops of the Mohawk and Schoharie Valleys, vital granaries for Washington's armies, and to drive the whites from the Mohawk homeland (page 92).

"Brant's in the Valley!"

Half a dozen generations ago that shouted news was enough to prickle the scalp of the bravest settler along the Mohawk. Men snatched up musket and powderhorn; warning guns boomed from the little stone forts; and the luckier families fled for the stockades a jump or two ahead of Brant's tomahawk-swinging, torch-bearing redskins and "blue-eyed Indians"—nearly naked, war-painted white Tory renegades.

Today Joseph Brant is a peaceful contractor living in Gloversville. Direct descendant of the dreaded warrior, he builds houses where his ancestor burned them. He came here from Canada, where the British gave the Mohawks land for their help in the Revolution.

Did any inner compulsion draw this new Joseph Brant back to his ancestral valley? Not that he knows or will admit.

"I thought," he said, "it would be a nice place to set up a little business."

But among the visitors drawn to Johnson Hall were this Joseph Brant and Ethel Brant Monture of Rochester, New York, great-great-granddaughter of the chief (page 95).

In the solid mahogany stair rail at Johnson Hall are deep gashes which tradition says were made by Brant's tomahawk as a sign to his warriors to spare the house.

Another story relates that when prisoners were being taken toward Canada, after the Cherry Valley massacre, Brant ordered one of them, a Dutchman, to go back about two miles and get some birch bark—meaning for him to escape. To the Dutchman an order was an order, and he reappeared bearing the birch bark, much to the chief's disgust.

One of the last battles of the Revolution was fought on October 25, 1781, at Johnstown, where the well-preserved stone fortress-jail still serves as calaboose. North of town the raiders under hated Walter Butler were beaten, and he himself was later shot dead when he paused to gesture defiance at the pursuers.

Tales of atrocities perpetrated or permitted by Butler still linger in the Valley—though recent historians paint him in a better light—and as a boy I shivered at the sight of sinister old Butlersbury, south of Johnstown. Given a face lifting with new white siding by its present farmer occupant, the ancestral home of the Butlers now bears a less evil and secretive look. But it still evokes a shudder in those brought up on the writings of Robert W. Chambers, who lived at near-by Broadalbin.

Colonial Courthouse Still in Use

In Johnstown, seat of Fulton County, court still convenes in the colonial courthouse built by Sir William Johnson in 1772. From the belfry atop its neat red-brick symmetry, a rope-pulled hammer hitting an old metal triangle summons lawyers and litigants to court after recess as of yore (page 94).

But in front of the witness chair is a wooden panel built in 1929. No sleek modern feminine legs shall be suffered to distract or influence this court!

From above the judge's bench looks down the portrait of Judge Daniel Cady, father of the feminist Elizabeth Cady Stanton, most famous of Johnstown's daughters. In the judge's office, more than a century ago, she noted how tragically the laws of the time discriminated against women, and in a long, energetic life successfully fought for women's rights, including equal suffrage.

On near-by Green Street, in front of the 1763 home of the schoolmaster of Sir William Johnson's free school, now stands a glove-shop sign pointing to a factory in the rear.

Abundance of deer for buckskin led to early establishment of the leather industry at "Stump City," now Gloversville. Settlement of the site began in 1752 after purchase of a 20,000-acre tract here by one Arent Stevens and nine others for "three pieces of showde (shoddy), six pieces of gailing linen, three barrels of Beer, six gallons of Rum, and a fatt Beast."

Today progressive Gloversville is a city of 23,300, nearly two-and-a-quarter times the size of adjoining Johnstown.

Source of many of the fine gloves worn in the United States, Gloversville and Johnstown today have large tanneries and hundreds of glove factories, ranging from tiny backyard handicraft shops to elaborate modern plants.

Hand in Glove with Geography

Hides come from far corners of the earth. At a typical Gloversville tannery we saw bulky bales of skins roll in from Brazil, South Africa, Nigeria, and the Anglo-Egyptian Sudan. The dusty hide worn by a hair-type sheep roaming the vast South African veldt will grace slender feminine hands as chic dress gloves next Easter (Plate XII and page 79).

Other exotic hides undergo a similar transformation. The original wearer of the skin in some "pigskin" gloves may have been a Mexican peccary or the carpincho, or capybara, a largely aquatic South American rodent.

Fine kid gloves are a specialty here, though numerous other kinds are made, including fabric and baseball gloves.

Many workers and factory owners are descendants of skilled glovemakers who came from England, Scotland, or continental Europe generations ago.

For sewing, some factories now send gloves all the way to Puerto Rico and back by plane.

A hundred other products of the two cities range from baseballs to baby food.

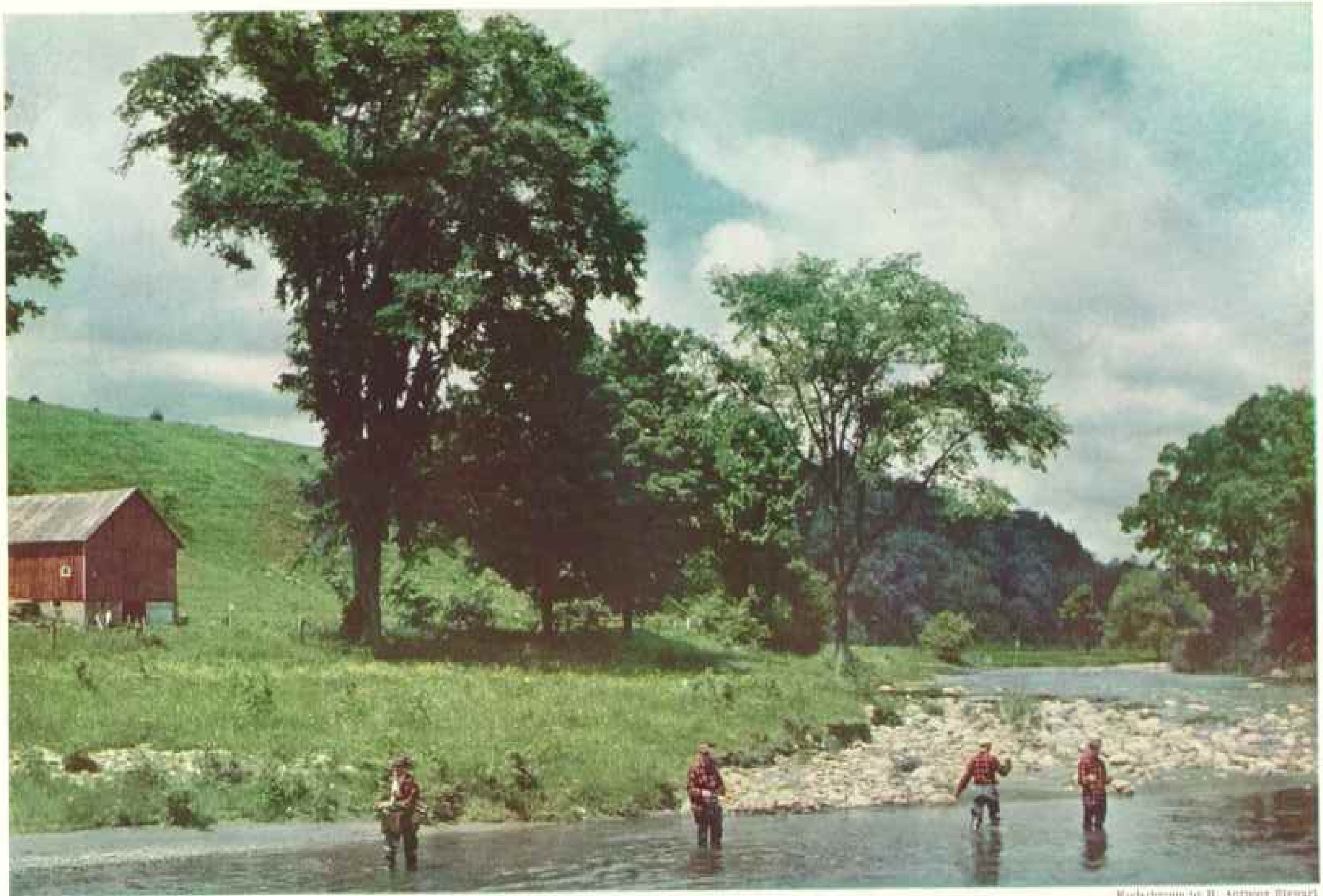
In Johnstown 57 years ago was founded a business which has won Nation-wide repute. Charles B. Knox, son of a Mohawk Valley flour and feed merchant, had been a lumberjack, sheepherder, Texas Ranger, and traveling salesman when he learned of a new process for making gelatine and began its manufacture. He had to carry glove samples to pay his expenses while introducing the product, and the business was only a struggling infant when he died in 1908.

His widow, however, proved to be one of the outstanding businesswomen of her time,

Kodachrome by B. Anthony Stewart

Near This Idyllic Trysting Spot, Temples of Atomic Research Rise

On the opposite bank (out of picture at left) are General Electric's huge new Research Laboratory and the Government's Knolls Atomic Power Laboratory below Schenectady. Upriver, the Rexford highway bridge is built on a stone aqueduct which carried the old Erie Canal across the Mohawk.



Kodachrome by B. Anthony Stewart

Fishermen Wade and Whip for Trout in the Young and Carefree Mohawk Near North Western, North of Rome

Kodachrome by B. Anthony Stewart

Like Subjects Salaaming a Potentate, They Bow to Weed the Lowly Onion

Down the long rows on hands and knees go boys and girls earning vacation money in the black-earth salad bowl at Rome. Summer work in these flat, fertile mucklands helps many a descendant of Italian and Polish immigrants to get a financial start toward a college education.

His Electric Knife Cuts Out Sweat Shirts for Athletes, Whole Teams at a Time

Many thicknesses of cotton cloth are sliced to the proper pattern in a knitting mill at Utica. Knit and woven goods rank first in the varied industrial output of this busy Mohawk Valley metropolis.

Kodachromes by B. Anthony Stewart

With the War Over, Color Is Coming Back to Milady's Gloves

In Gloversville she examines a colorful pair of kids. Here and in adjoining Johnstown millions of imported skins are tanned, dyed, and made into gloves. Hair sheep yield both velvety suede and glossy cape.

Against the Rainbow Round Her Shoulder, She Checks the Hues in Rugs
At the carpet city of Amsterdam, rug samples are inspected for color before the giant looms get the green light. The "color box" holds 5,000 standard shades—so many they are known by numbers, not names.

Kodachromes by B. Anthony Stewart

Teapots from Utopia—Silverware in the Making at Oneida Community

A veteran of 30 years' service at Oneida, Ltd., solders handles and spouts on copper teapots to be silver-plated in an electrolytic bath. The industry, now employing 3,500, was established by "Perfectionists" from New England.

Kodachrome by B. Anthony Stewart

Not Much Elbowroom! Into Lock 17 at Little Falls a Sharpshooting Tugboat Captain Pushes an Oil Barge

Shoehorned into the lock with little to spare, barge and tug will be lowered 40½ feet to the Mohawk beyond the falls. Petroleum and its products make up 89 tons of every 100 moving through the Valley by canal. Next come molasses, iron and steel, wheat; sand, stone, and gravel; chemicals and drugs.

Kodachrome by B. Anthony Stewart

In a Television Studio at Schenectady, Andrew Jackson Urges His Pipe-smoking Wife to Come with Him to Washington

Programs at General Electric's Station WRGB range from historical plays and opera to musical comedy and fashion shows. All action is shot by three cameras, two of which are on wheels for ready movement. First one, then another is on the air as the director shifts from general view to close-up.

Kodachrome by B. Anthony Stewart

Picture of Peace, but on This Hill Early Missionaries Met Torture and Death

Boy, girl, and collie climb from Route 5S toward the Shrine of Our Lady of Martyrs, at Auriesville, above the Mohawk, where Father Isaac Jogues and his fellow "Black Robes" were murdered by Indians 300 years ago. Canonized in 1930, they became the first North American saints of the Roman Catholic Church.

and from this humble beginning she built the Knox Gelatine Company of today, with its large manufacturing plant at Camden, New Jersey, and its offices and packaging plant in Johnstown. At 89 Mrs. Knox is still a source of wise counsel to her son and grandson who now run the business. Among her many benefactions to Johnstown are a home for women, elaborate athletic field, and Y.M.C.A. swimming pool.

From bone from Argentina the firm makes gelatines for salads, desserts, baby food, soups, and confections, for photographic film, capsules, and sanitary coatings for meat and other foods. Knox products are used in treatment of peptic ulcers, and an outstanding recent addition is a blood plasma substitute, developed during World War II.

Carpet City Notes Craving for Color

Neighboring Amsterdam's livelihood rests largely on rugs and carpets, first made there by John Sanford 109 years ago.

At a big carpet plant the manager told us that lack of labor was the chief bottleneck preventing full production.

Into the wool-washing department poured bales of strong coarse-fibered wool from Ireland, Iran, India, China, Australia, New Zealand, Egypt, Turkey, Arabia—all over the world except home. American wool is of such fine quality that most of it goes into clothing, not rugs.

While we watched giant looms, almost fully automatic, weave each petal in just the right place in intricate flower designs, a company official commented on tastes and trends.

"Americans," he remarked, "are becoming more color-conscious than ever. Lighter, brighter colors are in demand now. The style started on the Pacific coast and in the Southwest" (Plate XIII).

Among the other products of this industrial city of 33,300 are pearl buttons, paper, gloves, boxes, and baseballs; underwear, shirts, sportswear, looms, and brooms. Large quantities of broomcorn were once grown in the Mohawk and Schoharie Valleys.

Col. Guy Johnson, Sir William's nephew and son-in-law, lived in Guy Park Manor, close to the river, and at near-by Fort Johnson is Sir William's early home (page 93).

Both Tribes Hill and Fort Hunter, at the mouth of Schoharie Creek, were once strongholds of Mohawk clans, and at Auriesville perches the great shrine of the Valley. Here stood the Mohawk village of Ossernenon, where America's first canonized martyrs—Isaac Jogues, René Goupil, and Jean de Lalande—died for their faith 300 years ago.

Through the help of the Protestant dominie Johannes Megapolensis of Fort Orange (now Albany), Father Jogues escaped after his companions had been killed by the Mohawks and he himself had suffered terrible torture. But the heroic "Black Robe" returned from France to the scene of his travail and eventually his tomahawked head was spiked on the Indian palisades.

In the dim ravine where he walked and prayed, wood thrushes sound their flutes at dusk. "It seems," said Tony, "as if he walked here still."

Near the spacious Coliseum on the hilltop we talked with learned, congenial Jesuits who watch over the shrine with loving care.

Besides stone tomahawks and other implements, they have found skulls and skeletons of Indians and also of two Negroes.

Inadvertent assistance is given by groundhogs, which occasionally bring up human bones, thus indicating where to dig. "But as archeologists," one Jesuit dryly observed, "they are not very scientific."

Driving on downriver toward Schenectady, we stopped at the little whitewashed Jan Mabie House at Rotterdam Junction. Built about 1680, it is the oldest still standing in the Valley. A local policeman, his children, and grandchildren are tenants, but descendants of the Mabie family still own it.

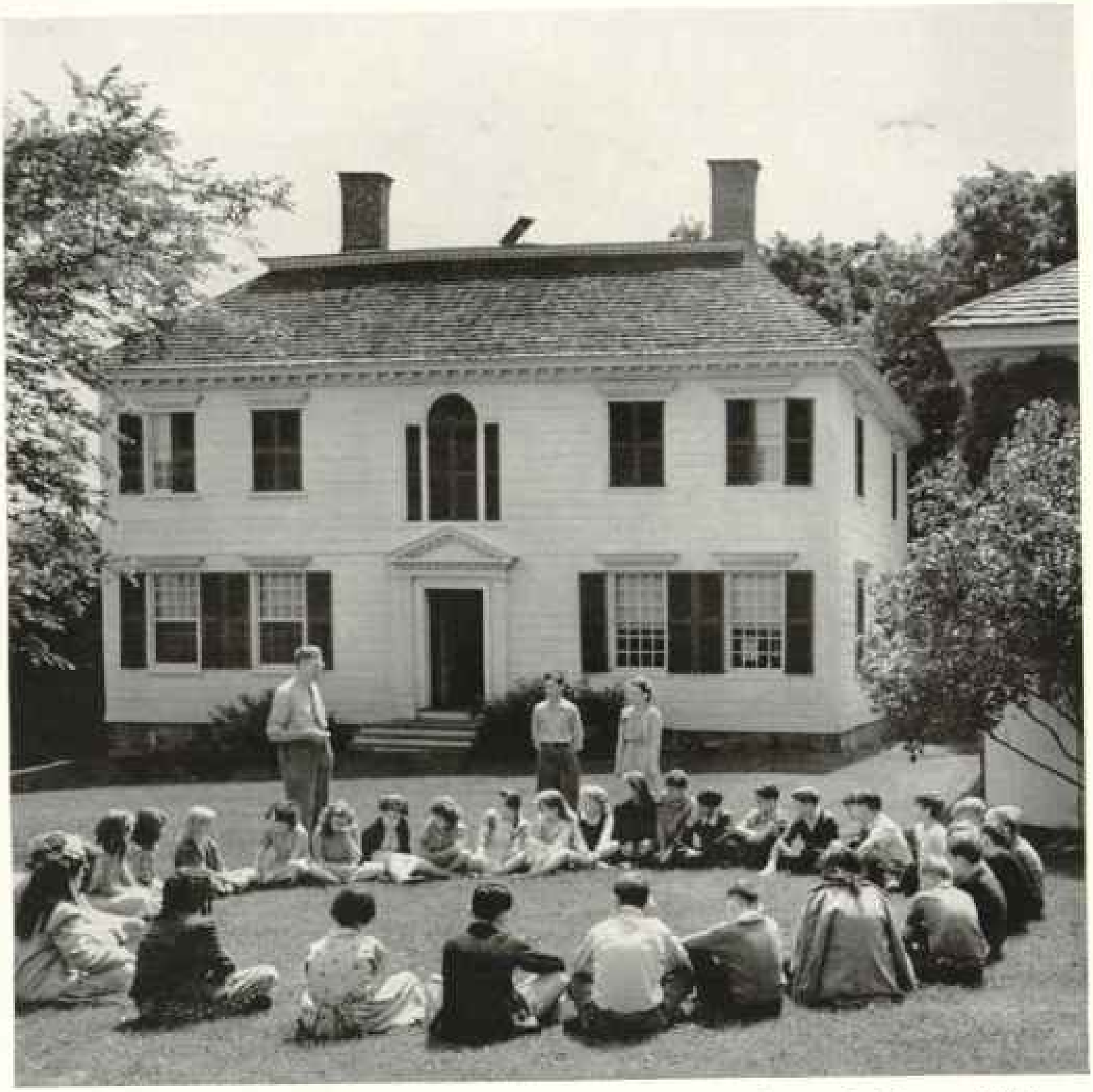
In the center of one of its fertile fields is an area never touched by the plow because tradition has it that Negro slaves of the Mabies are buried there.

Light and Locomotives for the World

At Schenectady the Mohawk flows into the future, for here are the vast General Electric Company works, with their laboratories pioneering new worlds of science.

Here, too, is the American Locomotive Company plant, again turning out giant diesel-electric locomotives and other engines for the railroads of the world (page 107) after building thousands of tanks and tank destroyers during the war. America's first diesel-electric was made here in 1925, and Alco's oil-burning, electric-drive mammoths are now being turned out by assembly-line methods.

Electrical power transmission equipment and a turbosupercharger come from General Electric, and another close link between the two firms is the little brick building where G-E was born. Originally the McQueen Locomotive Works, an offshoot of American Locomotive, the building was bought by Thomas A. Edison in 1886 and burgeoned into mighty General Electric, whose hundreds of buildings now surround that humble nucleus.



Where Indians Squatted in Powwow, Children Hear the Story of Johnson Hall

Fifth- and sixth-grade students of Oppenheim-Ephratah Central School sit in Indian fashion on the lawn of the baronial mansion at Johnstown where Sir William Johnson died in 1774 after a long and exhausting speech to the tribesmen (page 95). At right is a corner of a stone blockhouse, one of two which protected the building. Like Sir William's earlier home at Fort Johnson, the mansion is now a museum (page 93).

Chief products of the Schenectady plant are immense generators, turbines, and other equipment for production and control of electrical energy. But jet-propulsion engines and radio transmitters are also made here, and from these home offices are directed all of the vast G-E plants and enterprises, now including operation of the Government's atomic-energy plant at Richland, Washington.

In a high-vaulted, cathedral-sized building, workers were assembling one of three 90,000-kilowatt generators—each as big as a house—being made to replace smaller ones destroyed by the Russians when the Germans approached their Dnieper Dam. Generators also were being produced for Paris, Tunis, Spain, and other far places in the power-starved postwar world, as well as for projects at home.

Magic on the Mohawk

Present research afoot in the G-E laboratories includes cooperation with the Government in efforts to "do something" about the weather. One scientist we met was making miniature snowstorms in a home "deep freezer" in connection with studies designed to prevent formation of ice on airplane wings (page 108).

More recently he succeeded in causing an

Off Goes a Locomotive to Help Haul the Loads of Vast Brazil

At the Schenectady plant of the American Locomotive Company, a crane lifts the big steam engine from its wheels for transfer to a railroad flatcar. Four cars are needed to ship each one to its port of embarkation. The plant has a monthly capacity of 45 to 50 steam locomotives and about the same number of diesel-electrics (page 165). The former go chiefly to foreign countries. Customers last year included railroads of Mexico, France, Belgium, Russia, and Finland in addition to Brazil.

actual snowfall from a three-mile cloud by dropping a little dry ice upon it from a plane. General Electric scientists say this discovery can be used not only to combat icing of airplanes but also to precipitate snow where needed—as at winter resorts and areas requiring moisture for irrigation—and to force snow clouds to drop their loads before passing over cities.

Nothing seems impossible at Schenectady, where G-E scientists have produced artificial lightning and electric arcs nearly twice as hot as the surface of the sun, developed the ductile tungsten which made electric-light bulbs 80 percent more efficient, so developed the X-ray that it now can peer through many inches of steel as if through glass, and made innumerable other discoveries which have affected the lives of all.

As a former director of the laboratory has said, "The only perpetual motion is the growth of truth."

