VOLUME XC NUMBER ONE

THE NATIONAL GEOGRAPHIC MAGAZINE

JULY, 1946

Map of the United States of America

Seals of Our Nation, States, and Territories
With 14 Illustrations
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Postwar Portrait of the United States

Thirty-two Pages of Illustrations in Color

PUBLISHED BY THE
NATIONAL GEOGRAPHIC SOCIETY
WASHINGTON, D.C.

$4.00 A YEAR 50c THE COPY

VOL. XC, No. 1 WASHINGTON JULY, 1946

THE NATIONAL GEOGRAPHIC MAGAZINE

Seals of Our Nation, States, and Territories

By Elizabeth W. King

With Paintings by Staff Artists Carlotta Gonzales Lahey, Irvin E. Alleman, and Theodora Price

FROM the day you are officially born to the day you are declared officially dead, you are confronted by papers bearing seals.

Look at your birth certificate (page 4), your marriage license, your old-age pension, a death certificate. Consider your "greetings" from the local Selective Service Board, your commission if an officer, your honorable discharge from the armed forces. Glance over the deed to your house, your driver's permit. Count your paper money, your Victory bonds.

Then try to recall the Great Seal of the United States, the seal of your own State, or even a simple notary's seal (page 7). Your school diploma carries a seal. What is on the signet ring your father used to wear?

Recently a New York radio station, WOR, made telephone calls to possible program listeners and asked, "What animal is on the New York City seal?" For each wrong answer $5 was added to a "pot of gold," and it took two weeks for the lucky winner of $230 to give the correct answer, a beaver.

"I Should Know, but . . ."

When the joyous news of victory in Europe came, President Truman read his proclamation over the radio, and in it were these words:

"In witness whereof, I have hereunto set my hand and caused the seal of the United States of America to be affixed" (page 8).

Soon telephones at the National Geographic Society's Washington headquarters began to ring. People explained apologetically, "I realize I *should* know, but just what does the seal of the United States look like?"

Your Society had published pictures of the Great Seal (page 30) several times,* and members of its staff had been working for months collecting specimens of seals of the Federal Government, States, and Territories on which the present color series and this article are based.

Most Americans have seen these "fingerprints of authority" on documents or as decorative designs in public places and have wondered at the stories behind their heraldry and symbolism.

Symbols of History and Hopes

If you are one of the almost 150,000 members of the National Society of the Daughters of the American Revolution, you may remember the seals around the walls of Constitution Hall, the D. A. R. auditorium in Washington.

Perhaps you have visited your State capitol and seen how frequently the seal is used for decoration. Many monuments at Gettysburg bear seals showing the States from which the fallen heroes came. Some dining cars are decorated with the seals of the States through which the train travels.

Should you be invited to the White House, your invitation would bear the President's coat of arms, and if you were a guest at a state dinner, you would eat from china bearing the same design, which appears as a central device on the Presidential seal.

The official seals of our Nation and States are eloquent of our history and hopes, the

* See "Flags of the World," by Gilbert Grosvenor and William J. Showalter, NATIONAL GEOGRAPHIC MAGAZINE, September, 1934.

Staff Photographer B. Anthony Stewart

Off Goes Secret Diplomatic Mail, under Lock and Leaden Seal

In the State Department mail room a courier waits while a clerk with a hand press crimps the seal with the words "Department of State, Washington." Much diplomatic mail goes under seal by regular post. Pigeonholes contain envelopes for such widely separated cities as Berlin (top row) and Tokyo (bottom).

deeds and aspirations of our countrymen. Yet to most citizens the meaning, and even the appearance, of more than one or two are little known.

Color Compilation of All State Seals

The National Geographic Society is presenting herewith the first complete full-color magazine reproduction of the seals of all States and Territories, the Federal Government and its Departments, with brief "biographies" recording the history and symbolism of each.

In law, "What is a seal?" can be the $64 question. In some States the distinction between sealed and unsealed documents has been abolished. Official Government documents generally bear a seal. The legal aspects of seals, however, do not concern us here.

In common terminology, "What is a seal?" is a simpler question, but it has three answers.

First, a seal is any device, or die, bearing a design which can be impressed in relief upon a soft, tenacious substance, such as clay, wax, or even suitable paper. Such an instrument is called a matrix, stamp, or seal press.

Second, any impression made by such a device is a seal; this is the most common meaning of the word.

Third, a representation of an impression is loosely called a seal. Such representations used as decorative or identifying motifs may be found on objects ranging from stationery to doorknobs, although in many cases these are actually based on the coat of arms rather than on the seal.