Now a one-hundred-million-volt betatron smashes atoms to explore their secrets, and high on a river bluff below Schenectady is rising General Electric's huge new research laboratory, a "House of Magic" full of portent for the Atomic Age. Explorers of the far fron-

General Electric Company

Waving His Scientific Wand, He Produces Man-made Snow

A miniature blizzard is created in a home freezer by Vincent J. Schaefer, scientist of the General Electric Research Laboratory at Schenectady. First he formed a cloud of moist air by breathing into the five-below-zero chamber. The wand, cooled in liquid air to 70 degrees below zero, was then plunged into the cloud, where it formed tiny ice germs. Growing at the expense of water droplets, these quickly became snowflakes. Mr. Schaefer's experiments led to successful attempts to force actual clouds to drop their snow (opposite page).

tiers of science, the hundreds of scientists being marshaled there are pioneers more potent than any who fought when war drums rolled along the Mohawk, scalp yells quivered on the Valley air, and the frontier was aflame.

At work in that laboratory will be an eager-minded army of 850—more than all the men who marched with Herkimer into the deadly ambush of Oriskany and fought their stubborn way out.

Another vast laboratory alongside will specialize in atomic research for Uncle Sam and will bring the number of scientists and their aides to more than 2,000. This $20,000,000 Government project, to be known as the Knolls Atomic Power Laboratory, will be built and operated by General Electric. It will include an atomic pile for experimental production of power, and a "hot" chemical laboratory for studying radioactive materials.

Out at Schenectady airport we saw the latest type of General Electric jet-airplane engine slung under the belly of a B-29 to be taken for daily rides so its makers could check its performance in the air before mounting it in a fighter. Nothing is left to chance (page 75).

Tomahawk to Television

World-known is WGY, the General Electric radio station, and its Station WRGB has long been pioneering in television (Plate XV). Building a chain of microwave relay towers, General Electric now links Schenectady with New York by television—a far cry from Indian smoke signals billowing from hilltops.

After watching a telecast at WRGB, Tony and I strolled out to cool off by the Mohawk. In from these waters French and Indians stole on a February night in 1690 when they fell upon sleeping Schenectady and slaughtered most of the inhabitants.

"Imagine one of those Indians coming back to life," said Tony, "and seeing such modern magic as this: people playing parts in a studio here and their likenesses twinkling out without wires into homes many miles away."

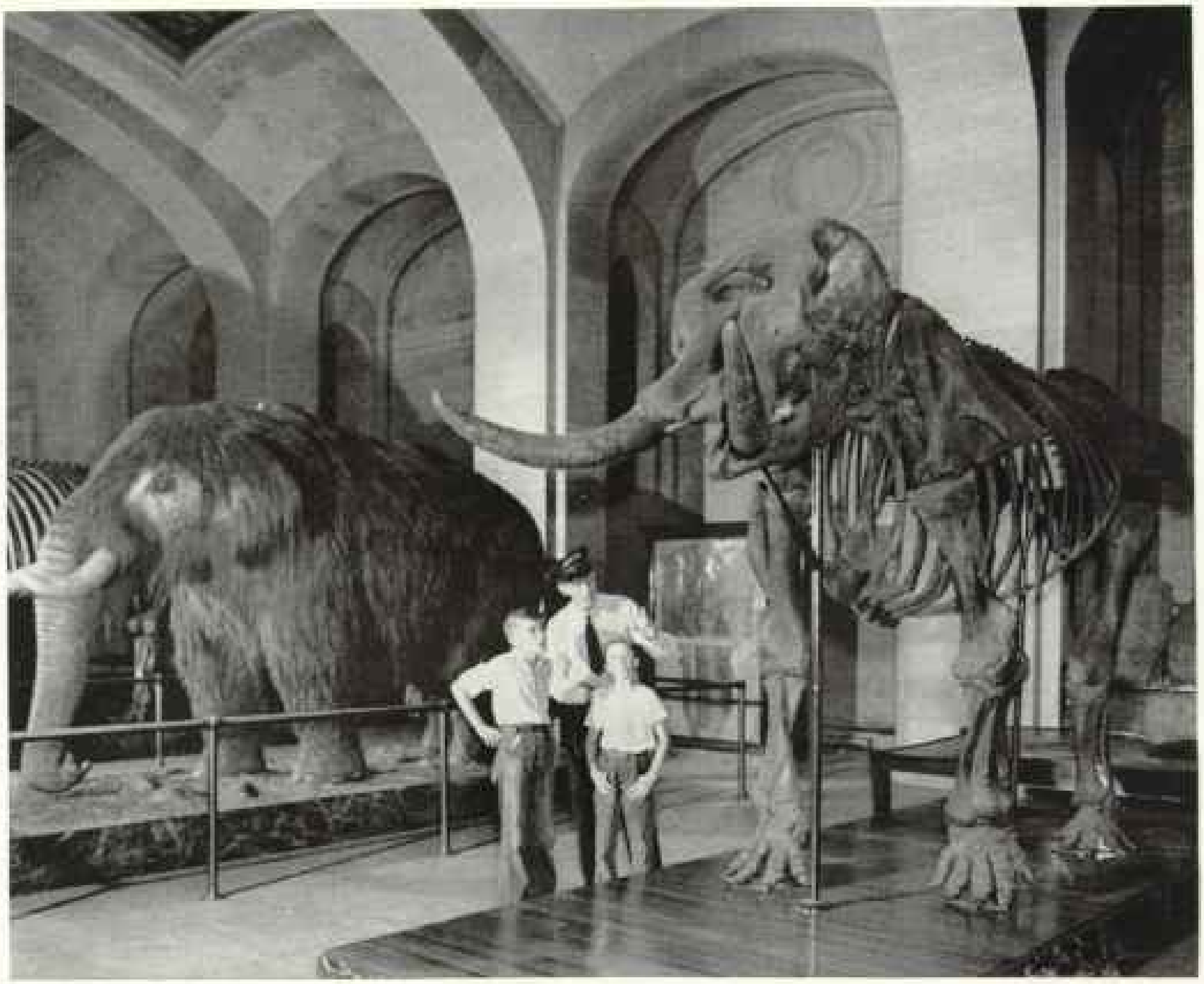
Such a contrast sums up the Valley—tomahawk to television.

The station was putting on a fashion show, and on the theory that women dress for men, students of Schenectady's Union College were

Hugh Ackroyd

Handfuls of Dry Ice, Sown by Plane, Made These Snow Clouds Drop Their Load

This dramatic storm near Gresham, Oregon, was produced on April 4, 1947, by methods developed by General Electric scientists at Schenectady (pages 106, 108). Rain and snow estimated at hundreds of tons resulted from "seeding" the clouds with 17 pounds of solid carbon dioxide by E. S. Ellison, head of the Portland Weather Bureau. Diving from 10,000 to 4,000 feet immediately after sowing the pellets, he and his companion saw long "bridal veil" streamers of snow trailing from the clouds. Most of it reached the ground as rain.



"If You Had Lived a Few Thousand Years Ago, You Might Have Seen One of These"

Two young visitors to the New York State Museum at Albany stare at the skeleton of a mastodon found 60 feet down in a Mohawk River pothole at Cohoes by workmen digging the foundation for a factory. At left a reconstruction shows how this shaggy relative of the elephant looked when it roamed the lower Mohawk Valley in the wake of the great Ice Age.

invited to act as informal judges (Plate II).

Union, founded in 1795, was the first college west of the Hudson. It was established by farming folk of the Mohawk and upper Hudson Valleys who were reluctant to send their sons as far as Harvard, Yale, or Columbia. Union from the start was nonsectarian, and the liberal spirit of its founders has marked it through the years.

From Union's pleasant, tree-shaded campus have gone forth leaders in many fields, including outstanding engineers, statesmen, judges, missionaries, and college presidents.

Incidentally, Union cradled the country's oldest college social fraternities.

At Schenectady the main roads leave the Mohawk and slash directly toward Albany and the Hudson across the pinelands which gave Schenectady its name, meaning "Trail Through Open Pines." Over this route came Arendt Van Curler when the doughty Dutchman founded the town in 1662.

To the north the widening river flows eastward to the falls of Cohoes and the locks of Waterford. There at last the stream which trickled from an iris patch pours forth its full-grown waters.

But this area's kinship is with the Hudson. The climax of the Mohawk's story is reached at Schenectady.

As we drove back along the Mohawk at dusk, Tony said: "You know, there's a charm about this valley. Early in the morning and in the evening, there's a peace and quiet that I haven't seen anywhere else in the world."

So my Valley had won this southerner after all!

But my friend was having an afterthought.

"Unless," he added, "it's down South, with smoke curling up from a little cabin and the sun rising over the cotton fields."

I let it go at that; for, beside many an alien river, I have known what it is to see visions of home.

British Castles, History in Stone

By Norman Wilkinson

WHAT tales of derring-do—of secret passages and escape down tower walls in night and storm, of drafty banquet halls dim-lit by guttering torches, of sword-play and assassination, of knights in armor, of silken ladies tossing favors to their champions in the joists, of desperate deeds and intrigues that changed the course of history—are brought to mind by the old castles of England, Scotland, and Wales!

In and around these venerable strongholds—the huge stone castles as opposed to the simpler defended mounds of pre-Norman days—was enacted much of the tense drama of Britain in medieval times.

Home of Queen a Haunted House

Glamis (pronounced "glahms"), ancestral home of Queen Elizabeth of Great Britain, had its beginnings in the dim past of Scottish history (Plate I). Nearly six centuries ago it came into possession of an ancestor of the Strathmore family, of which Elizabeth is a member. Her forebears, the Earls of Strathmore, are descended from a long line of Scottish kings.

In Glamis Castle, legend says, Macbeth, Thane of Glamis, murdered King Duncan. History does not verify the story, but tradition prevails, and a low-ceiled Gothic chamber in the castle is still known as the Duncan Room.

Another popular legend tells of ghosts playing cards with the Devil in a secret room of the castle. Much of the present building was constructed in 1675-87, but parts of it are much older.*

Sir Walter Scott, when a lad of 20, slept in the castle after draining a full measure of wine at a draught from the golden goblet known as the Lion's Cup. He admitted that the "hoary old pile," as he called the building, set his nerves on edge. One of the oldest-inhabited houses in the British Isles, Glamis has few equals in ghostly atmosphere.

Scene of Royal Holidays

After Lady Elizabeth Bowes-Lyon's marriage to the Duke of York in Westminster Abbey in 1923, she and her family went to Glamis every August for a holiday.

To celebrate the marriage, people of the little village of Glamis burned huge bonfires on Hunter's Hill near the castle. Bonfires were lit, too, when Princess Margaret Rose was born at Glamis in August, 1930, and when the Duchess became Queen of England.

Edinburgh Castle occupies a wonderful position, high above the gray city (Plate II). The rock on which the castle stands has been a military site since the seventh century, when Edwin, first Christian King of Northumbria, set up an outpost here called Edwinsburgh.

Romance and tragedy are bound up in the stones of this palace and prison, which was one of the strongholds surrendered to Henry II by William the Lion in the Treaty of Falaise in 1174. It was taken in 1313 by Randolph, Earl of Moray, whose warriors scaled the rock wall.

The "Black Dinner" at which the young Earl of Douglas was murdered in 1440 was held in the banquet hall.

The victim, flattered into appearing, was unaware of his danger until an ominous black bull's head, a fatal symbol, was set on the table. He put up a fight, but was overpowered and executed.

In 1566 James VI of Scotland—James I of England—was born here to Mary Stuart.

In the novel *St. Ives*, Robert Louis Stevenson tells the thrilling story of the castle during the Napoleonic Wars, when French military prisoners were confined in its towers.

Today the castle contains a museum and a monument to Scottish troops of World War I.

Windsor, Home of Britain's Kings

Of the great inhabited castles, Windsor, chief residence of the Kings of England for some 850 years, is the outstanding example (Plate III). This home of George VI stands on rising ground in the Thames Valley, with the town of Windsor at its base.

William the Conqueror founded the castle on a steep chalk hill above the river, and additions have enlarged it down the centuries. Much of the present structure dates from Henry III (1216-1272). During World War II Windsor Great Park, south of town, in which fallow deer once roamed at will, was plowed up for wheat and other grains. The deer are no more.

Of Winchester Castle, begun by William the Conqueror and finished by Henry III in 1235, only the Great Hall remains (Plate IV). At its western end hangs a representation of mythical King Arthur's Round Table, a relic believed to have existed in the 13th century. The Round Table, repainted by Henry VIII,

* See "Bonnie Scotland, Postwar Style," by Isobel Wylie Hutchison, in the May, 1946, National Geographic Magazine.

shows clearly in the etching. In the Great Hall Sir Walter Raleigh was tried.*

A square tower and a chapel (*c.* 1392) are the oldest surviving buildings of Dunnottar Castle, near Stonehaven in Scotland (Plate V), but the intrepid Scottish leader Wallace took an earlier castle on the same site in 1297.

Harlech Castle, in Wales, begun in 1286, is superbly situated on a rocky promontory rising 200 feet above the sea (Plate VI). Three times this stronghold was attacked and taken after sieges lasting many months.

Owen Glendower beat vainly against its impregnability in 1404 until finally, when the garrison inside had been reduced to 21 men, the fortress was forced to surrender. Glendower then established his daughter, wife of the pretender Edmund Mortimer, and her children there. When Glendower had been beaten in the field, his son-in-law defended Harlech for eight months. He finally died of starvation, and the castle yielded.

Its stubborn defense against the Yorkist siege of 1468 inspired the Welsh national anthem, *March of the Men of Harlech*, in which its name lives forever.

In Britain's Civil War, Harlech further maintained its reputation for stalwartness and strength, but was finally taken over by the Welsh brother-in-law of Cromwell.

One of the Oldest Buildings in Britain

Dover Castle (Plate VII), dating from the 12th and 13th centuries, contains the Pharos (*c.* A. D. 50), a relic of the original Roman fortress. Constructed of Roman bricks and tufa, the Pharos is one of the oldest standing buildings in England. Miraculously, the castle escaped serious damage in World War II, although Dover was under continual bombardment.

The solid grandeur of these great fortresses impresses the beholder. Look at Tantallon Castle, in East Lothian, at the mouth of the Firth of Forth (Plate VIII). Standing right on the cliff a hundred sheer feet above the sea, it offers only one approach by land—a narrow neck of turf with sea on three sides. Little short of treachery could reduce such a fortress in the days before modern artillery. Dating from the 14th century, it was the seat of the Douglases.

James V, as a youth, besieged the castle in 1528. A force of 20,000 men, well equipped with artillery and a battering ram, came against it. But his 20-day siege proved unsuccessful, for the thick walls resisted all attack.

In 1639 the castle was yielded to the Covenanters. In 1651, when General Monk attacked it, heavy guns were used to breach the wall. The defenders retreated to the central tower and held out until permitted to surrender on good terms. It fell into ruins in the 18th century.

Arundel Castle is another of the few in this series which are inhabited and in perfect repair (Plate IX). One of the oldest in Britain, it was founded to guard the Arun River's gap here in the chalky South Downs. Much of the present building is modern, and many additions have been made. In early days the seat of the Fitzalans, Earls of Arundel, it passed to the Howards, Dukes of Norfolk, in the 16th century. The castle stands above the little town of Arundel, in Sussex.

In the siege of 1643, Sir William Waller broke through the defenses in the town and attacked the castle. Seventeen days of heavy siege finally forced the defenders to capitulate. After the battle Arundel stood a ruin until the tenth Duke of Norfolk began to reconstruct it in 1786. At tremendous cost it was restored to more than its original magnificence.

To make way for modern barracks, most of the historic buildings of 13th-century Stirling Castle (Plate X) have been sacrificed, but the Chapel Royal, rebuilt in 1594, still exists beside a small garden from which a flight of steps ascends to the Douglas Room. In this room in 1452 James II stabbed the Earl of Douglas and flung his body out the window.

The country about Stirling is rife with drama, for near by is the field of Bannockburn where Robert Bruce and his little army of Scots defeated a host led by Edward in 1314.

Stirling Castle had an important role in British history. In 1304 it was captured by Edward I of England after a siege of three months, but ten years later it was retaken by Bruce after Bannockburn. James II, and probably James III and James IV, were born here, and in the High Church the infant Mary Queen of Scots was crowned. Key fortress of Scotland, Stirling was a mighty factor in its defense.

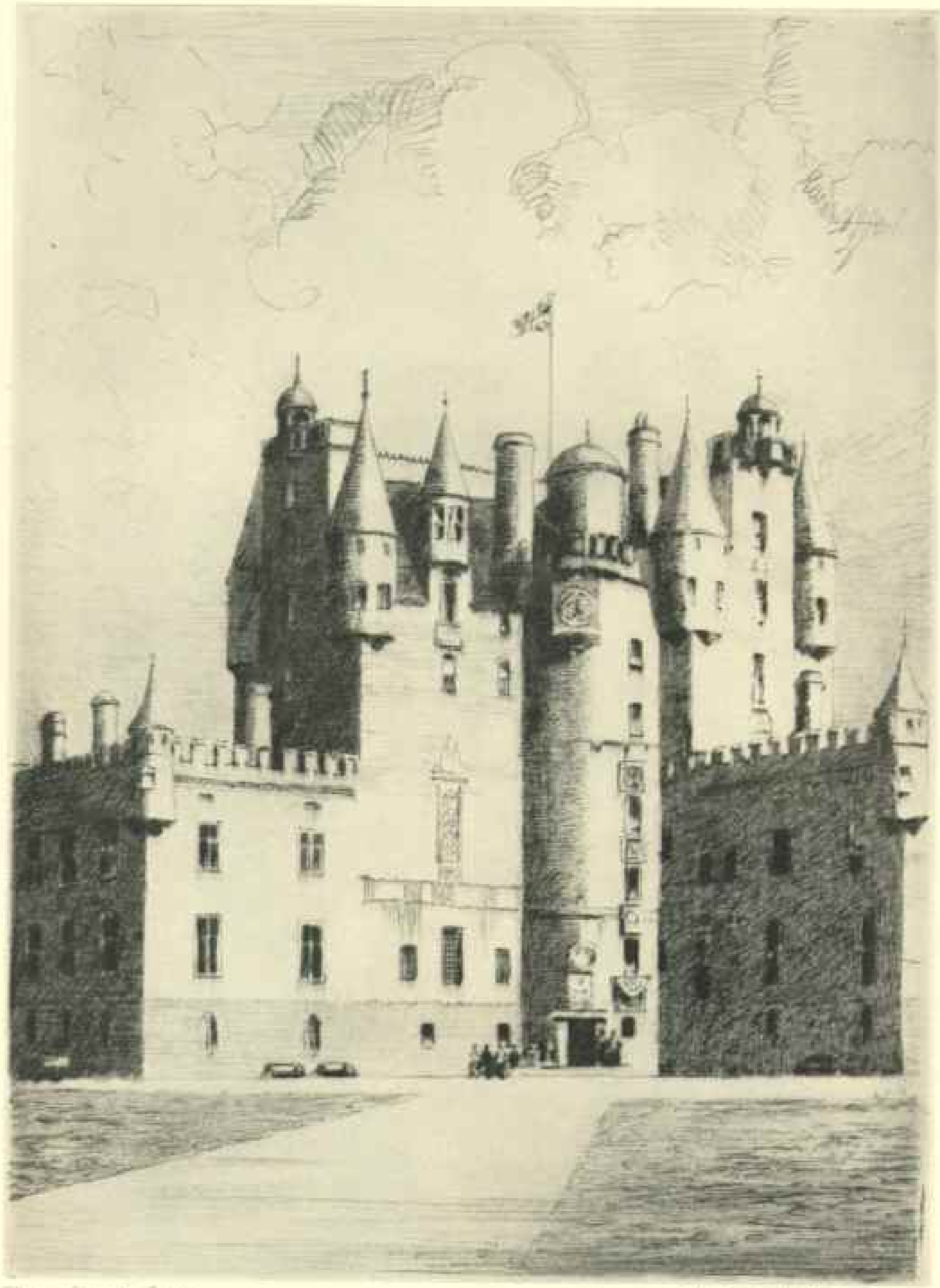
Kenilworth, Home of Romance

The history of Kenilworth (Plate XI) is wrapped up in one of the greatest periods of England. In its prime it ranked among the most important fortresses in the realm.

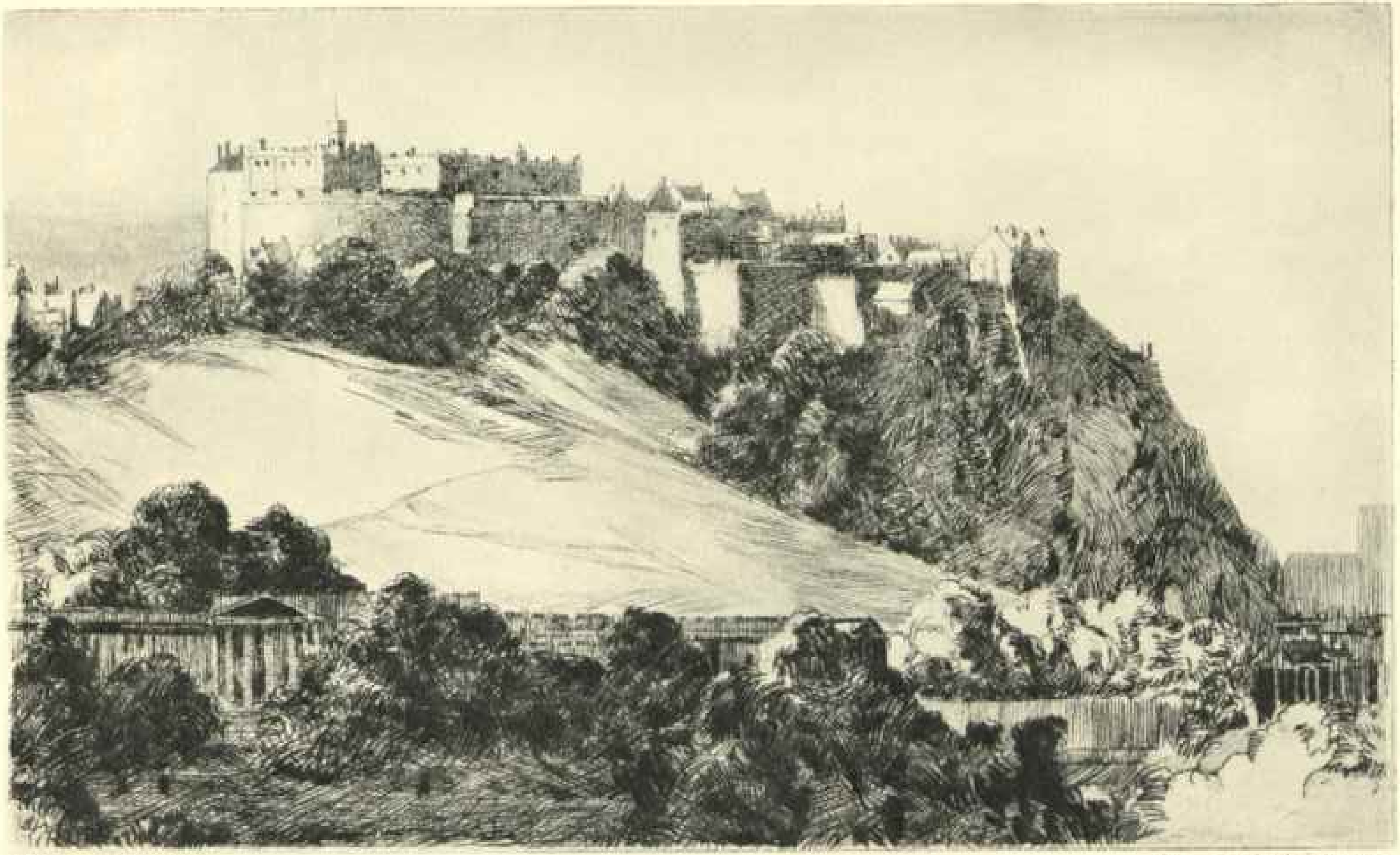
Commanding gently rolling country on a tributary of the Avon, Kenilworth was founded by Geoffrey de Clinton, Treasurer of Henry I, about 1120.