The design of the seal is frequently, although not always, considered as the coat of arms of the government or agency, or it may incorporate a part of those arms.

Seals are evidence of the authenticity of documents. They are carefully guarded, and in two States—New York and Illinois—the issuance of specimens or sample impressions of the seal is prohibited by law.

Authentic seals impressed on documents were available, however, and their reproduction in paintings by The Society's artists was approved by State officials, since such representations would not enable a would-be document forger to duplicate the actual impression in relief.

Seal Forcibly Held in Political Fights

To safeguard this hallmark of authority, a keeper of the seal is designated (pages 9, 35, and 38). In bitter disputes between political factions the seal press has sometimes been held by force.

For some 20 years prior to 1878 Maine voted Republicans into office. In that year, however, the Democrat and Greenback parties joined to form the Fusionists and succeeded in getting some candidates into office.

In 1879 the election of the governor and some of the members of the Legislature was hotly disputed. Feeling ran so high that the State militia was in charge for several weeks before the Supreme Judicial Court decided in favor of the Republicans. This dispute is known as the Maine "State Steal" or "Count Out," the Fusionists claiming that the opposition had counted them out and stolen the State.

During the dispute, the Fusionist secretary of state carried off the seal press and refused to give it up. Unable to carry on the government without the seal, the State Legislature in 1880 voted the cutting of a new matrix and passed a law making the removal of the press from the secretary's office punishable by a prison sentence and a fine.

Seals have been used since early historic times. There are many references to them in the Bible. The infamous Jezebel wrote letters in King Ahab's name and signed them with his seal. St. John, in his vision, saw a "book sealed with seven seals."

Many Early Seals Were Cylinders

The earliest seals found in Babylonia were in the form of a cylinder, which was rolled over clay or beeswax to make an impression establishing ownership of articles or the validity of contracts.

These cylinders were usually about an inch and a half long and one-half inch in diameter. They were slightly hollowed near the middle. Some scholars believe that the original seals were joints of a reed, carved to give them individual identities. When the seals were made of more durable material, such as serpentine, syenite, agate, or lapis lazuli, the familiar shape of the reed joint was continued.

The cylinders usually carried mythological designs showing the gods and their worshipers. Much Babylonian art known today is in the form of seal impressions. Seals also furnish information about the earliest religions and customs of Assyria, Persia, Syria, and Phoenicia (page 6).

The cylinder was used in the valley of the Euphrates from about 4000 B.C. until about 300 B.C., when it was largely replaced by a cone-shaped seal with the design cut into the flat bottom of the cone.

Cylinder seals were also used in early Egypt, but there they were supplanted by the scarab, the conventionalized representation of the dung beetle carved in stone or gems. Some scarabs were for jewelry, but many were for seals.

Early scarab seals, like the cylinders, were worn as a bead on a cord around the wrist, but later they were threaded on a wire and worn as rings. The scarab could be turned with its flat face outward for sealing, or in toward the finger for secrecy and protection of the carving.

Origins of Signet and Wedding Rings

Scarabs frequently bore mottoes and sometimes the names and titles of the officials to whom they belonged. The modern signet ring is a descendant of the scarab ring.

Seals were highly regarded in the Roman Empire, but their use in Europe declined after its fall A.D. 476. Seal rings or signet rings continued in favor for betrothals as evidence that an agreement or contract had been made. This points to the origin of the wedding ring.

After several centuries, seals slowly regained their popularity, and, in a day when few people could write, seals served as signatures. With the Renaissance the importance of seals continued to grow, and the beauty of their workmanship kept pace with the artistic achievements of the age. Some of the best examples were made in the 13th and 14th centuries.

Impressions by ancient cylinder seals were made directly into jar stoppers, and into the clay tablet on which a deed, will, bill of sale, or the like was recorded.

The scarab seal in Egypt was impressed into fine clay and the impression then attached to documents by slips of papyrus. The Romans used clay, beeswax, and, in the time of the Empire, lead for making impressions.

When the fashion of sealing was restored to general use in Europe, beeswax was ordinarily used. The Popes continued to use lead for many years because such seals were less affected by climate than those of wax. Lead seals have been largely replaced in recent years because of the difficulty of sending them through the mail. Lead survives in the

Staff Photographer John E. Fletcher

A Baby Harks to the Sound of the Seal Press Which Formally Launches Its Life

Birth certificates at the Arlington Hospital, Arlington, Virginia, are imprinted with the seal of the hospital. The baby's footprint and the mother's thumbprint are impressed on the back of the document, which is presented to the mother. For official purposes a certificate bearing a Virginia seal must be obtained from Richmond. From birth to death, man's road through life is marked by seals (page 1).

square seals for diplomatic mail (page 2), the strips used for sealing freight cars, etc.