In 1562 Queen Elizabeth presented the

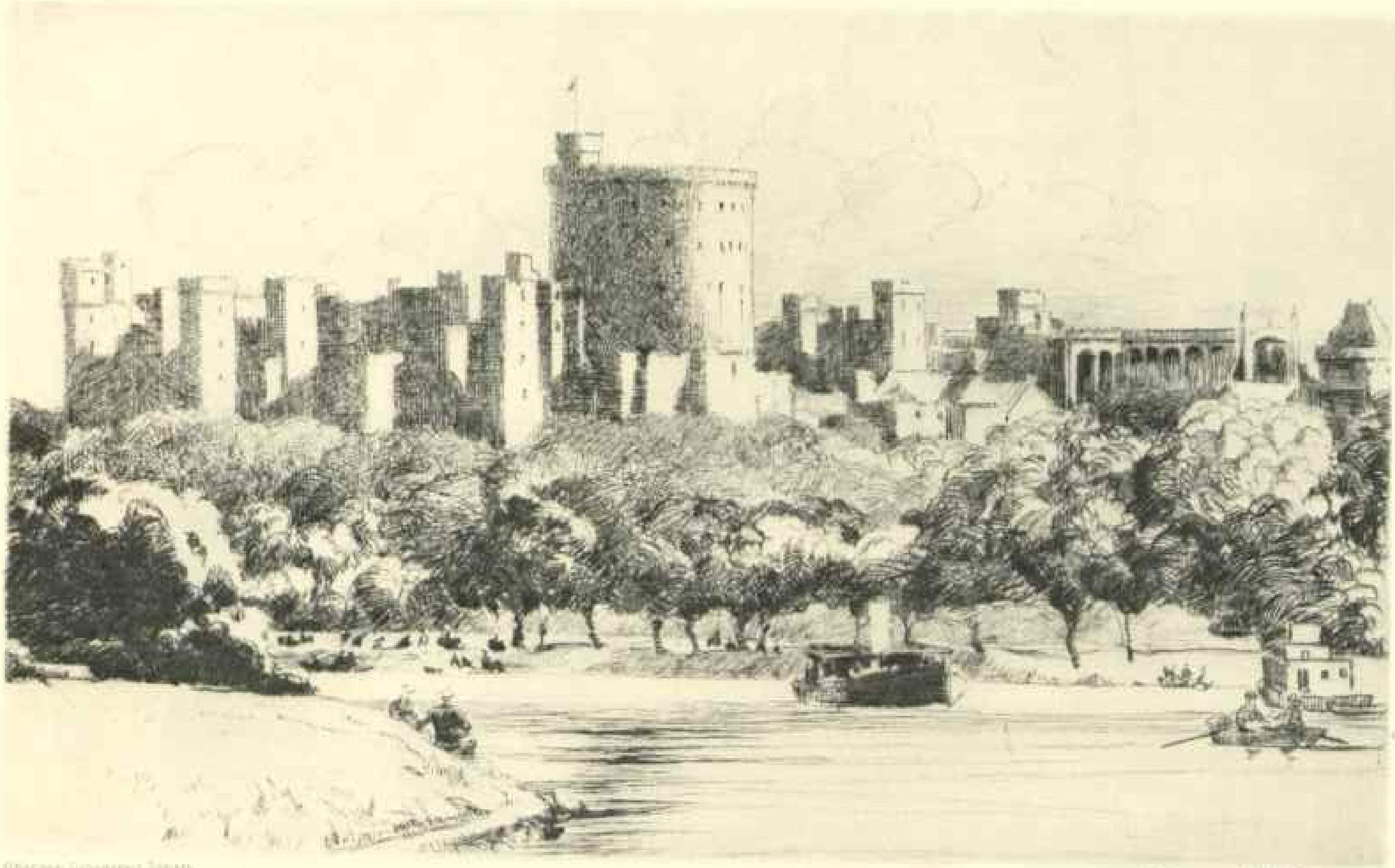
* See "Winchester, England's Early Capital," by Frederick Simpich, National Geographic Magazine, January, 1941.



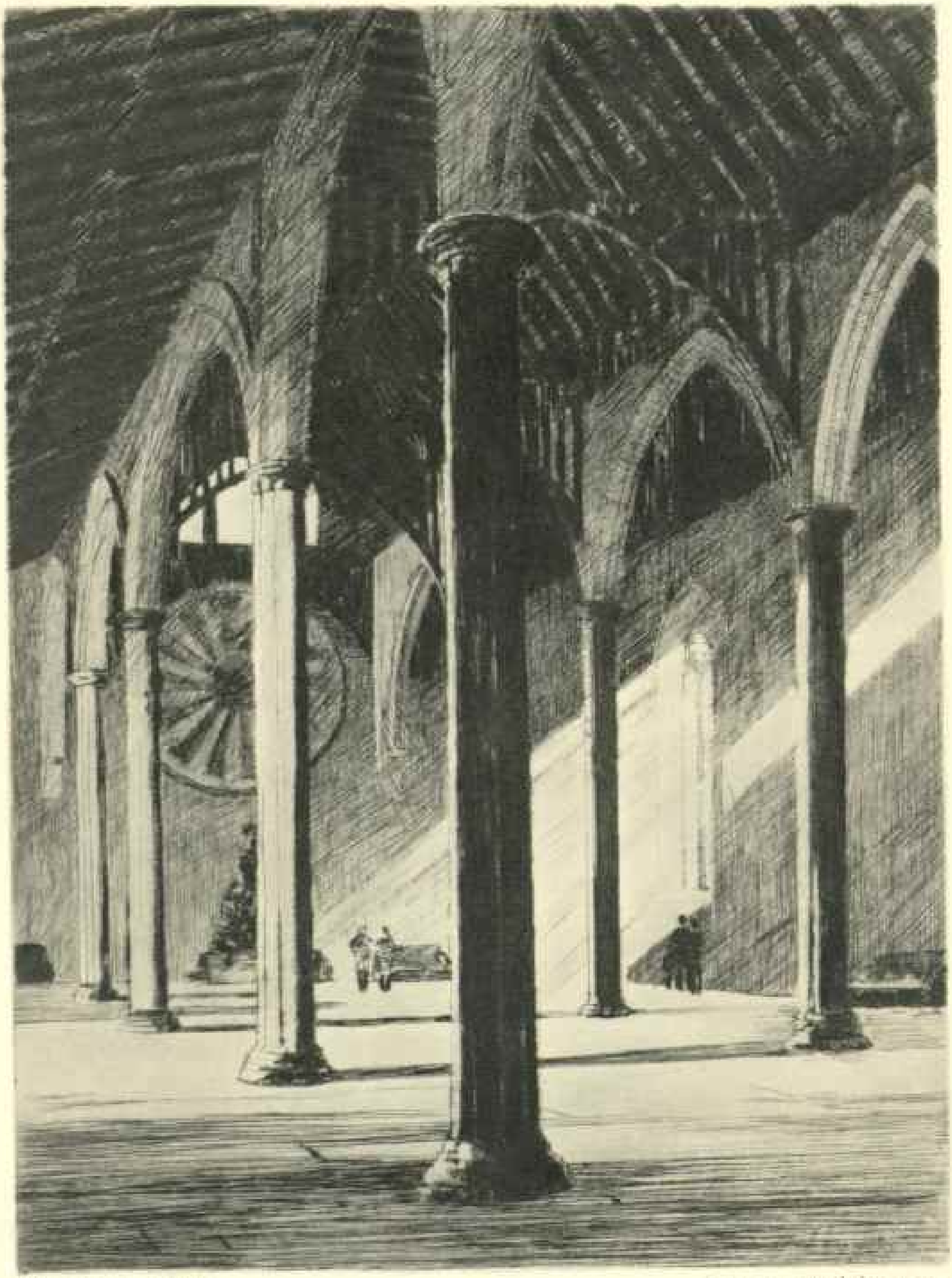
GLAMIS: ANCESTRAL HOME OF BRITAIN'S PRESENT QUEEN



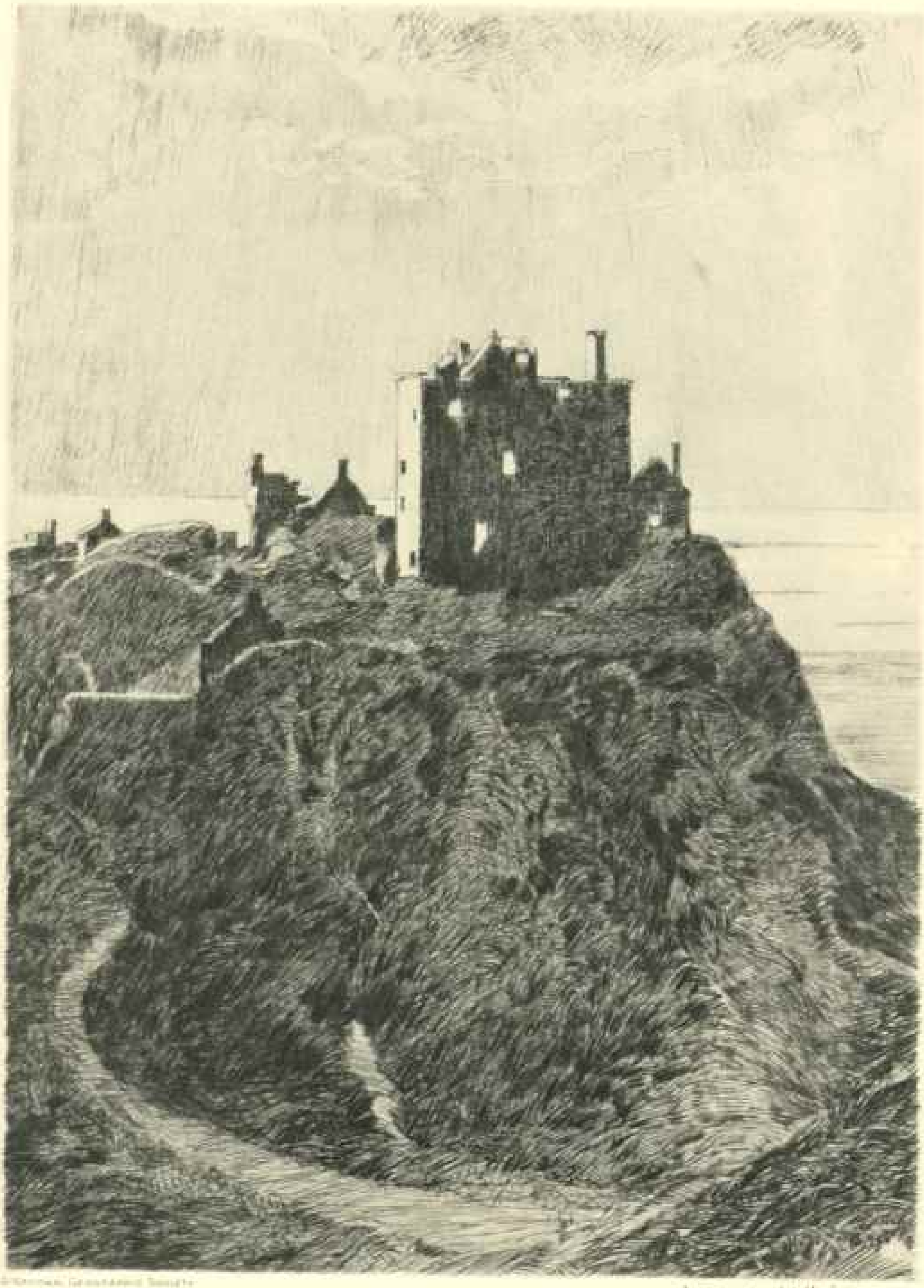
EDINBURGH: MEDIEVAL SEAT OF SCOTTISH KINGS



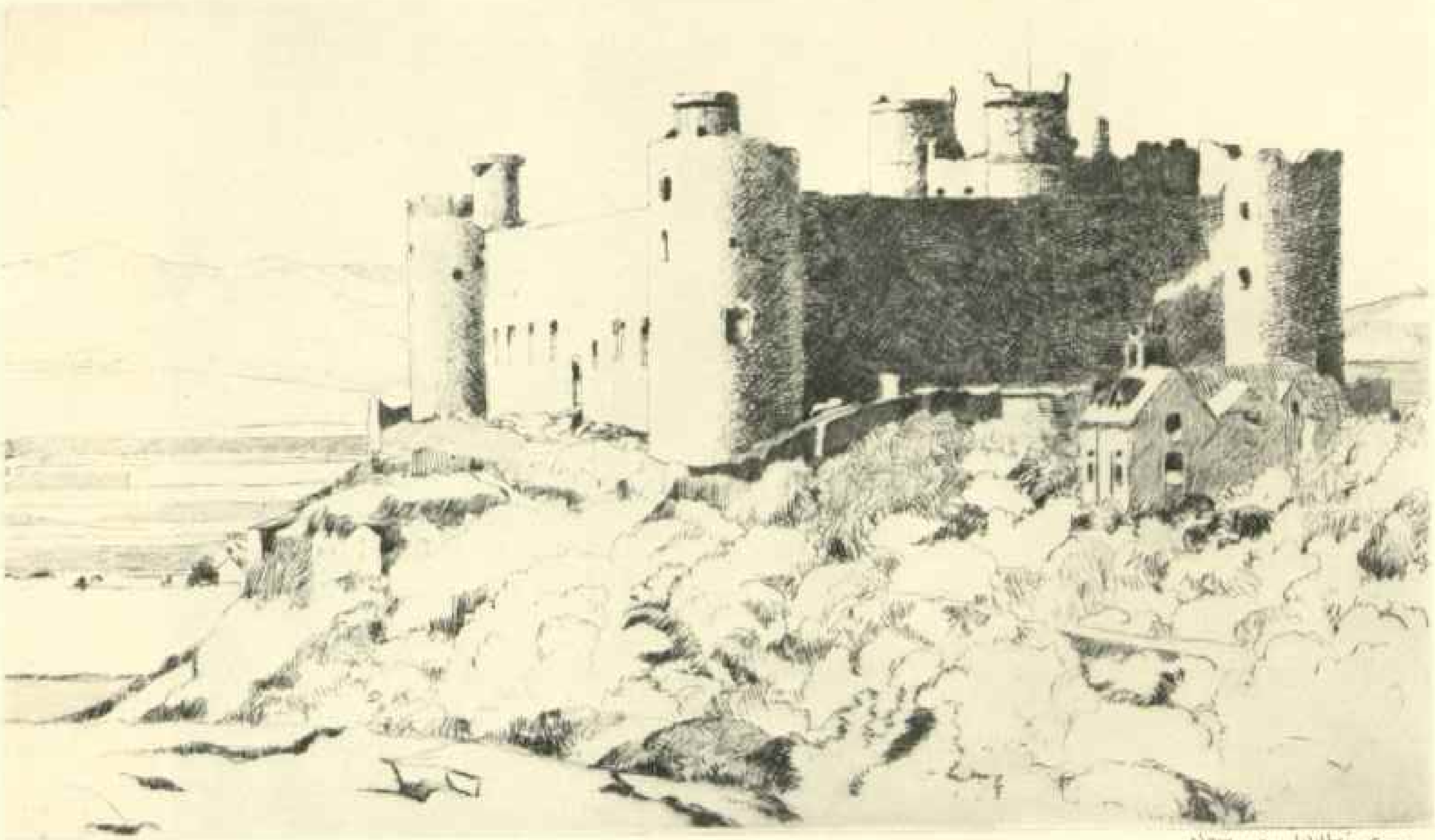
WINDSOR: ROYAL RESIDENCE SINCE THE DAYS OF THE CONQUEROR



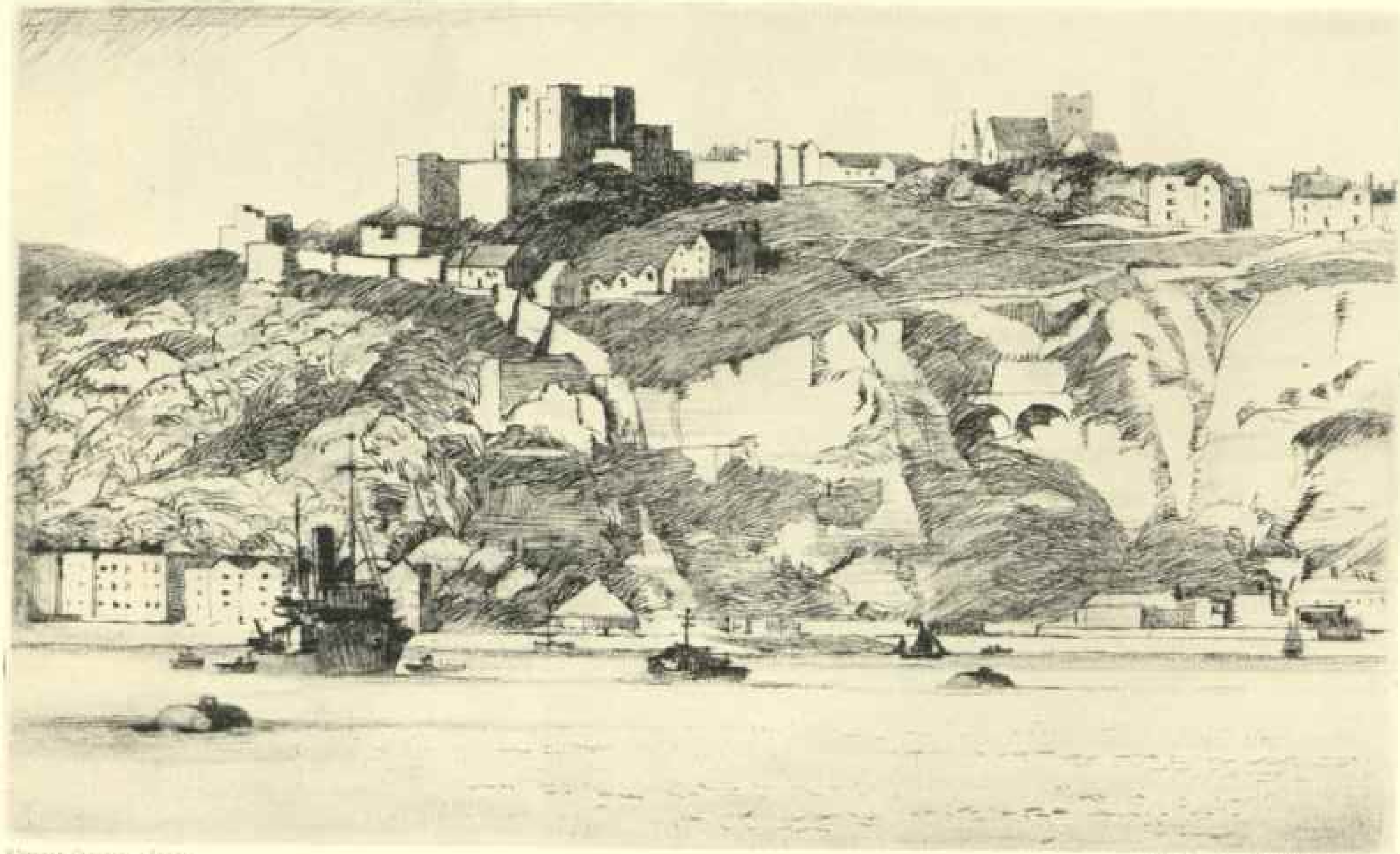
WINCHESTER: SCENE OF RALEIGH'S TRIAL



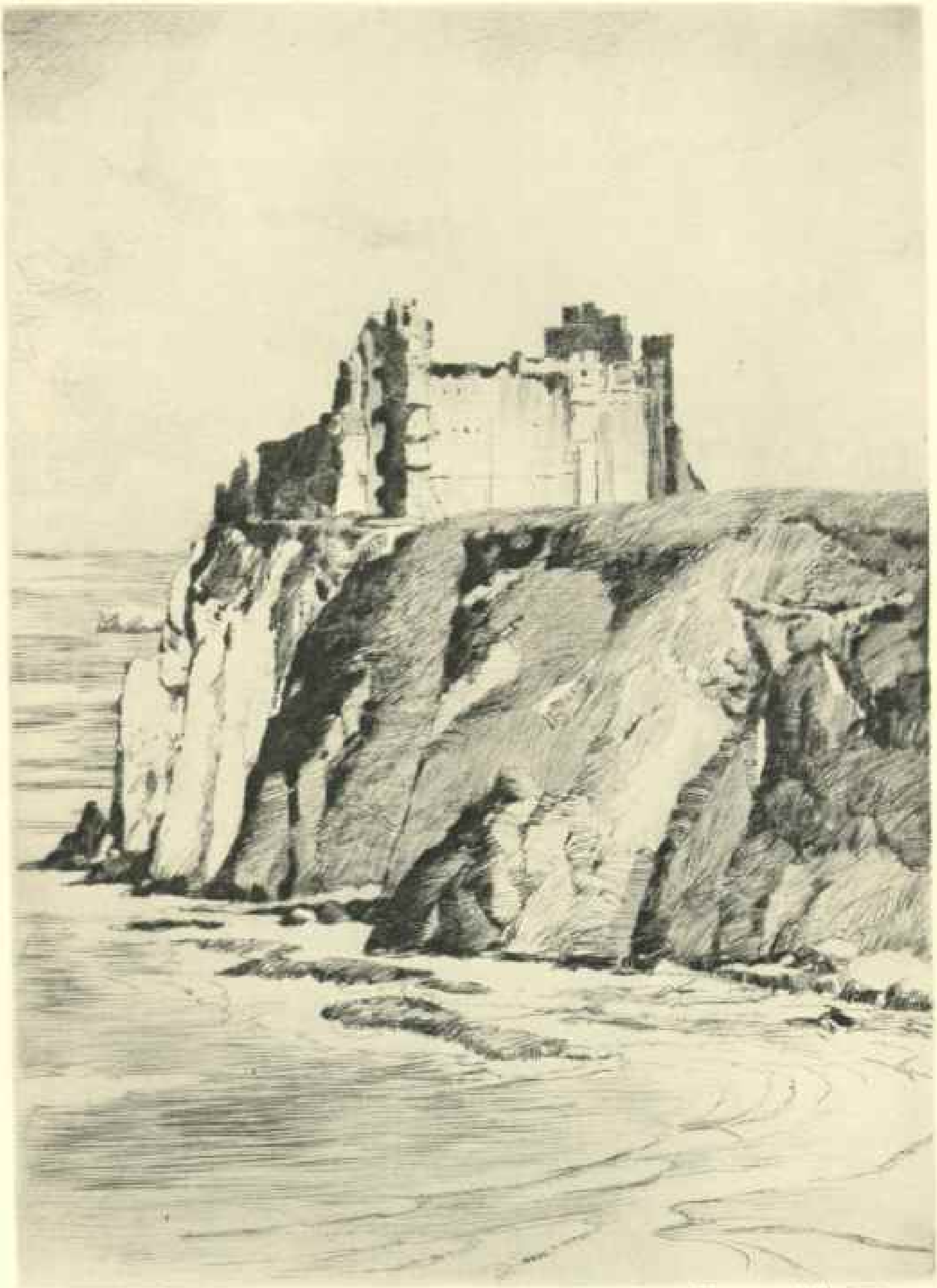
DUNNOTTAR: STRONGHOLD OF SCOTTISH CHIEFS



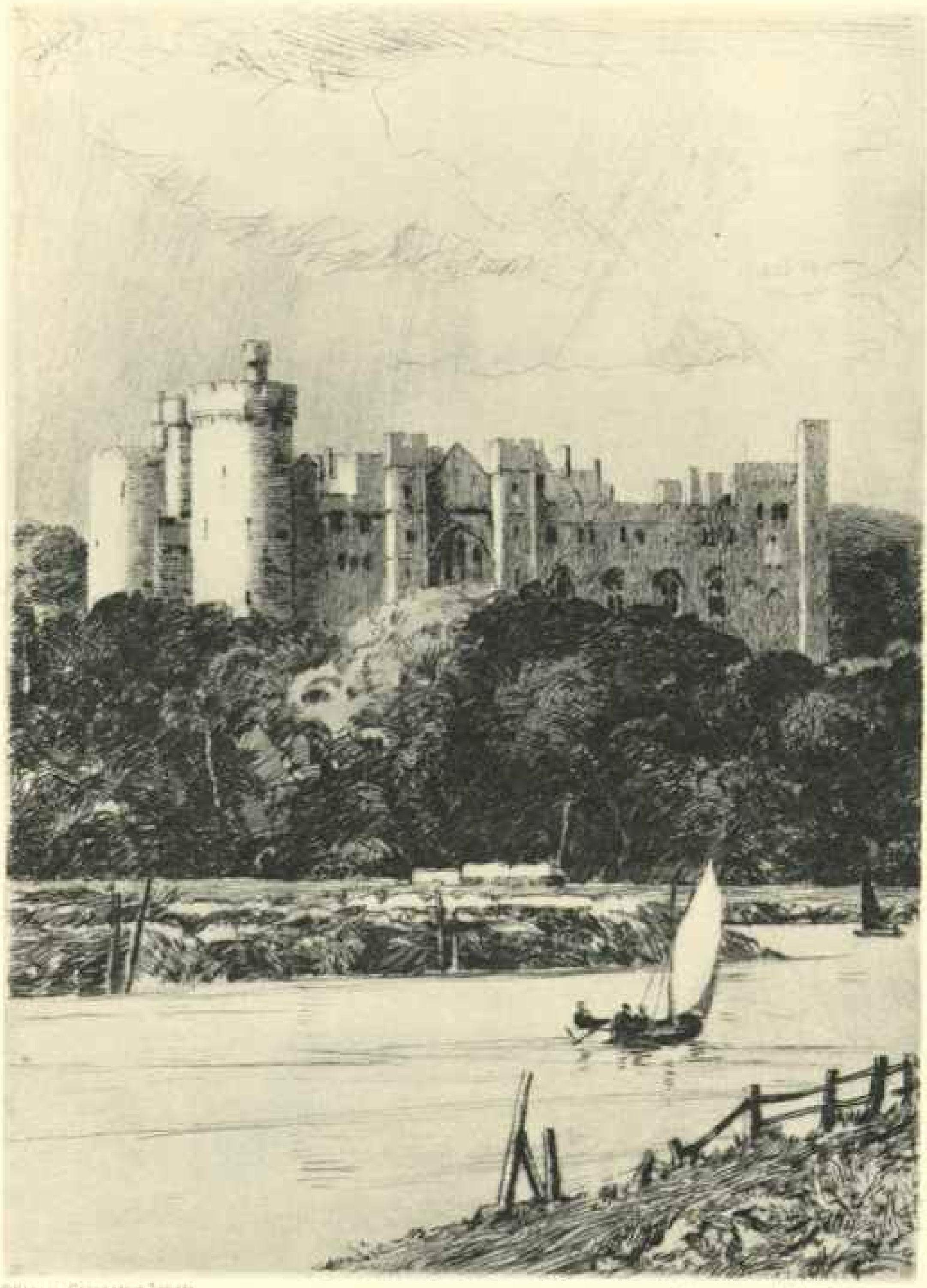
HARLECH. STARVATION FORCED ITS DEFENDERS TO YIELD



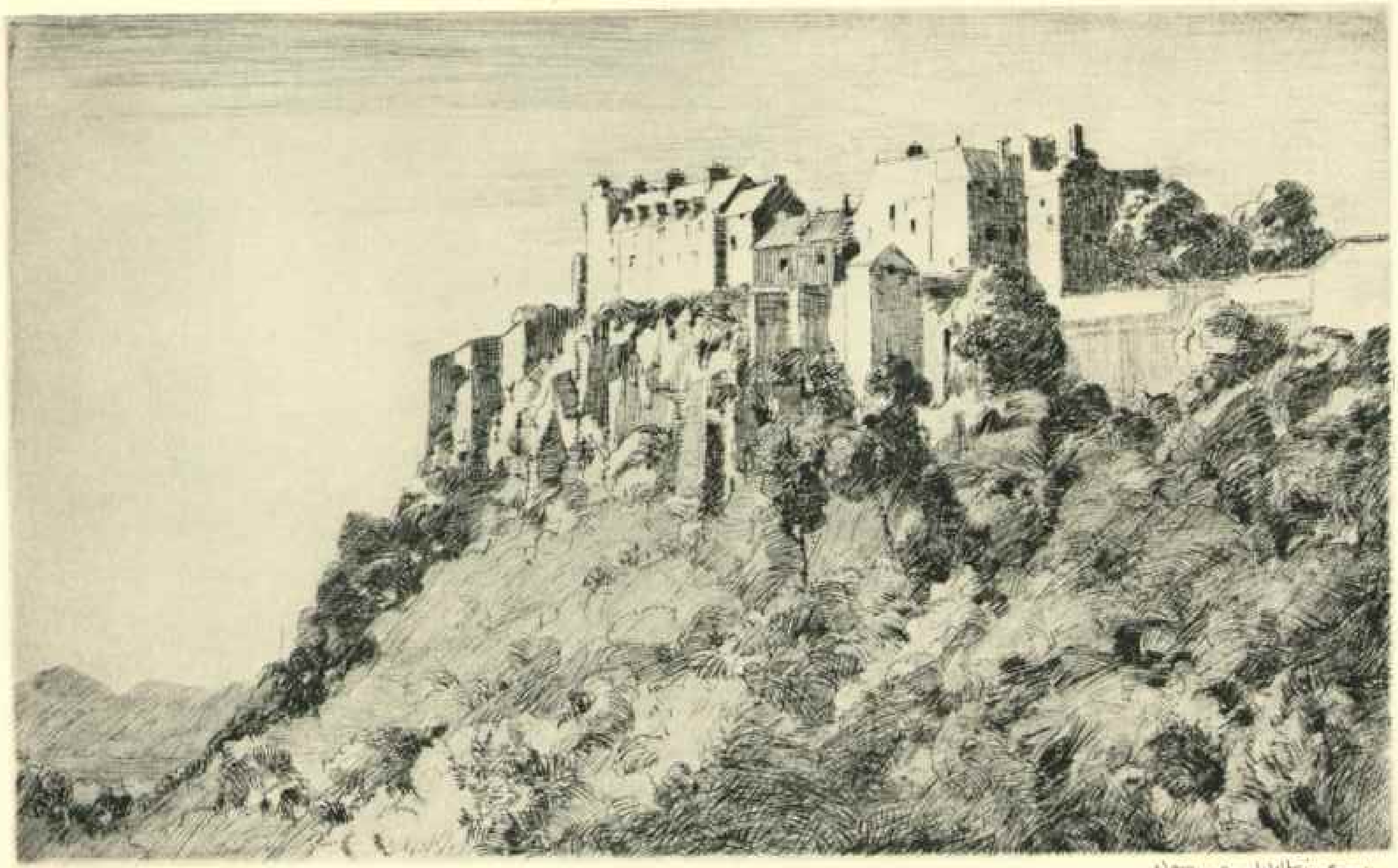
DOVER FROM CHALK CLIFFS LOOKS ACROSS THE CHANNEL TO FRANCE



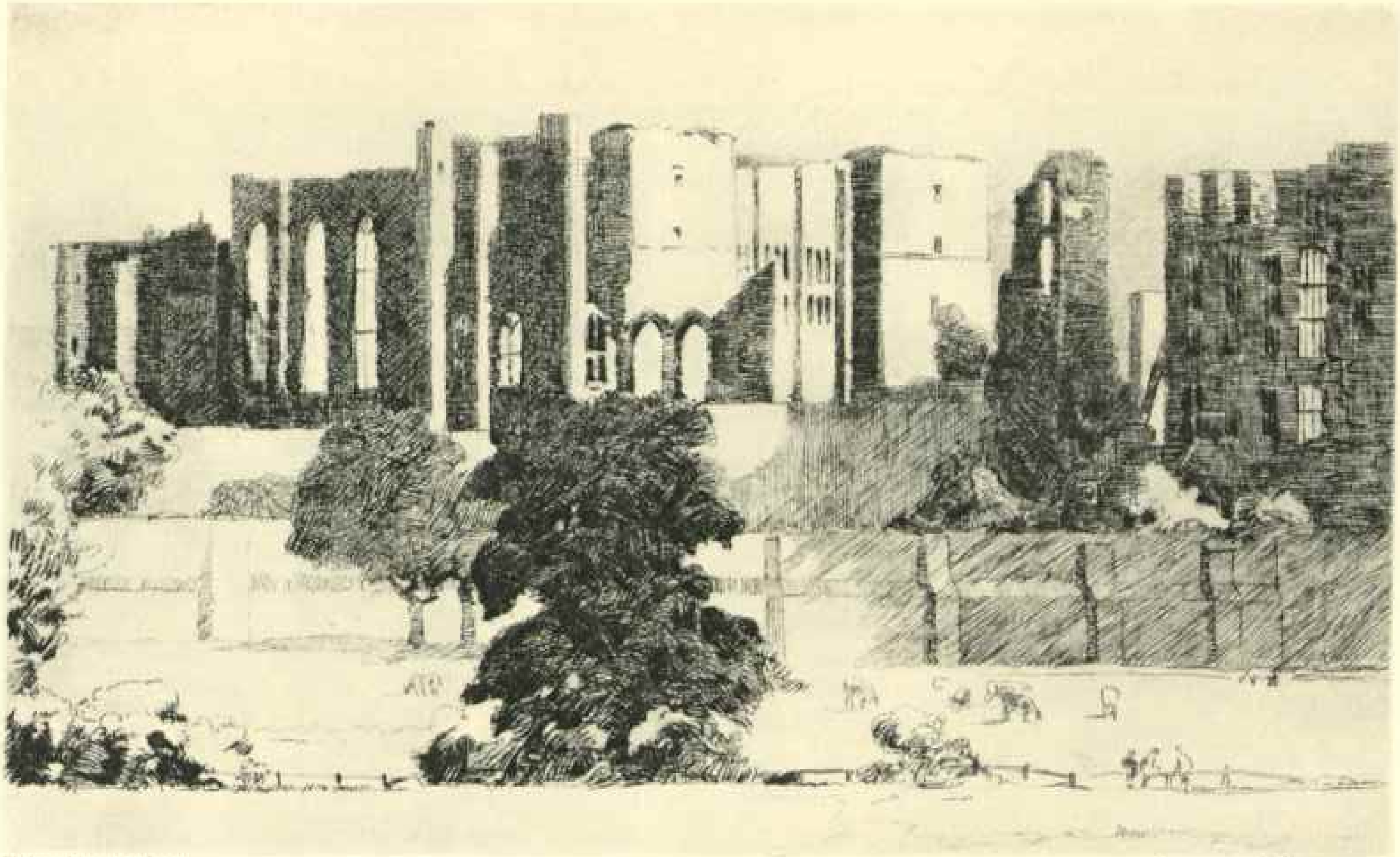
TANTALLON: REFUGE OF A SCOTTISH BOY KING, JAMES V



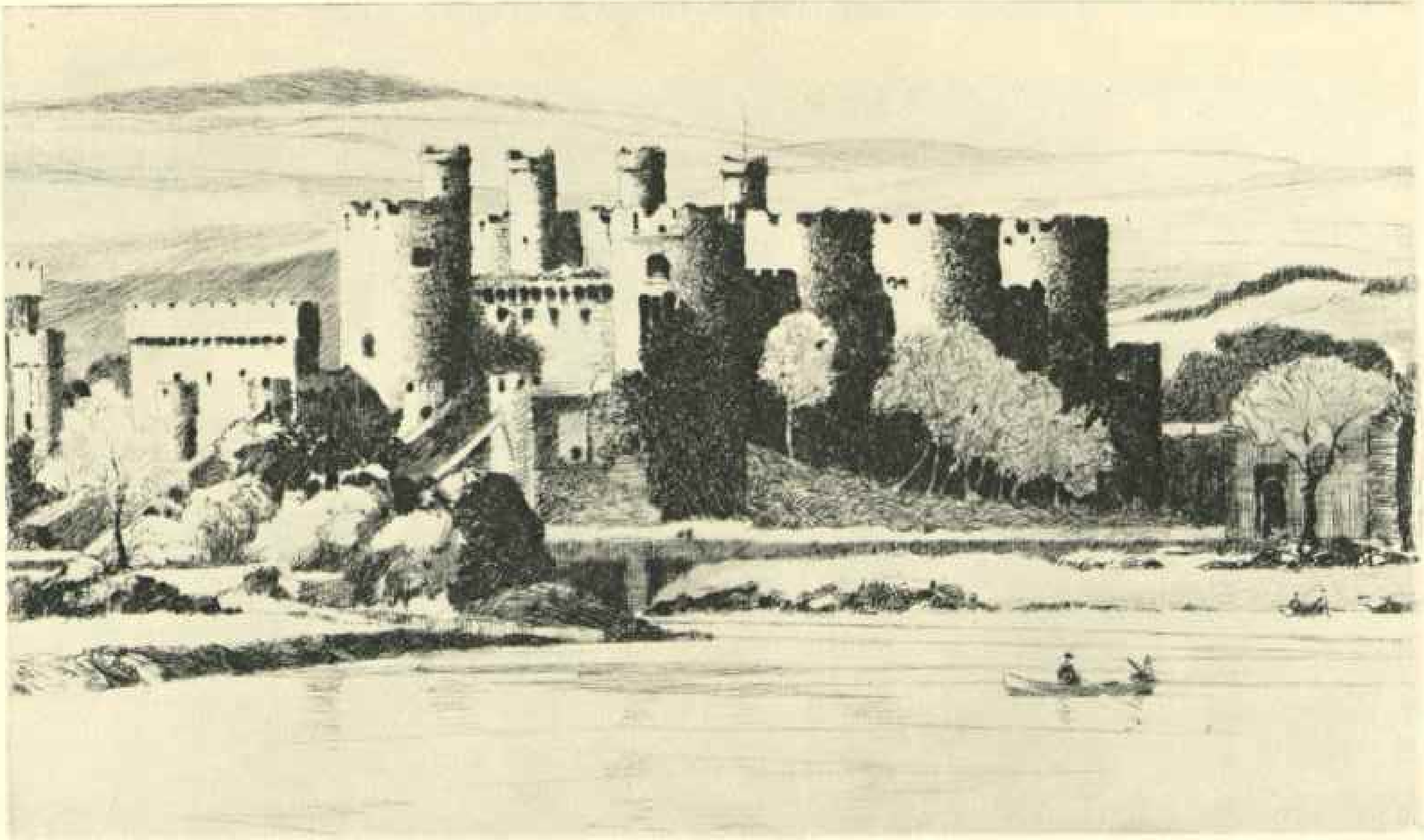
ARUNDEL: ONE OF BRITAIN'S OLDEST



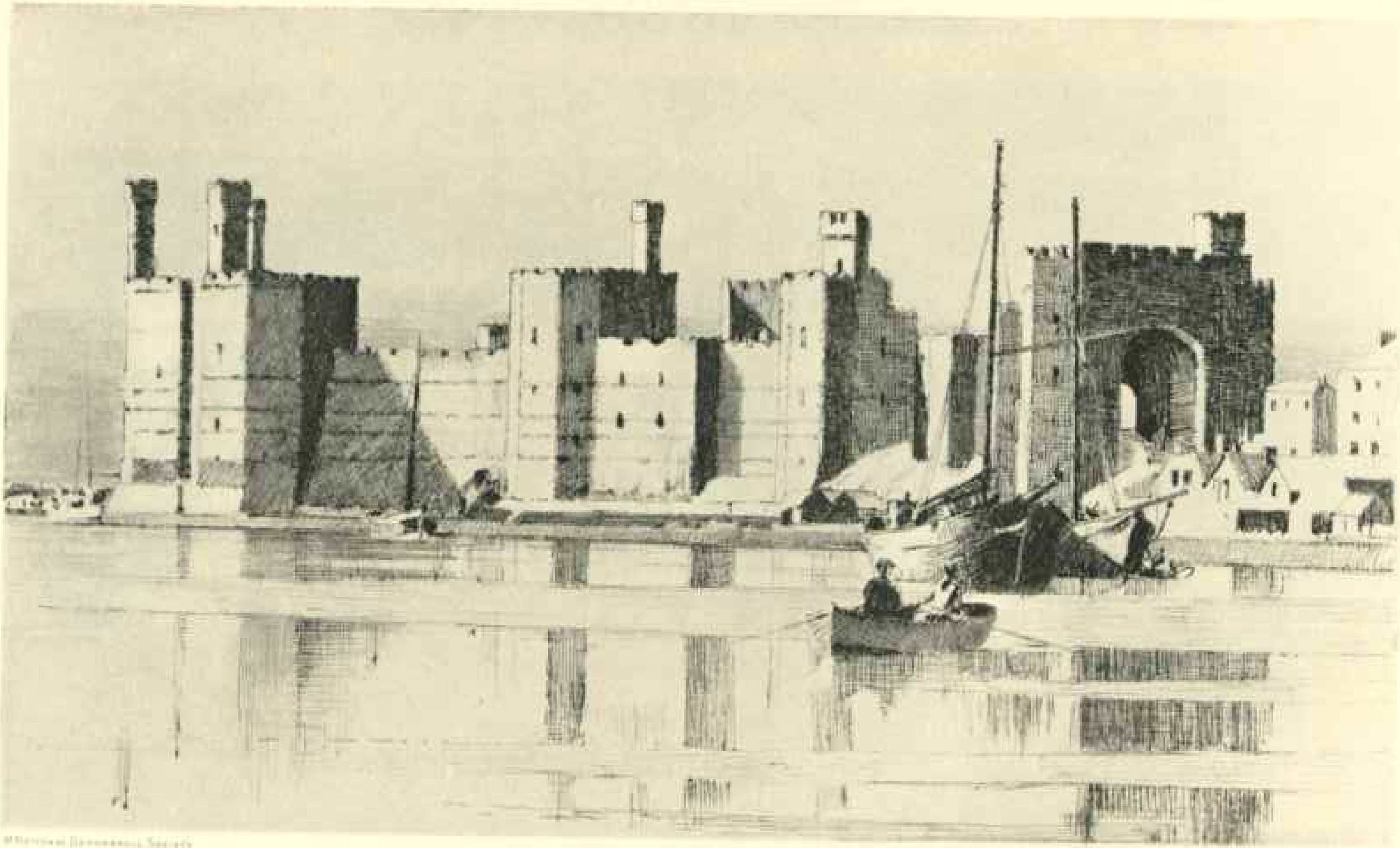
STIRLING: WHERE THE INFANT MARY QUEEN OF SCOTS WAS CROWNED



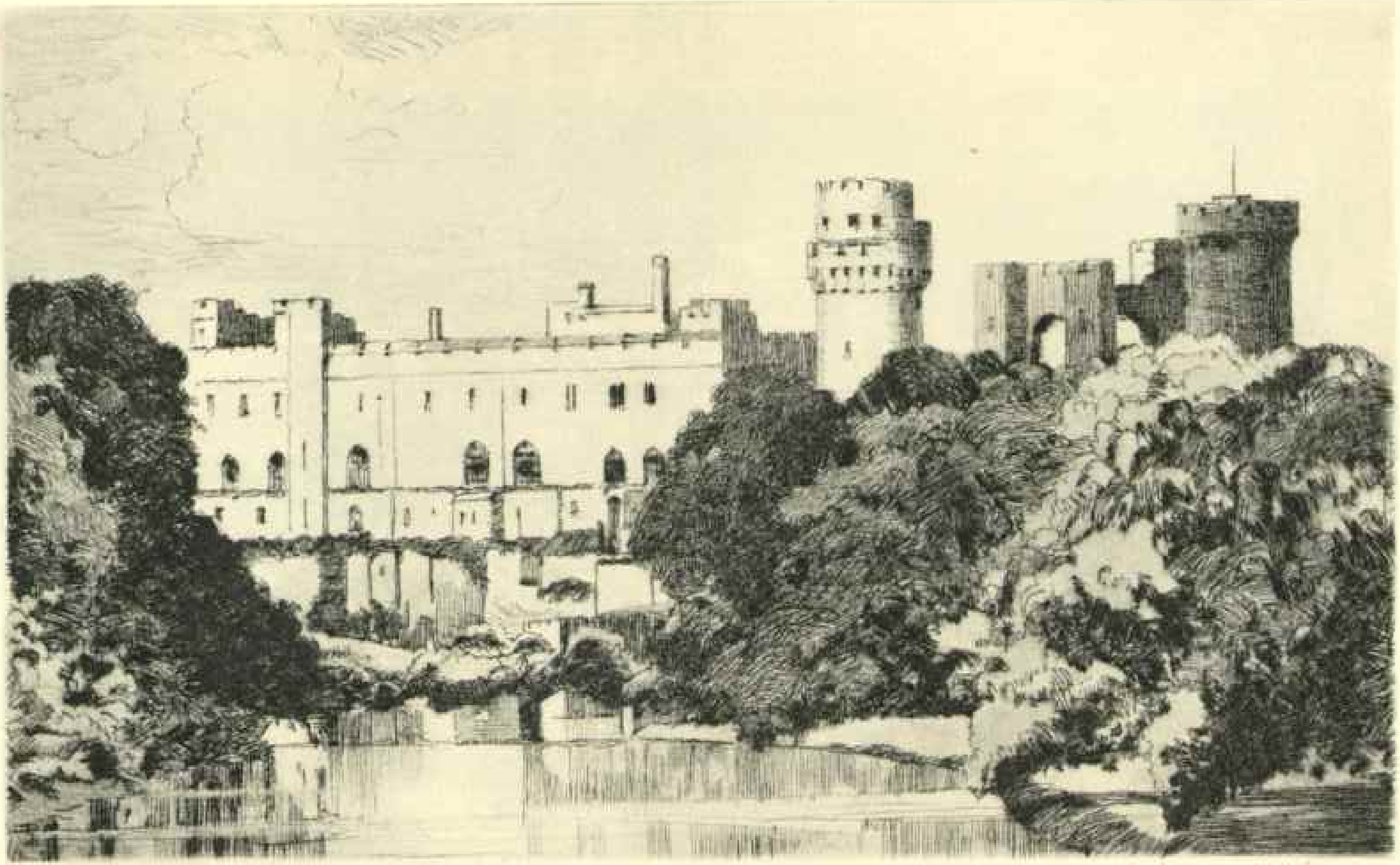
KENILWORTH: SCENE OF PLEASURES DESCRIBED BY SCOTT



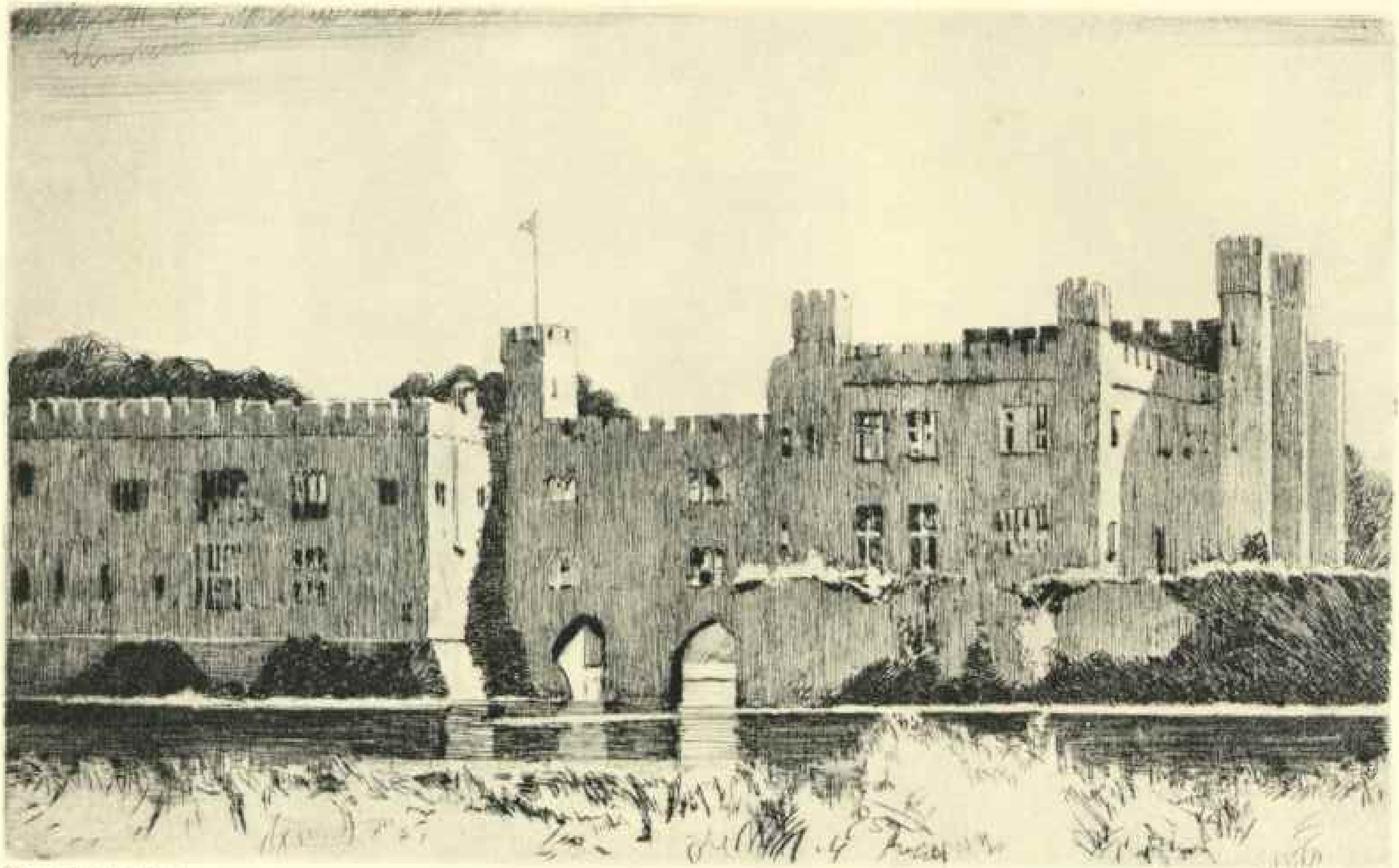
CONWAY: FORTRESS WITHIN A MILE OF WALLS—NORTH WALES



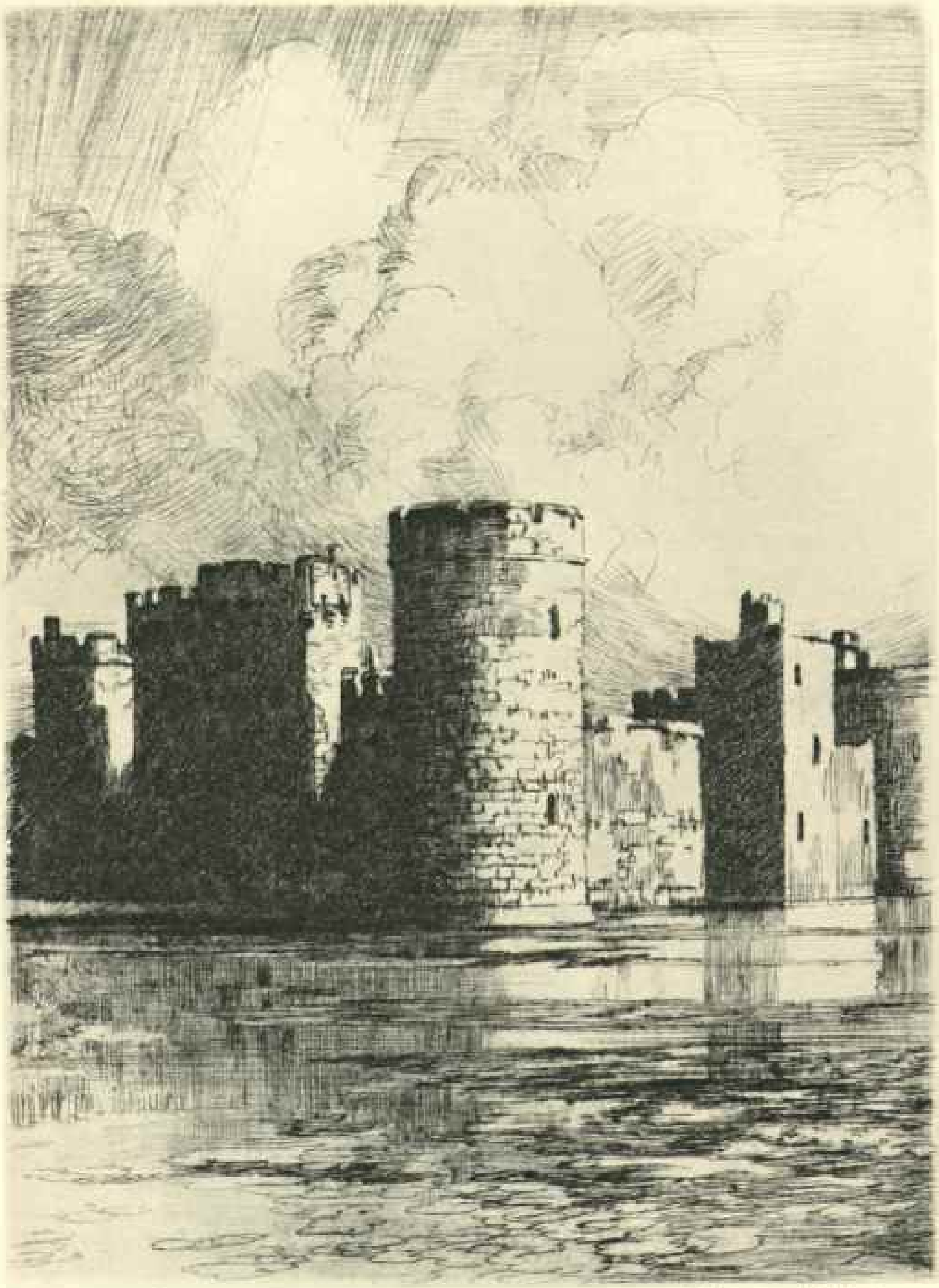
CAERNARVON: NEVER TAKEN BY ASSAULT



WARWICK: 15TH CENTURY PRISON OF EDWARD IV



LEEDS. WHERE ARROWS WERE SHOT AT A QUEEN



BODIAM: ON THE RIVER ROTHER IN SUSSEX

castle to Robert Dudley, Earl of Leicester, who spent enormous sums enlarging it and entertained his royal patroness here in the magnificent style described by Scott in *Kenilworth*.

When Cromwell gave the castle to some of his officers, they demolished it and divided the land into farms for themselves. After the Restoration it passed, hopelessly ruined, into the possession of the Earls of Clarendon.

Even as Kenilworth stands today, stark and deserted, something of its old magnificence remains.

A combined fortress and fortified town with a mile of walls and 21 towers is Conway Castle, in north Wales (Plate XII). Built for King Edward I by Henry de Elreton, it was completed in 1284. It remained intact until the Great Rebellion, when it underwent two sieges. In 1665 it was plundered of all its usable timber, lead, and iron.

Conway Built for the Ages

Conway is so well constructed that when part of a tower fell out through undermining, it did not disintegrate and was difficult to break apart for restoration.

Few of the castles I etched are inhabited, but some are being protected from decay, by the National Trust * and by other means. Some, like Caernarvon and Warwick, allow us to picture their former grandeur (Plates XIII and XIV). Think of them in their heyday, standing gaunt and menacing but peopled with knights and ladies, men-at-arms and retainers—small, self-contained towns.

Since books were few, and the ability to read was a rare feat, the fortress dwellers must have had little to talk about. News traveled slowly, and a courier was their only contact with the outside world. Nevertheless, they seem to have been fully as happy as we. We are entertained; they entertained themselves.

Castles built for military purposes reached their apex in the early 14th century, when the government of England was carried on within their walls. From that time the need for great fortified strongholds began to decline.

Caernarvon is similar to Conway in arrangement, but it is easily distinguishable by its polygonal towers. The castle stands on a rocky platform commanding the southwestern end of the Menai Strait in Wales. There are two main entrances—the King's Gate on the north and the Queen's Gate on the east.

Caernarvon was the most important of Edward I's six fortresses in Wales.

In 915 Ethelfleda, daughter of Alfred the Great, is believed to have made a strong fortification on the site of Warwick Castle (Plate XIV), which lies along the Avon and is the seat of the Earl of Warwick. William the Conqueror founded a castle here.†

Leeds Castle, though much altered since its beginning in the 13th century, retains the atmosphere of its period (Plate XV). Still inhabited, it is in perfect repair. It has an exquisite setting, being almost entirely surrounded by water and backed by woods.

When Queen Isabella, fragile wife of Edward II, came one night to demand admission to the castle, the castellan refused, being without the King's orders. At the same time he sent forth a shower of arrows. The Queen then influenced the King to have the castle besieged. The castellan was captured with 11 others and hanged above the drawbridge.

Here Henry V received Emperor Sigismund and imprisoned his stepmother Joan for practicing witchcraft. For the same alleged offense, Eleanor, wife of good Duke Humphrey of Gloucester, was tried here.

This romantic castle in Kent also has American connections, for it was the home of Lord Culpeper, early Governor of Virginia, and of his grandson, Lord Fairfax, patron of the young George Washington.

At the time of my visit to Leeds it was a military hospital. The coming and going of Army vehicles and the presence of nurses and soldier patients seemed to recapture some of the life of its early days. This vitality is denied to many of the castles, somber ruins having no occupants but pigeons, bats, or perhaps a solitary vixen raising her brood amid the fallen masonry.

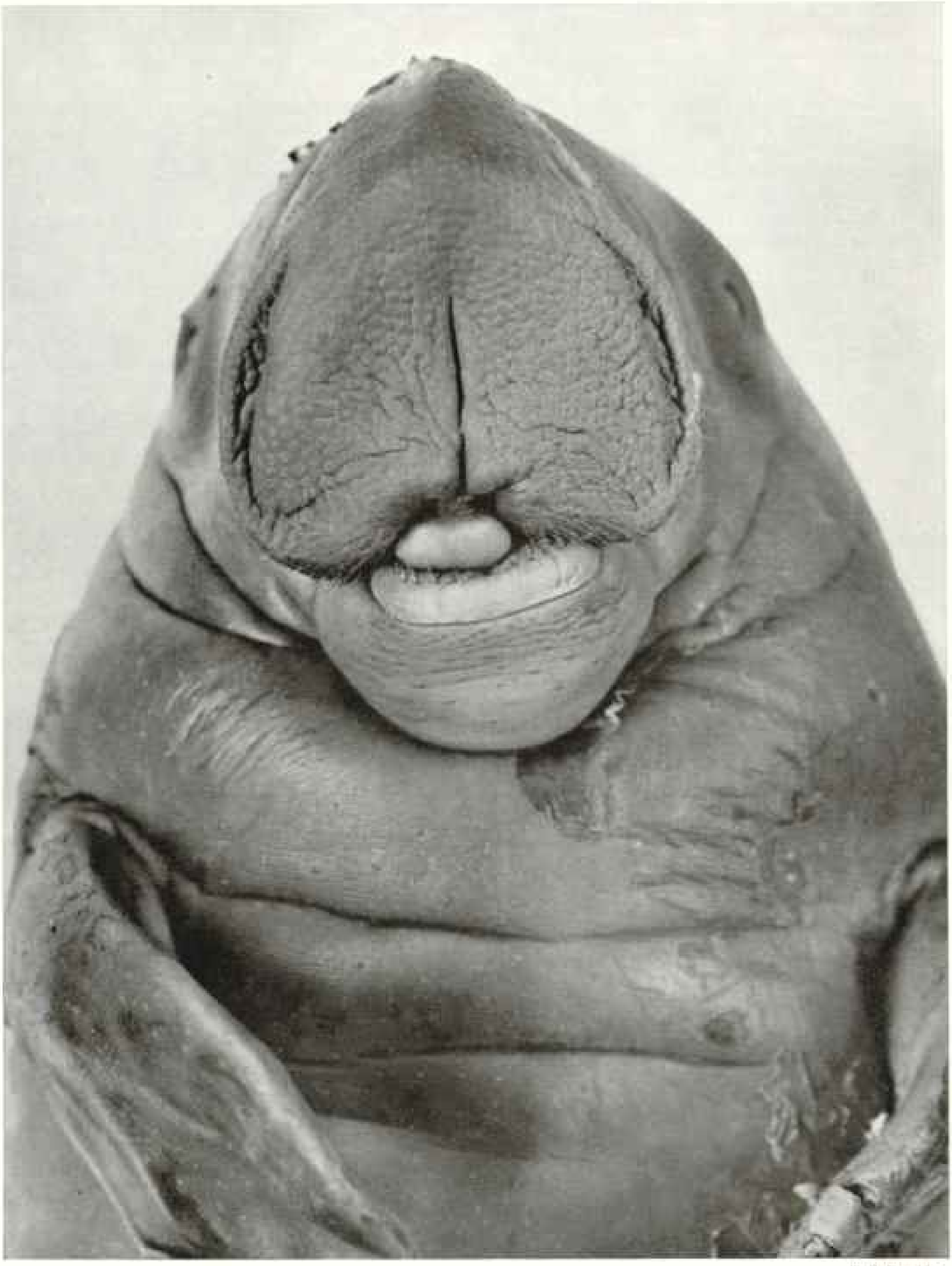
In Sussex, on the River Rother, stands Bodiam Castle (Plate XVI), built in 1386 and dismantled during the Civil War. It was erected by Sir Edward Dalyngrugge, who served under the Black Prince in France and used part of his spoils of war to establish himself in a castle as a manor lord. Bodiam was built all at once.

As I sketched these castles, I contrasted them with the cathedrals which I had previously drawn for the National Geographic Magazine.‡ With few exceptions, the castles were lifeless ruins, all pageantry gone. But the cathedrals, with glorious stained glass and carving all in perfect order, were living things which even the German bombing hosts had left almost untouched. Cathedrals of religion stand intact, while many of the castles, built for war, are in ruins.

* See, in the National Geographic Magazine, "Preservation of England's Historic and Scenic Treasures," by Eric Underwood, April, 1945.

† See "How Warwick Was Photographed in Color," by Maynard Owen Williams, July, 1936.

‡ See "Cathedrals of England," by Norman Wilkinson, December, 1939.



T. C. Boucher

Imagine Meeting This Lovely "Mermaid" Face to Face Five Fathoms Deep in a Lagoon!

The author, caught in diving gear, had no trouble recognizing a dugong, but, not knowing whether it liked meat, he beat a retreat. "As in an agonizing dream, I felt as if I were being chased in slow motion." Later Commander Johnson learned that such aquatic mammals lived on sea grass. Suckling their young, they were mistaken for mermaids by old-time sailors (page 144).

Adventures with the Survey Navy

By Irving Johnson

THIS is the story of the "Survey Navy." It is told belatedly, for little could be said during the war. Now, though peace has come, few citizens have any realization of the important part that survey crews played in winning the war in the Pacific.

"Survey Navy" was the nickname affectionately bestowed upon the survey ships of the Navy's Hydrographic Office by the men who served them.

Not much fighting was expected of these lightly armed vessels. Their job was to chart a route to Tokyo through a constellation of question-mark islands and past vicious reefs lurking in ambush for ships. Survey Navy, often working ahead of the fighting fleets, had to blaze a trail beset by the deadliest hazards of man and Nature (map, page 135).

War in the remotest recesses of the Pacific compelled the Navy to rely in many instances on navigational charts a century old. These bore the vaguest directions, such as: "This island reported to lie 11 miles ENE of position shown," or "Many uncharted reefs exist; proceed with native pilot and good light."

As one consequence of the lack of charts, the U. S. S. *South Dakota*, one of the few American battleships in the South Seas during the desperate summer of 1942, ripped her bottom on an unreported coral head.

Old Chart Costs Japan a Battle

Japan's costliest example demonstrated the folly of attempting an invasion without accurate charts.

On a gloomy night off New Guinea in August, 1942, the enemy fleet groped into Milne Bay with the aid of the best available chart—one printed by the British nearly a hundred years ago.

Twelve miles up the bay the Japanese landed, expecting to surprise the Australian airfield and its defenders. Too late the Nips found themselves mired in a swamp three miles from their goal. Many were slaughtered by the Aussies; others were thrown back into the sea.

This disaster, the direct result of a faulty chart, broke the back of the enemy's drive on Australia.

My work as a civilian steered me into the Hydrographic Office's surveys. As owner and skipper of the *Yankee*, a schooner carrying 6,000 square feet of sail, I had explored scores of little-known Pacific islands.* Long before the war, prowls around the coral atolls convinced me that charts were grossly inadequate.

War caught me in Hawaii, advising the Navy on locations for new South Sea bases. In Pearl Harbor stood the U. S. S. *Sumner*, the Navy's special survey ship, then a veteran of 26 years' service. Originally the U. S. S. *Bushnell*, a submarine tender, she had been converted into a survey ship in 1938 (page 132). *Sumner* got off to a fighting start December 7, 1941, when one of her three-inch guns exploded the first Japanese torpedoplane in mid-air.

Destiny brought us together. Of all the Navy assignments available, none could have suited me better than duty as navigator aboard the *Sumner*, with rank of Lieutenant Commander. I was eager to make charts. What I never counted on was the adventure attending a pencil-and-paper job.

We Take Over a Coral Solitude

In 1942 the *Sumner* was detailed to load Marines and take over the Wallis Islands (Iles Wallis), a French-owned group between Samoa and Fiji. I was assigned to the party because, I believe, I was the only Navy man who had been to Wallis before the war.

I remembered from my *Yankee* days that Uvéa, the main island of the Wallis group, was surrounded by a coral reef whose dangerous lagoon channel already had claimed several ships. For safety's sake, we entered the channel on a slack tide, which lasted barely 15 minutes.

As pilot, I took station in the crow's-nest. There I looked deep into the clear water, just as I did from the *Yankee's* square-sail yard a few years earlier. We were nervous lest an enemy shell end our survey before it began.

Quietly we sneaked into the lagoon and anchored, hoping we hadn't been detected. Then we headed for shore in motor whaleboats and survey boats. In this stage of the war, none of us dreamed of the ingenious assault landing craft still to come.†

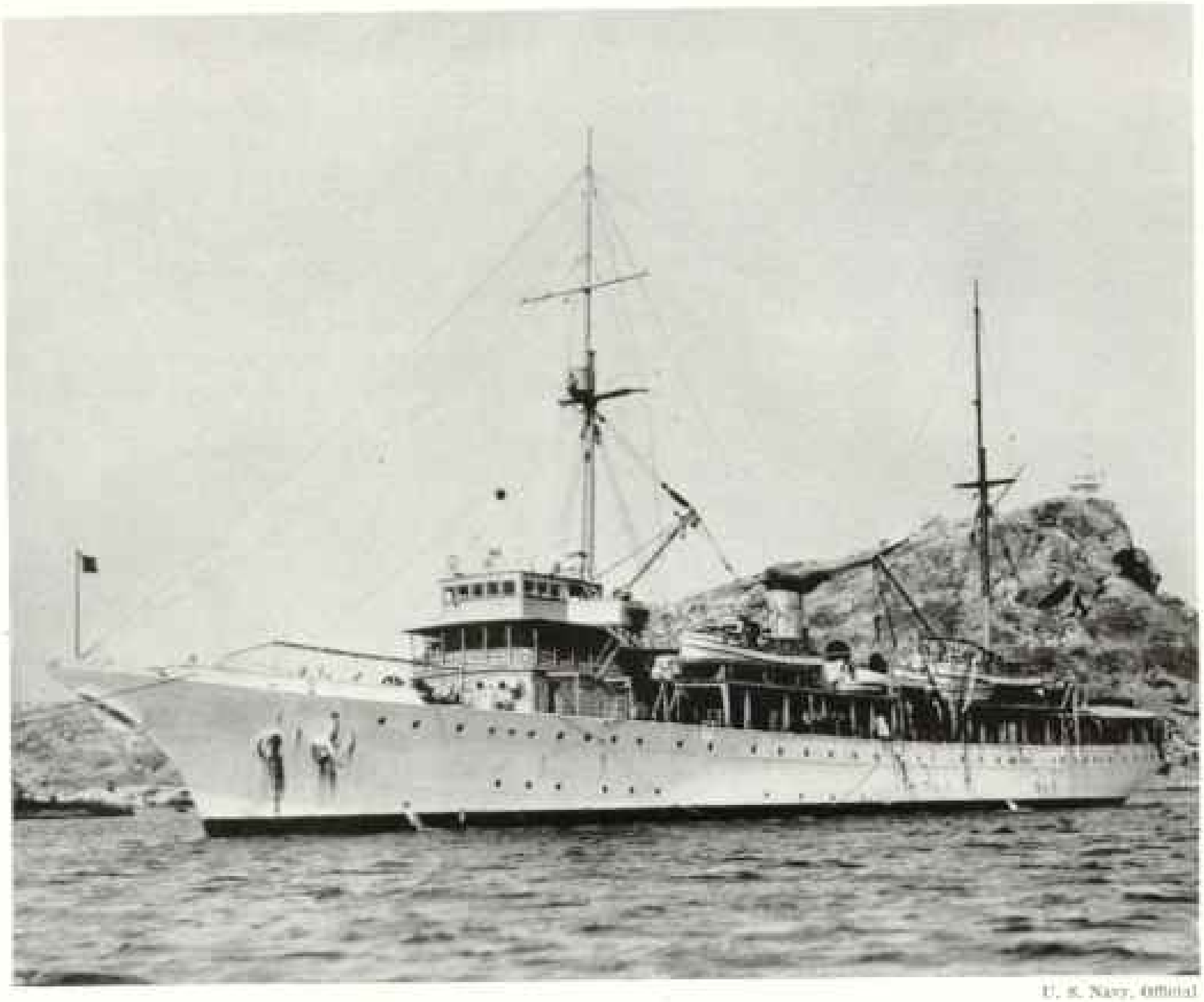
My job was to lead the small boats across the reef-choked lagoon, plant buoys to show others the way, and locate a landing place.

For a quarter-hour our open whaleboat made a perfect target, but not a shot rang out. The jungle remained silent but ominous. Where were the Japanese, I wondered.

Beating the Marines ashore for once, I ran

* See "Westward Bound in the *Yankee*," by Irving Johnson, National Geographic Magazine, January, 1942.

† See "Landing Craft for Invasion," by Melville Bell Grosvenor, National Geographic Magazine, July, 1944.



U. S. Navy, Official

U.S.S. *Sumner*, Queen of the Survey Navy, Thrived on War's Close Escapes

Wherever the amphibious forces were going in the Pacific there went the lightly armed *Sumner*, sometimes ahead of the fighting ships. In four years she underwent repeated air attacks, but suffered no serious damage. Instead, she shot down the first torpedoplane at Pearl Harbor (page 131). Once the 350-foot vessel marooned herself in a tricky lagoon (page 140). Shown here off Curaçao, Netherlands West Indies, she has still to exchange her white paint for guns.

for the sheltering trees. Then memory guided me a lonely mile through the bush to a native village and the chief's house. Luckily he remembered me. He said we were the first visitors he had seen in 17 months. For once we were ahead of the Japanese!

Since many more Marines were due soon in ships too large to enter the lagoon, the *Sumner* detailed a crew to blast out a landing, erect markers, plant buoys, and sound a small harbor. Within three days we had sufficient information to prepare a rough chart. I drew the sketch on my knee. A printed copy was handed to each boat coxswain as he entered.

Sumner a Seagoing Printing Plant

A French-made chart of Wallis looked good on paper, but Hydrographic engineers detected some curious discrepancies. For example, the map showed an extra half-mile of island which we could find nowhere. Obviously a new chart was needed.

Sumner was the ship to do the job. She was a floating print shop, turning out charts for immediate use. In her drafting room Hydrographic engineers and cartographers spent long hours at their exacting work (page 143). When the hand-drawn chart was complete, photographers and platemakers worked without sleep until they had prepared zinc plates. Then printers, starting the lithographic press, ran off thousands of copies in five colors.

None of these processes meant anything, however, without the essential raw material—a painstaking, accurate survey. To make original surveys, the *Sumner* carried 14 small boats. They worked around islands and in sheltered waters.

In larger open-water areas the ship herself took soundings on predetermined lines, keep-

ing a record of her exact position. The navigator—remember, I was one—got a daylong workout. He had to plot horizontal sextant angles taken by quartermasters every three to five minutes. He also conned the ship. When he sighted an undiscovered shoal—and many's the time!—he had to change the ship's course quickly.

However, part of our work was done while the ship was at anchor in harbors and lagoons. There I took a rest as navigator, only to become the *Sumner's* diving officer.

In order to make underwater movies, I had learned a little about diving while on the *Yankee*. Now I couldn't wait to learn more.

Learning Dynamite by Trial and Error

My diving started in a certain lagoon in the Wallis group which the *Sumner* was charting as a battleship and carrier anchorage. As these ships were on their way, we had little time to lose. Imagine our concern when a survey of the entrance channel revealed coral heads—formations built by corals' stony skeletons—which no battleship could pass. Pearl Harbor could not send dynamite specialists in time; so we took on the job. As none of us had done much under-water blasting, we started learning the hard way.

Knowing that on the surface one stick of dynamite would knock a 50-gallon drum a hundred feet high, we used a single stick for the first charge under water. For detonation we attached a long wire to an electric cap and then backed off as far as possible. "Ready—fire!" For a moment nothing seemed to happen. Finally a bubble rose and burst quietly.

Following that fiasco, we increased the charge till we were using 80 sticks, an entire box at a time. Later, sometimes, we fired 80 boxes in a single charge. Our blasting wire enabled us to back off only 135 yards. Once the shock knocked our whaleboat's engines off their beds and bounced the batteries three feet high. We learned something every day.

So many lagoons were unable to accommodate our big ships that the blasting of coral heads became supremely important. Usually we blasted as we surveyed. Then the cartographers incorporated the changes as they drew their charts.

To many of the South Pacific islands the *Sumner* was the first actual sign of war. In the beginning the natives brought gifts of fruits, vegetables, chickens, and tapa cloth. As if for fun, they carried lumber and cement to mountaintops and cleared jungle paths with machetes.

Native naïveté soon wore off, however. Our hosts stopped fishing and fruitgrowing; many

From Irving Johnson

Not an Oil Derrick, but Survey Tower

Five tons of steel lunge skyward on a Pacific island. Navy riggers may be volunteers, for their work is hazardous as well as strenuous. In tricky surf they handle small boats laden with parts of towers. Ashore, they carry steel on their shoulders for long distances, often up mountains. A tower must top trees and hills to give instruments an unobstructed view; so it generally stretches its full 100 feet (page 141).

U. S. Navy Official

A Theodolite Delights Childish Ulithi Islanders

Navy Hydrographic engineers made it a policy to befriend natives, for they could be useful clearing trees and carrying beacons (page 140). These Micronesians, unused to telescopic instruments, were amazed by the sight of distant, inverted objects magnified 30 times.

started living on canned rations. They wanted money for every service. Some had no realization that there was any monetary unit less than a dollar. A Pago Pago native nonchalantly paid a survey man $10 for a fish.

As the war progressed, prices for food, curios, and labor were controlled.

Meanwhile, the *Sumner's* first war year took her to the Society Islands, New Caledonia, Tonga, Fiji, New Hebrides, and the Samoan group. So far, everything had been peaceful.

Then we headed for Guadalcanal, Solomon Islands, where we got our first taste of fighting since Pearl Harbor.*

Our rush job was to survey and chart several harbors on adjacent Florida Island.

Guadalcanal's fate was in doubt that winter of 1942-43 when the Japs came racing down "The Slot" at night to attack supply ships. What our fighting ships needed was a fuel and supply anchorage closer than the one in the New Hebrides, 600 miles away, so they could always be on hand to defend our front door.

As Florida Island's Port Purvis could not be used until we produced a chart, we had to race against time and bombs. Beacon builders and base-line measurers carried guns and posted lookouts, just as the Pilgrim corn planters did when guarding against Indian raids. Though Japanese infested the jungle, work proceeded day and night.

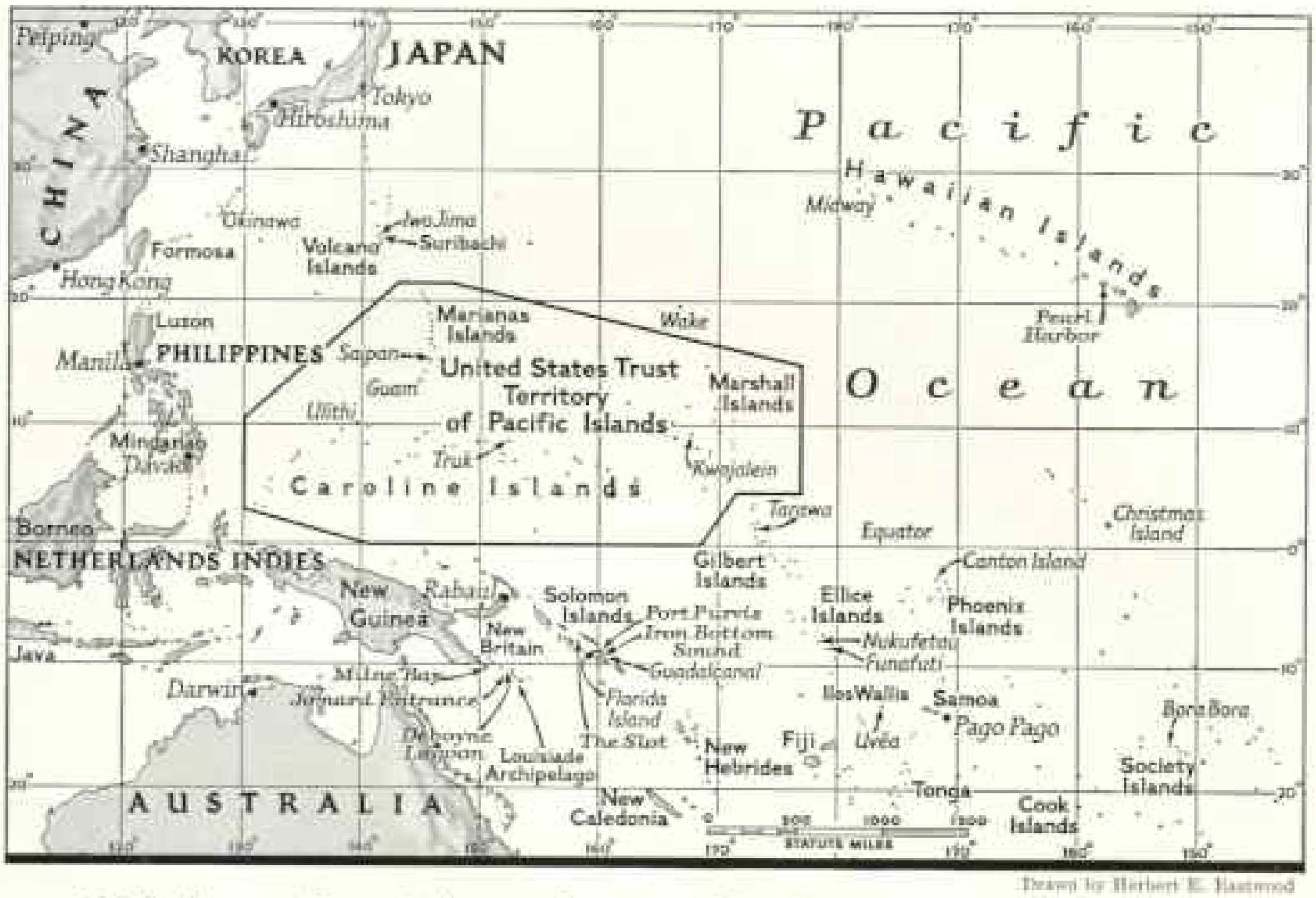
Comdr. George F. Kennedy, Senior Hydrographic Engineer, was largely responsible for time-cutting methods which set a new record. Areas were surveyed, beacons built, buoys planted, obstructions dynamited, and charts delivered in 21 days!

In the last three and a half years the *Sumner* turned out more than 50 field charts in 26 separate areas. These areas stretched from Bora Bora to the Philippines to Iwo Jima.

Divers Jimmy Secrets of Jap Wrecks

Next we got a job on Iron Bottom Sound, the stretch of water between Guadalcanal and Florida. This bay got its name from the many American and Japanese ships sunk there. The enemy's ships contained codes and secret charts which Naval Intelligence was itching to examine.

* See "At Ease in the South Seas," by Frederick Simpich, Jr., National Geographic Magazine, January, 1944.



Drawn by Herbert E. Eastwood

U.S.S. *Sumner* Charted Remote Recesses of the Pacific for Our Fighting Fleet

When war with Japan broke out, charts of many strategic areas were outdated and incomplete. New ones were made, often under enemy fire. Heavy line encloses former Jap-held Pacific islands entrusted by the United Nations to the United States.

U. S. Navy Official

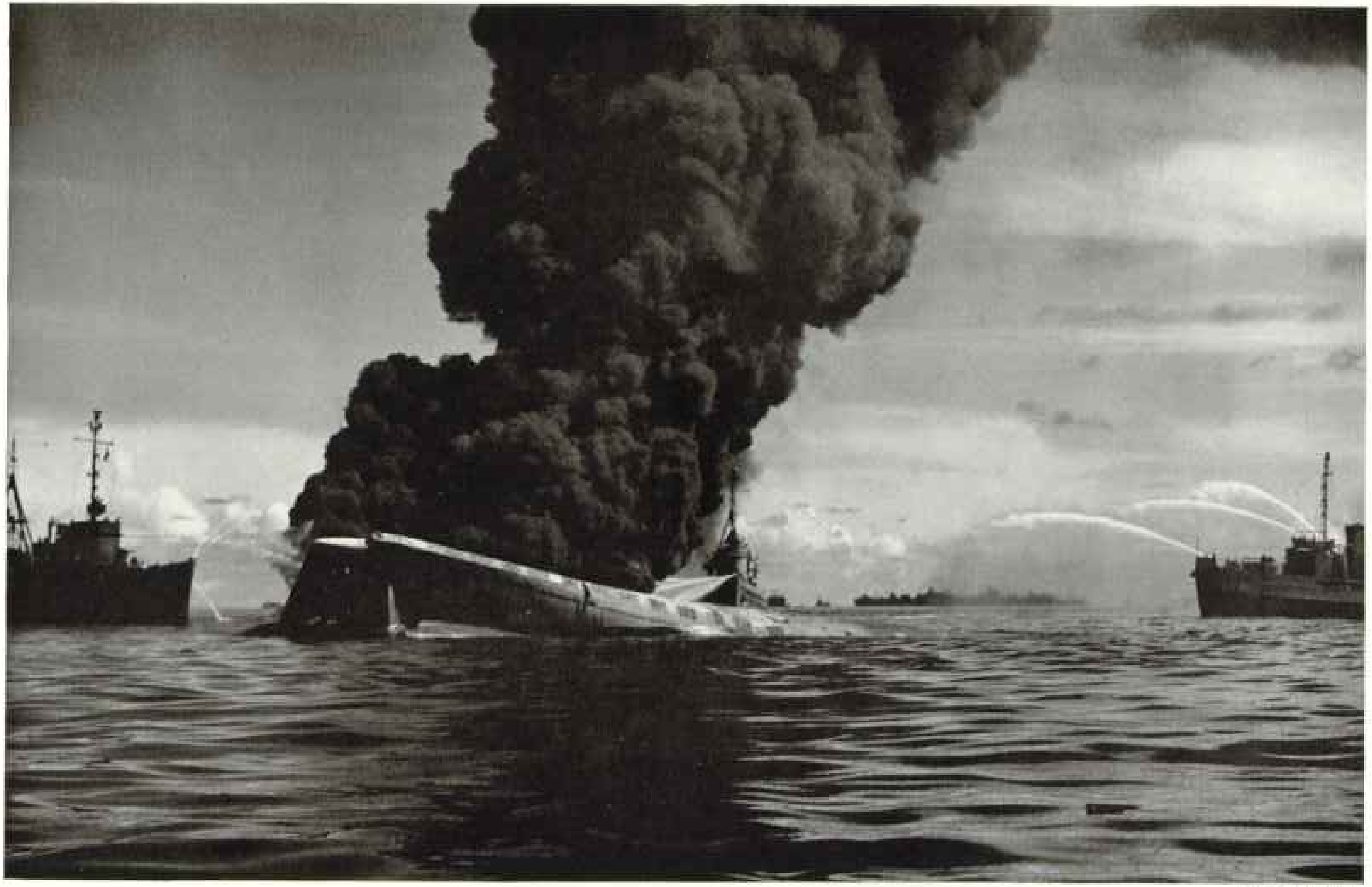
A Whaleboat Fixes the Position of a Shoal Snagged by Wire-dragging Vessels

In this intended anchorage a dragline (note its buoys) has been drawn at a depth of 40 to 50 feet to determine whether big ships may pass. Here the wire has struck rock, and quartermasters fix its position. A seaman (left) takes a sounding. Blasters will remove the obstruction. A Hydrographic ship mothers a brood of small boats. These devote long hours to dragging, sounding, and plotting (page 143).

Rising Tide Catches a Hydrographic Crew Measuring a Base Line on Okinawa Even as the Battle Progresses

U. S. Navy, Official

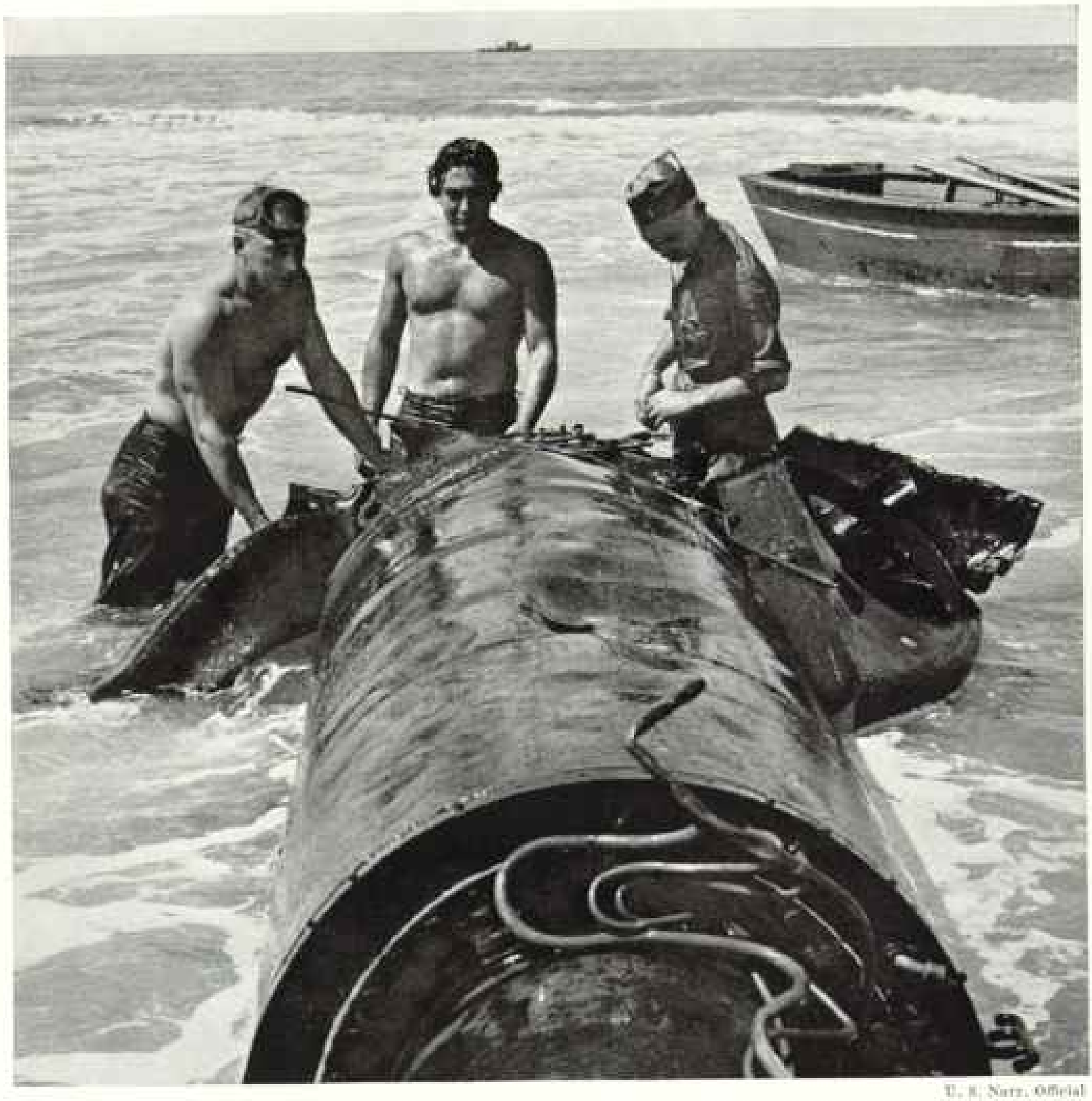
A Dukw, Surveyor's Time-saving Burden Bearer Across Surf and Sand, Fascinates Okinawa Children



U. S. Navy, Official

Up in Smoke Goes an American Tanker, Victim of a Baffling Attack in Closely Guarded Ulithi Lagoon

Here the Navy massed an armada. Suddenly it began losing ships to torpedoes fired from—no one knew where. Premature death of a Japanese pilot on a suicide errand disclosed the secret. His stealthy torpedo-submarine ran on compressed air. To detectors the engine noises sounded like fish (pages 138, 146).



U. S. Navy Official

Like a Whale on a Beach, a Piloted Torpedo Lies Stranded in Ulithi, Solving a Riddle

By using compressed air for power, a suicide-bound Japanese hoped to sneak silently past the lagoon's entrance. Despite a miniature periscope, he struck a reef, where his torpedo exploded with fatal results. Thereby he revealed how Japanese had attacked a protected anchorage (page 146). The author (left) searched vainly for the wrecks in his deep-sea diving suit. Surface craft, dragging his air hose as a cable, towed him 20 feet above the bottom. A war correspondent (right) and a Navy signalman examine the *kamikaze* submarine.

As professional divers were not available, we accepted the job. We entered blasted hulls in total darkness. Codes, messages, charts, and other secrets we jimmied from compartments, but, knowing not a word of Japanese, we were never able to evaluate our discoveries. One survey crew uncovered a complete file of Japan's secret, red-bordered charts. Red borders proclaimed their supreme importance to the Japanese. They were so precious to us that a Navy captain carried them to Pearl Harbor under his arm.

Our personal prize was found in the sunken destroyer *Kikutsuki*. It was a miniature Shinto shrine beautifully carved in the form of a wooden temple. A bowlful of Japanese money, perhaps an offering to the gods, lay beside it. This souvenir remained aboard the *Summer* for the rest of the war.

That sunken destroyer gave me a fright I shall never forget. As it lay in warm, shallow water, I tackled it without a diving suit, using only a helmet with air line. Reaching the pitch-black hull, I started to grope my way

down another deck, only to find myself blocked by a heavy steel hatch. This door I pried open, but the ship's list, some 40 degrees, immediately swung it shut. Clearly, a rope was needed to hold that hatch. To save a return trip for one, I used the string holding up my pants.

Then I blundered downward again. My lifeline twisted around so many corners that I couldn't signal the tender. Stagnant water rose within a few inches of my nose. Clad in open helmet, I could not escape the overwhelming stench.

Meeting the Dead in Davy Jones's Locker

Then, of all the horrors, a mushy, clammy object brushed across my bare stomach. As I pushed it away I felt—or did I imagine?—the sweep of long, cold fingernails. My only thought was to escape at once.

Then in the blackness my helmet struck steel. That hatch had come down, my stout air hose having dislodged the string! Luckily I was still receiving air.

Sudden shock almost caused me to pass out. That emotion was succeeded by terrible anger at myself for having been so careless. (A diver's brain is never quite clear when he is working under pressure.) A flash of sobriety forced the conclusion that I had to pry open the hatch or stay down forever, for we had no extra diving gear for a rescuer.

There was agonizing uncertainty until my fingers discovered a way to apply leverage. The hatch slowly lifted.

When I came up, the pumpers wondered what had kept me so long.

Months later a Navy salvage crew raised the *Kikutsuki* for a detailed inspection.

Our next big job took us around Deboyne Lagoon, in the Louisiade Archipelago, off the eastern end of New Guinea. Here the *Sumner*, standing a hundred miles ahead of the armed forces, was preparing an alternate way to get at Rabaul, the major Japanese base on New Britain (page 142).

Numbers of enemy planes, bound on missions, flew high overhead. Having spotted the *Sumner*, the Japanese sent a few planes after each raid, but they found nothing. Forewarned, we were surveying over the horizon.

Diver's Pet, a Baby Porpoise, Cries for Air

Sharks, devil rays, dugongs, and coral fantasies gave wartime Navy divers never a dull moment. By diving, the author uncovered Japanese naval secrets. Once he trapped himself in a sunken destroyer at Guadalcanal. This man entertains visitors at Marine Studios, a huge "oceanarium" in Marineland, Florida. Recently biologists and cameramen saw this porpoise born. Like other aquatic mammals, it must breathe on the surface.

U. S. Navy, Official

An Admiring Beach Party (Right) Envies a Ulithi Chief His Full-bodied Tattoo

Native men in this group aided in the erection of the wooden beacon. This fixture flashes no light. Instead, it bears a big black number for quick identification by navigators. By taking bearings on several beacons shown on their charts, they can fix their ship's positions. Wartime Hydrographic ships carried lumber for hundreds of such beacons. Captured Japanese materials came in handy (page 145).

It was comforting to know that each week the Navy sent a plane or PT boat to collect our latest survey information so it wouldn't be lost when we sank.

Little-known Nukufetau, one of the Ellice group, was our next objective. We had to determine whether its lagoon and channel could accommodate the invasion fleet soon to be flung against Tarawa, one of the Gilbert Islands (page 143).

Judged by the hundred-year-old sketch chart, the lagoon appeared to be a fine anchorage for large ships. The chart's single sounding in the entrance pass showed a 30-foot depth.

Close approach, however, showed the island six miles out of position. None of the old chart's bearings worked out correctly.

Sending two sounding boats ahead, we entered the passage at slow speed, with a native pilot. Twice the *Sumner's* fathometer showed zero, meaning no water under her keel, but we skimmed across without a perceptible bump.

Evidently the native pilot, who knew exactly where his canoe could go, had no realization of the *Sumner's* 18-foot draft.

Two weeks of sounding proved that Nukufetau's entrance pass was so cluttered with sharp coral heads that any ship drawing more than 12 feet could enter only by a 100-to-1 chance.

Now, having overcome such odds, the *Sumner* was trapped in a fine lagoon. We had to blast an escape route. Our diving team went into action. Before it was safe to leave, we had used the last stick of dynamite.

Coral's Fantastic Architecture

For big-time operations, Nukufetau's channel remained too shallow, despite improvements. Further search in the vicinity revealed that the big atoll of Funafuti might

U. S. Navy, official

Steel Rears above Palms; Riggers Climb a 100-foot Tower Like Monkeys

Part of a survey ship's cargo, the tower comes ashore temporarily. Each leg is fastened in concrete. Soon a theodolite, mounted on the summit, will shoot angles between various objects to fix positions. Likewise, ground and boat crews, sighting at two or more towers, will take their bearings. Once its work is done, this structure will be dismantled and again stowed aboard ship.

be used. Its entrance channel was deep, but crooked and coral-choked. Armed with fresh dynamite, we went to work blasting.

Funafuti proved our biggest job; it required thousands of tons of explosives. Here coral heads were enormous and fantastic. Some rose like cliffs, 100 feet from the bottom. Others grew like toadstools, small at the base, large at the top, perhaps 200 feet across.

Once the charge was set, these mushroom shapes toppled easily. Climbing their steep sides to plant a charge required a mountaineering job under water. However, ragged coral offered so many hand and foot holds that divers had little difficulty climbing vertical columns or even overhanging ledges.

In the northern end of the lagoon we found a coral castle right out of fairyland. My weirdest dreams had never pictured anything like its caves, tunnels, verandas, and grottoes, all decorated in extravagant color schemes.

In these rooms lived brilliant tropical fish, so tame they could almost be petted.* Occasionally they fled in terror as my foot broke through a veranda roof or delicate parasol formation; but curiosity soon brought them back to see what I was doing to their marvelous apartment house.

Before we set off the explosives, I had every man of the diving party go down to see this wonderland. What a shame that military necessity compelled us to wreck it!

A Diver's Battle with a Devil Ray

In the lagoon's paradise lurked several hundred demons. They were manta rays, also called devil rays or devilfish—the latter name richly deserved. Flat, ugly, and diamond-

*See, in the National Geographic Magazine: "Net Results from Oceania," by Walter H. Chute, March, 1941; "Coral Castle Builders of Tropic Seas," June, 1934, and "On the Bottom of a South Sea Pearl Lagoon," Sept., 1938, both by Roy Waldo Miner.

Ryan Neill Phillips

Shy but Friendly Natives Meet Visitors to Deboyne Lagoon, Louisiade Archipelago

Here, east of New Guinea, the *Sumner* surveyed Jomard Entrance to save our submarines and scout forces a roundabout passage north to Rabaul (page 139). Despite contact with missionaries, the people had only stick tobacco for currency.

shaped, some weigh more than a ton, and their flippers spread 15 to 20 feet. When surfacing, they have been known to upset small boats.

Funafuti's rays loved to sleep in coral sand pulverized by our dynamite blasts. They were disturbed and resentful whenever we dived to place a second charge. If sufficiently angered, they charged like wounded bulls. It was useless to run; cumbersome diving gear and 40 feet of water slowed divers to a nightmare immobility.

When one big ray swerved close to me, I stood ready with a shark knife. My first thrust slit his flipper. Infuriated, he whirled and charged at knee level. Just as he struck my legs, I drove the knife to the hilt and fell on his back.

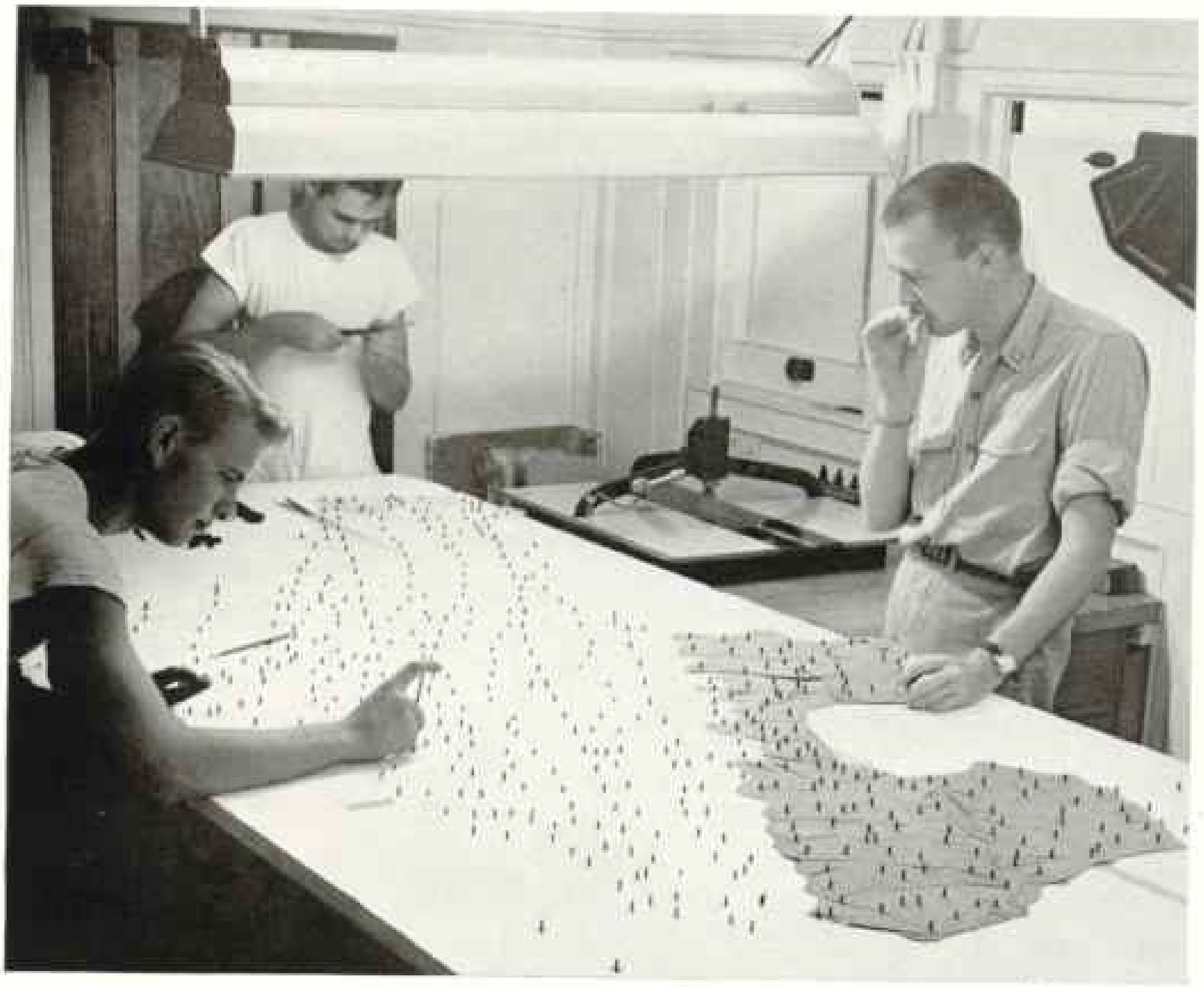
As my helmet filled with water I was helpless, but the ray sped away in a cloud of sand. Twice wounded, he had had enough. I straightened up my helmet; soon pump pressure restored the air.

The manta ray's smaller cousin, the sting ray, I encountered only once. This ray carries a dangerous weapon in his whiplike tail, which is armed with a painful barb at its base.

My specimen I found half-buried in sand where we had just blasted. As he looked thoroughly dead, I judged it safe to play a trick on my pumping crew by sending the ray, in my place, to the surface on the lifeline. This wicked plan backfired. Just as I knelt to tie the line on the "dead" ray's tail, he woke up and took off like a submarine's torpedo. He was no more scared than I.

Funafuti has one more chapter in survey history. It was here that the rescued Eddie Rickenbacker was brought in after his 21 days on a rubber raft. What he had to say about his chart getting wet and turning to pulp set the Hydrographic Office on a hunt for something better.

The result was the yellow-rubber charts especially made for life rafts. These non-



U. S. Navy, Official

Seagoing Cartographers Chart a Front-line Island for Comrades in Battle

This chart, shown aboard U.S.S. *Bowditch*, is being prepared from aerial photographs. Though angles measured on vertical photographs are correct, distances usually are distorted. Here each stud stands for an identifiable picture point; a few are positions established by ground parties. Part of the island (right) is represented by overlapping, slotted paper templates, made from many photographs.

stretch sheets may be used as emergency sails, signals, sunshades, rain catchers, and ponchos.

At last we were ready for the invasion of Tarawa. The invading Marines' terrible ordeal under fire while running Tarawa's jagged reefs in assault boats is well known,* but the Survey Navy's story has yet to be told. At the peak of the battle the *Sumner* was called upon to survey the treacherous coral formations that had already grounded one of our destroyers.

Sinking from sight of the shooting and bombing, *Sumner's* divers worked in water thick with suspended sand. Visibility was virtually nil. Men detected coral heads only when helmets bumped them.

Meanwhile, the carnage on the beaches attracted a large number of sharks.

Usually sharks caused us small trouble, as air bubbles from our helmets appeared to make them cautious. Filled with curiosity, they liked to circle within 20 feet of a diver. Never quite trusting sharks, we wasted lots of time turning around to face them.

At Tarawa we had our first shark casualty. I was on the surface, watching a diver through a glass-bottomed box, when I saw a rather small shark lunge for him. Out came the diver's knife. He had time only to raise it when savage jaws ripped his arm. We pulled him, bleeding profusely, to the surface in time to save life and arm.

Dugong's Fearsome Face—a False Alarm

Out of the corner of my eye one day, elsewhere, I saw a huge, gray object approaching my diving helmet. Size and shape fitted a walrus, but a closer look revealed an ugly face that I remembered having seen in a

*See, in the National Geographic Magazine: "Gilbert Islands in the Wake of Battle," by W. Robert Moore, February, 1945.

U. S. Navy Official

Sumner's Survey Signal Attends the Flag on Suribachi

Snipers' bullets still zipped around the volcano when seven men from the Navy Hydrographic ship fought their way to the summit of Iwo Jima (page 148). Marines made their first desperate landing on the beach beyond the signal staff. In the distance, behind the flagpole, appears a captured Japanese-built airstrip. "Before we left," says the author, "we saw 64 B-29's, fighting bad weather back from a raid on Japan, come crowding down on the tiny field."

picture labeled "dugong," a large marine mammal frequently called sea cow (page 130).

I had forgotten, however, whether dugongs ate meat. This was not the time or place to ponder such a question; I took off for the surface as fast as water would let me. As in an agonizing dream, I felt as if I were being chased in slow motion.

At the first opportunity I consulted a natural-history text. There I learned that inoffensive dugongs live on seaweed; that old-time mariners mistook the full-breasted females for come-hither mermaids. All I can say is that the sailors must have been deceived by something better than their homely faces!

Another day a new diver, surfacing in haste, breathlessly reported he had seen the skeletons of men in a submarine graveyard. As I went down to investigate, I too seemed to see a grisly array of sea-bleached bones. Another look revealed the dead, whitened branches of finger coral.

To divers, even familiar objects often look distorted. If accidents do not get them, then the constant strain snaps their nerves. Joseph Brogan, whose rate was chief printer, was the only man out of our 30 divers who was tough enough to stand the gaff for the duration.

Japan's Fleet, Bottoms Up, Is Charted

Navy's next big advance took us to the Marshall Islands.* There Kwajalein's lagoon, nearly 80 miles long, presented the problem of charting 17 Japanese ships sunk in shallow water by planes from our carriers. Like mines planted just below the surface, their tall masts menaced ships' bottoms and anchors.

On calm days we had little difficulty spotting oil slicks rising from the wrecks. However, it took a wire drag to locate the mooring buoys secured to some. When the damaged ships sank, they pulled down the buoys just far enough to smash propellers moving overhead. Dynamite took care of these hazards.

Among the wrecks inspected by the *Sumner* was a 350-foot 5,000-ton ship lying in 110 feet of clear water. Without warning one

* See, in the National Geographic Magazine: "Our New Military Wards, the Marshalls," by W. Robert Moore, September, 1945; and "Hidden Key to the Pacific," by Willard Price, June, 1942.

night that Japanese ghost rose from Davy Jones's locker and stack her nose 50 feet into the air. We saw the whole thing plainly when a freighter turned searchlights on the wreck. One hour later the derelict submerged amid a stream of bubbles. Only one explanation satisfied me—that the ship was laden with a gas-forming cargo.

Sunken Japanese ships came in mighty handy at times. Our divers raided them for chain a hard-to-get item in the Pacific. Lots of enemy steel pipe and railroad iron went into beacons which we welded together aboard ship and planted on reefs.

Nearly two and a half years after Pearl Harbor the *Sumner* entered a San Francisco shipyard for a well-earned overhaul. As repair forces knew little about a survey ship's wartime requirements, they acceded to most of our recommendations. At this particular time I assumed command of the *Sumner*, and I enjoyed ordering everything she needed.

Air conditioning was installed for the cartographic drafting room and the print shop. A brand-new bridge was designed for survey work. Windows instead of portholes were built in, allowing visibility all around the horizon. Extra strength was provided to stand the strain of the many new guns that were unheard of in 1915, when the *Sumner* was built. Before long she took on the look of a multimillionaire's sleek steam yacht.

It was a real thrill not to have to pay the bill, as I would have had to do for the *Yankee*.

Our next cruise took us 400 miles southwest of Guam to Ulithi, whose lagoon was selected to be America's secret naval anchorage.* Time and again, more sea power was concentrated in Ulithi than at any other spot on earth. Though the lagoon was 22 miles long, it was too small to hold all the many ships demanding space.

U. S. Navy Official

The Author Gets a Comb in a Swap for Tobacco

"On Ulithi," says Commander Johnson, "we learned that the Japanese had taken away the best-looking girls. Why they hadn't kidnaped this 15-year-old puzzled us. We couldn't talk enough of her language to get the answer."

Summer entered Ulithi's lagoon with the aid of a captured Japanese chart. Before long we had our own, a chart showing many improvements. Survey crews changed the face of the lagoon by blasting coral heads, building navigational buoys, and wire-dragging large areas. These were tasks which the enemy did not do for his secret chart; his Navy was not big enough to require them.

Shortly after we started work, so many

* See "South from Saipan," by W. Robert Moore, National Geographic Magazine, April, 1945.

U. S. Navy, Official

Quartermasters Shoot Sextant Angles to Fix the Position of Their Sounding Launch

Because these men work long hours in a tossing boat, they are permitted to dress for comfort. Only two need to fix the launch's position; the third takes a shot to locate a wire drag buoy (page 135). Another man, concealed by the canvas, works at a board plotting angles as they are called out.

ships arrived in Ulithi that we had to put out three preliminary field charts for their use. Hundreds upon hundreds of ships, all competing for space, enormously complicated the survey work and added weeks to the job.

One of the first tasks was the establishment of a tide gauge. Automatic gauge mechanism, run by clockwork, makes a 24-hour record of tide levels on graph paper. Strangely enough, our gauge at Ulithi showed a sizable jump about the same time that a heavy earthquake struck Japan, 1,600 miles away, on December 7, 1944.

Hunting Japs' Mysterious Weapon

When the Japanese discovered the shipping concentrated in Ulithi, they attacked with a mystifying weapon. Though the Navy felt sure that no submarine could enter the lagoon undetected, ships nonetheless were being torpedoed without warning or explanation (page 137).

Evidently some torpedo mechanism was at work. Such a device was reported stranded in the anchorage following one attack. Naval Intelligence wanted to have a look, and I was detailed to find "the thing."

Diver Towed with Air Hose

To help me, the *Sumner's* crew devised a method of searching the depths of the lagoon. We used an air hose as a towline. This is how it worked:

In a deep-sea suit I was lowered 140 feet to the bottom, followed by 300 feet of hose. Then the diving boat, using the hose as a cable, moved at a speed which left me suspended 20 feet above the bottom.

By using the telephone in my diving helmet, I could give directions and report what was going on. When the sun was out, I could see about 30 feet on either side. The experience called to mind the *Nautilus* in Jules Verne's *Twenty Thousand Leagues Under the Sea*.

U. S. Navy, Official

Trousers Still Wet, a Survey Party Lands with Rifles and Tools to Erect a Beacon

Obviously these men do not expect trouble on this Pacific island, for they disregard helmets and camouflage. Surveyors from the *Sumner*, while working on Iwo Jima under full fighting equipment, killed 21 Japanese and captured six. Not one of the Americans was scratched.

My underwater tour located 35 fathoms of chain and a huge anchor, but no secret weapon.

A survey boat, however, observed a curious dark object submerged in two feet of water on a reef.

Investigating, we discovered a piloted torpedo, a sort of one-man suicide submarine. An explosion had killed the pilot. His narrow cylinder, some 40 feet long, operated on compressed air. Leaving the mother submarine a few miles outside the harbor, it apparently ran aground (page 138).

So small and silent were these *kamikaze* subs that they could sneak past the harbor entrance's detectors like a school of fish.

Sideswiped by a Typhoon

Typhoons were the gravest threat to the Ulithi anchorage. The mere edge of one storm sank or drove ashore every small boat afloat except a 50-foot LCM belonging to the *Sumner*. We saved it from the fate of a hundred other craft by securing it with 6-inch lines and manning it with a pumping crew. Elsewhere the same storm sank three destroyers, with the loss of 790 men.

For a week thereafter the lagoon was so rough that we could get ashore only in borrowed Dukws.

"Duck" Drivers Astonish Oarsmen

We were astonished by these amphibious trucks' ability to land on rough beaches through heavy surf. Equally at home on sea or land, they carried men and building materials from ship to terra firma in a twinkling. To skilled oarsmen who respected snarling breakers, it was disconcerting to see a carefree truck driver set all their skill at nought.

When we departed, Ulithi's lagoon was crowded with nearly 500 ships. Others were gathering at Guam when we arrived there—infallible sign of another big push. This one headed for Iwo Jima, in the Volcano Islands.

The survey of Iwo Jima proved the most thrilling, difficult, and dangerous of all. I shall never forget our approach early one morning.

Mount Suribachi loomed out of the smoke. Flashes rose from the fleet's big guns hammering the Japanese in their hide-outs.

Sumner anchored a thousand yards off the sloping shore at one end of the front line, where the 4th Marines faced the enemy. So close, yet in a way so remote, was the *Sumner* that we seemed to be watching a war movie on a screen. Reality took charge, however, when enemy shells came our way.

Sumner's Expedition to Mount Suribachi

Our first job was to rush a survey for harbor development near the front line. *Sumner's* crew men worked under sniper fire in small boats and beside the Marines ashore. As bullets splashed near by, they found it difficult to concentrate on sextant angles.

Lt. Comdr. John A. Stirton, Chief Hydrographic Engineer, wanted the first survey signal put atop Mount Suribachi, where the Marines had just hoisted the American flag (February 23, 1945).

Though bullets still swirled around the mountain, Ensign L. V. Elliott, a fighting Texan, figured he could make the top with six selected men. Loaded with carbines and full fighting equipment, they started out.

Color Guard Returns Safely

Using binoculars, we aboard the ship watched our companions' slow progress. Finally their signal appeared alongside the flag. All seven men came back alive (page 144).

Elliott and his gun-toting gang were detailed to erect more survey signals along the shore. In two weeks, while completing the job, they killed 21 Japanese and captured 6.

It did not take the enemy long to figure out that the yachtlike *Sumner* must be carrying the President of the United States, or at least a cargo of five-star admirals. They poured volleys at us from caves in the hills, dragging their artillery back into the earth after firing a couple of rounds.

Fortunately, their aim was poor, but a dud did crash aboard, killing one man and wounding three.

Meanwhile, two American destroyers and a cruiser gave us protection by firing over our heads into the gun caves. Every salvo jarred the *Sumner*. Things finally got so hot that we moved back a few hundred yards.

Determination of Iwo Jima's exact position on the planet was a hard job, because the island, built of volcanic ashes, was so loose at the joints that it refused to stay still. We were trying to use the astrolabe, a delicate instrument employed for determining positions by the stars.

Demolition Blasts Shake Instruments

Gunfire and demolition blasts, shaking the entire island, made observations inaccurate within a thousand yards. Even bulldozer vibrations upset our calculations.

Finally we were compelled to maroon our astrolabe party on a bare but solid patch of rock half a mile from Iwo Jima. There the men built a five-ton concrete pillar to hold the instrument steady and a shelter to ward off the wind.

Disregarding land-mass errors, they were able to locate a spot not much larger than a barrel head. Such extreme accuracy was needed for the sake of secret Loran navigational installations.

Today the war is over, and I am again a civilian skipper, sailing a brigantine; but the survey work is never finished. The Hydrographic Office carries on. Our Navy, Merchant Marine, and Air Forces need more and better charts of the world's far corners.*

* See also, in the National Geographic Magazine: "Victory's Portrait in the Marianas," by Lt. William Franklin Draper, November, 1945; "Springboards to Tokyo," by Willard Price, October, 1944; "Guam—Perch of the China Clippers," by Margaret M. Higgins, July, 1938; "American Pathfinders in the Pacific," by William H. Nicholas, May, 1946; and "Your Navy as Peace Insurance," by Adm. Chester W. Nimitz, June, 1946.

Notice of change of address for your National Geographic Magazine *should be received in the offices of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your September number, The Society should be notified of your new address not later than August first. Be sure to include your new postal zone number.*

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In Mexico, The Society and the Smithsonian Institution, January 16, 1930, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

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The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

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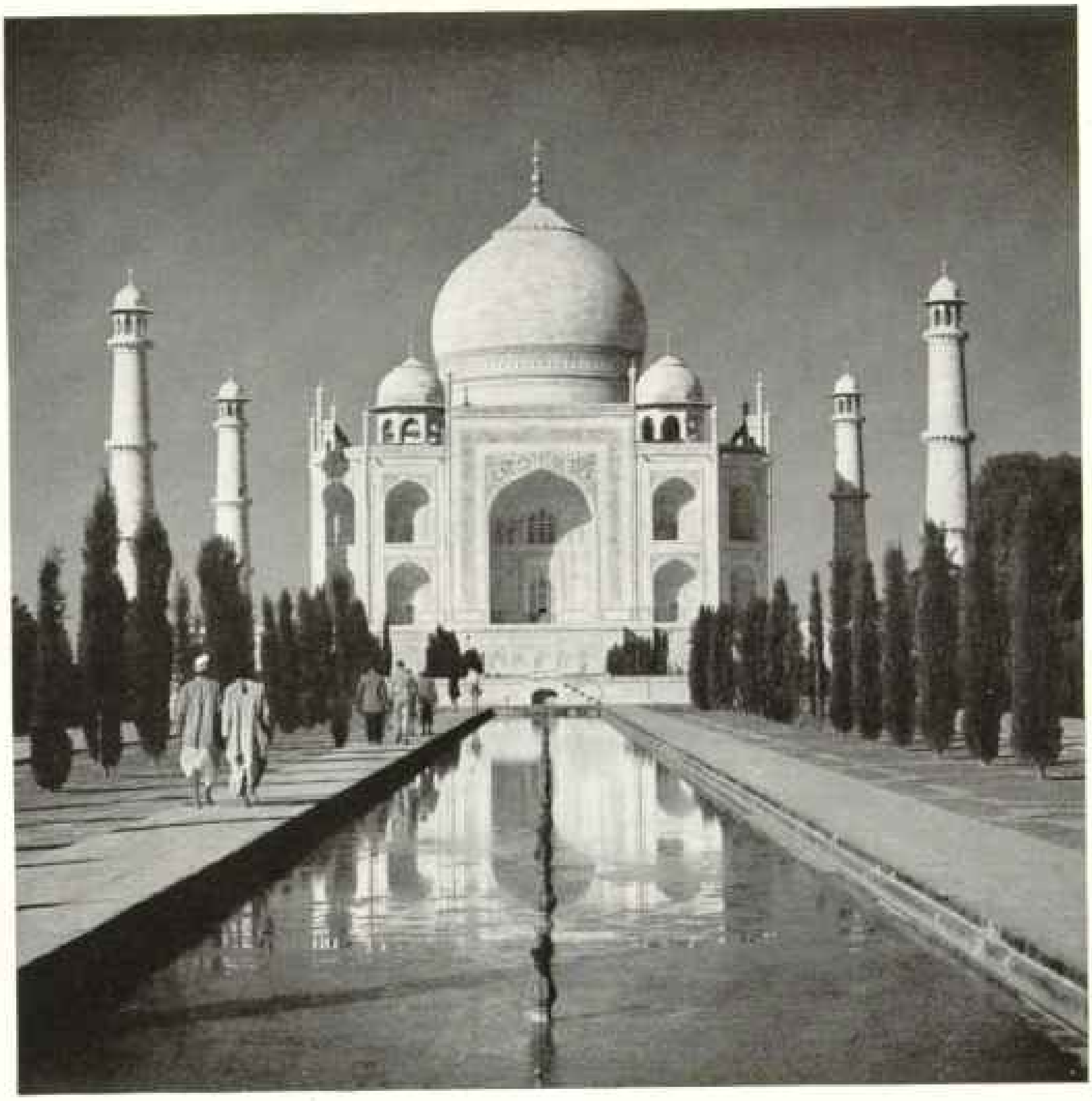

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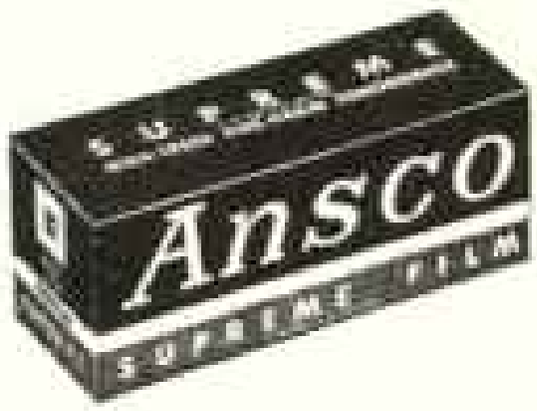

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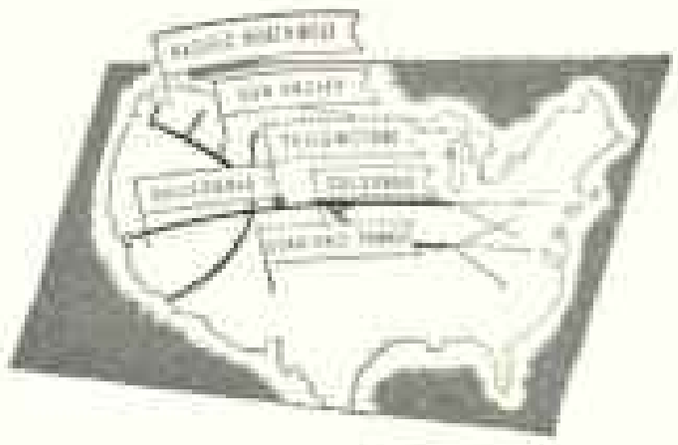

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Make it a habit, too, to keep your car in good condition. Brakes, steering mechanism, lights, and tires should be checked regularly.

When you have to stop, can you *do* it in time?

Chances are you *can't* stop as quickly as you think you can. At 20 miles an hour, your car will go at least 22 feet while you move your foot from the accelerator to the brake. Under the best conditions, it will take another 21 feet —or a total of 43 feet—before you stop.

This stopping distance increases with your speed. At 40 miles an hour it is 128 feet; and at 60 miles an hour you'll travel 254 feet before you can stop. The National Safety Council is the authority for these figures.

How should you drive at night?

Driving after dark requires special care, for you can't see very far ahead.

If your headlights show a barrier 150 feet ahead and you're driving 50 miles an hour—you are *outdriving your headlights*, for at that speed you can't stop in less than 186 feet.

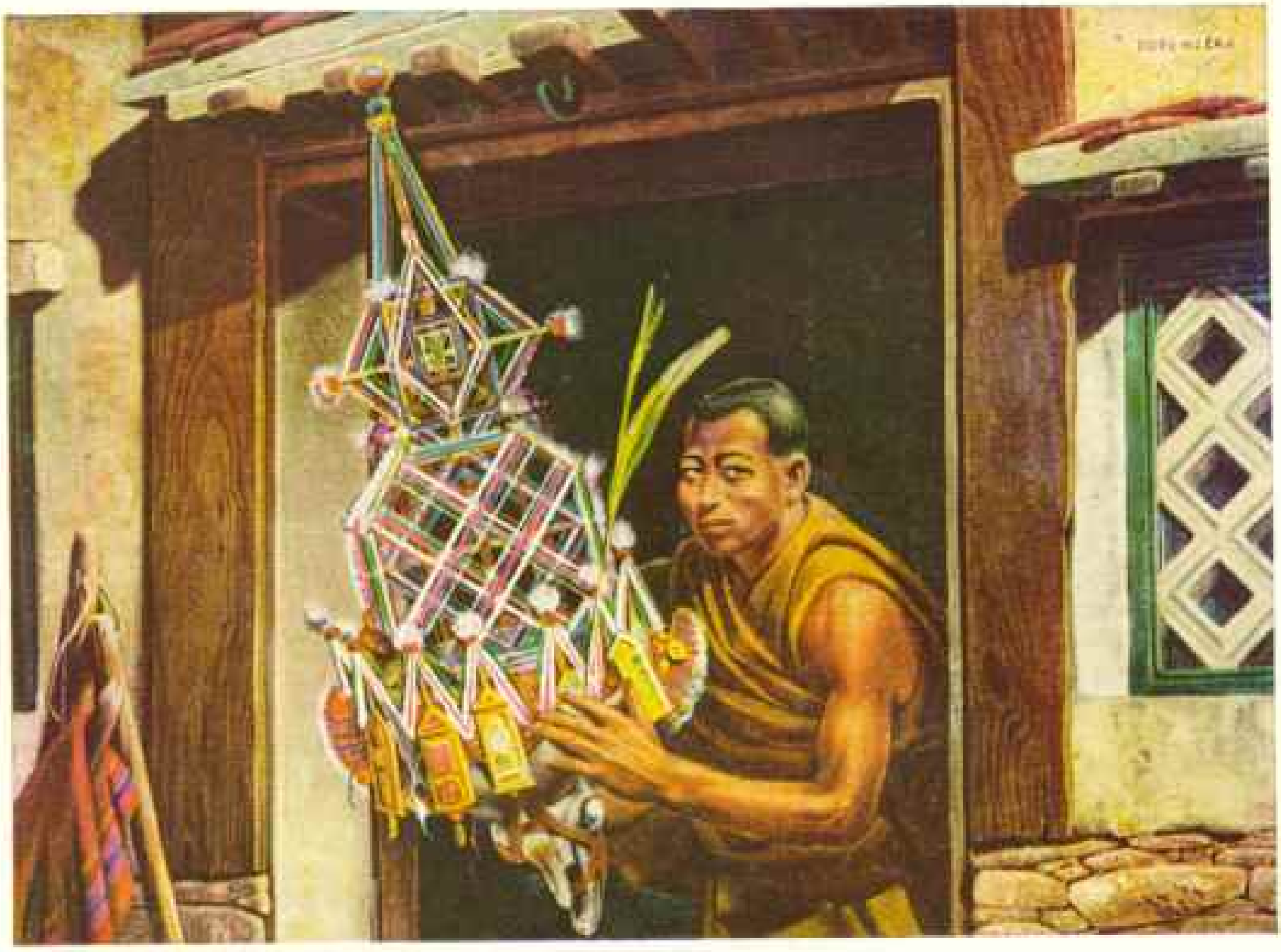
Try to avoid looking directly at approaching headlights. Lower your own lights; don't take the chance that a "light-blinded" motorist will run into you. Watch your side of the road for pedestrians or parked cars.

How can you help avoid accidents?

It's only sensible to adjust your driving to adverse weather and road conditions.

Be prepared for emergencies such as blowouts or sudden skids, and know what to do when they occur. Keep alert for the actions of other drivers or pedestrians.

And remember—a survey reported by the National Safety Council shows that drivers who have been drinking are 3 to 4 times as likely to be involved in an accident as those who haven't.



Demon Trap

TRAVELERS returning from Tibet tell of an interesting way Tibetans have of trying to protect their homes against demons.

A Tibetan, suspecting that evil spirits are lurking about, ready to set the house on fire or to cause some other disastrous accident, builds himself a demon trap.

With pieces of colored yarn, bits of silk, and a few sticks he fashions a cage-like device, from the center of which he hangs a ram's head. On the sticks he fastens wooden images representing his house and members of his family. Then, he hangs his demon trap above the doorway.

Demons on the prowl looking for a chance to harm the family are, he believes, fascinated by the bright colors of the trap. They fly into it, to vent their wrath on bits of wood which they mistake for the real objects of their devilment.

The Tibetans' demon traps are typical of the efforts that man has made for centuries to keep trouble from camping on his doorstep. None of these worked.

But modern man has something that *does* work. It's insurance. Insurance cannot prevent casualties and mishaps, but it does prevent them from upsetting the security of the family.

Today, by means of fire, accident, burglary, automobile, life, and many other kinds of insurance, man is able to protect himself and his family from the financial consequences of most kinds of trouble.

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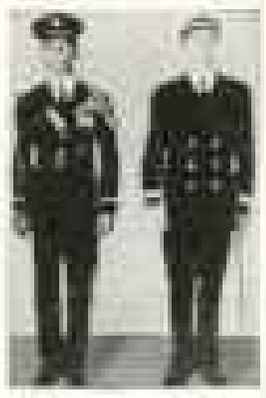

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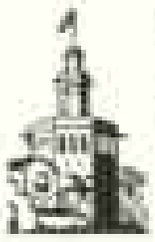

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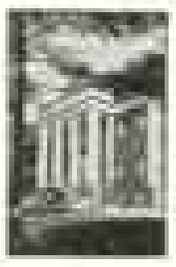

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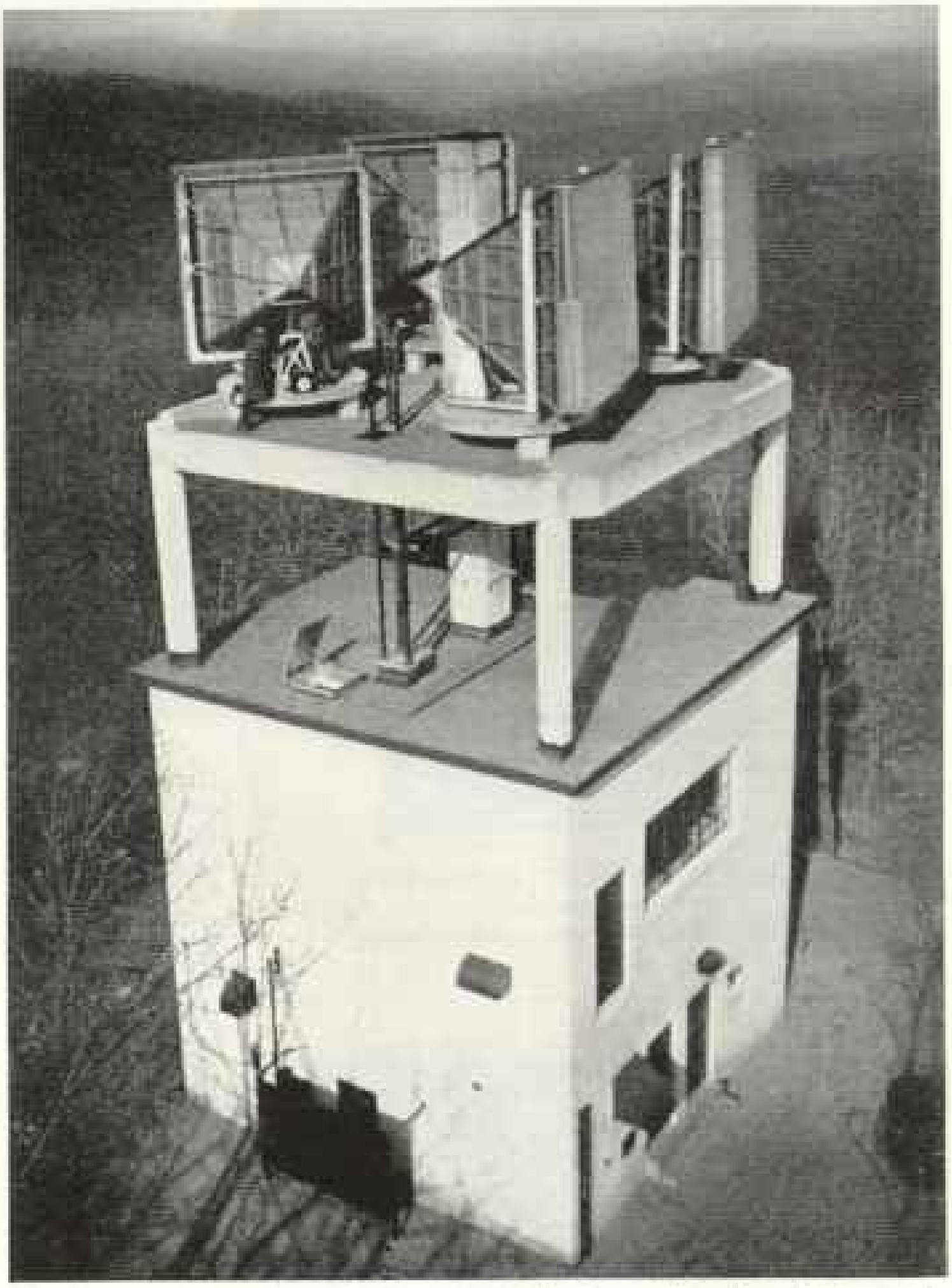
7-43

Seven towers on seven hilltops



One of seven relay stations—to test use of radio "microwaves" for Long Distance calls.

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