From the lead seals we get our expression "papal bull." A *bulla* was originally a circular plate or boss of metal, so called because it looked like a bubble of water (Latin, *bullire*, to boil).

The term was applied to the leaden seals used on papal and royal documents in the Middle Ages, and from that use it was transferred to the document itself. After the 14th century the term was especially applied to documents issued by the papal chancery as distinguished from other documents.

Although a bull is defined as "an apostolic letter with a leaden seal," there have been a few "golden bulls," sealed with that metal.

Sealing wax, invented in the 17th century, replaced beeswax for general use and retained its popularity until recent times. Of the seals obtained for this series, only one, the seal of the President of the United States, was impressed directly into sealing wax. Georgia applies wafers on both sides of a wax disk.

Practically all seals now are made by stamping the impression directly into the document, or by attaching paper wafers, or stickers, to the document and then stamping the impression into the wafer. Wafers usually have gummed backs, much like those of postage stamps. They are in various colors, gilt or gold stickers leading in popularity.

The wafers almost invariably have points around the margin. The Great Seal of the United States and the seal of New Jersey were the only two exceptions in the entire series; they have scalloped circumferences (pages 8 and 13).

Since the points and scallops are not considered an integral part of the design, but merely a "finish" for the seals, they are not shown in the paintings, except for the examples on page 28.

Wafers vary from about two to four inches in diameter, depending upon the size of the seal. The seals in the paintings are shown in a standard size, but sizes are given with the individual descriptions.

A matrix, or seal press, in the days of the scarab seal was the size of a large setting for a ring. Presses vary greatly in size. In the early days, Alabama had a 500-pound giant. When the State capitol was burned in 1849, State Senator Beloved L. Turner and a helper undertook to save the seal. The senator is reported as never passing the press again without stopping to look with jaundiced eye at the troublesome heavyweight.

Presses today are comparatively small, just large enough to hold the die and heavy enough to force an impression into the documents. Some are operated by hand, others electrically.

Formerly many seals had two faces, an obverse and reverse (or counterseal). In this series of seals, only six have reverses: the Great Seal of the United States and those for Georgia, Maryland, Pennsylvania, Virginia, and West Virginia. Only Georgia, Pennsylvania, and Virginia still use the double seal.

Two-faced Seals and Red Tape

Seals with two faces were originally used most frequently as pendant seals, and this is the present Georgia custom. For Georgia, a purple satin ribbon is run through holes in the top of the document, and the seal hangs free. The impression is made on gilt stickers affixed to the two sides of the disk of wax.

While pendant seals are rare nowadays, the ribbons have been retained for seals *en placard*, or placed directly on the face of the document. For this purpose usually two, and sometimes three, short pieces of ribbon in one or more colors are laid on the paper. The wafer is placed over them with an inch or two of ribbon showing below the edge of the sticker, and the impression is made (page 28).

When a sealed document has several pages, the ribbon is threaded through holes at the top; then the ends are laid flat on the last page and the seal wafer impressed over the ribbons (page 13).

Ribbons have lost favor in recent years. They are most frequently used on extradition papers; States which ordinarily do not use them may want them for what an Indiana official calls "showy occasions." Colors used by the States, Territories, Departments, etc., are indicated on pages 9, 31, 35, 38.

Red was a favorite color for ribbons used with seals. The fact that ribbon is generally necessary for documents of more than a single page furnishes one theory of the origin of the present-day expression "red tape."

Artistic Aspects of the Seals

At the time of the Declaration of Independence, all civilized nations used seals to authenticate documents; so on that same day, July 4, 1776, the Continental Congress appointed a committee "to bring in a device for a seal of the United States of America." Not until September 16, 1782, was a design approved, cut, and actually used (page 35).

By that time some States had already replaced their colonial seals by State seals. Most State seals, however, were adopted in what is sometimes called the Victorian era, as a glance at some elaborate designs will reveal.

Staff Photographer B. Anthony Stewart

Scarab, Ram, and Other Figures Reveal the Seal-making Skill of the Ancients

The hemispherical seal of chalcedony (translucent quartz) and its impression at lower left show a ram with a crescent and star representing Babylonian divinities. The crescent is for Sin, the moon-god, and the star for Ishtar, goddess of love. The seal was found near Aleppo, Syria. The cylinder seal of hematite (iron ore), at lower right beside its rectangular rolled impression, is Assyrian. It was found on Cyprus, which was conquered by the Assyrians under Sargon in 707 B.C. The scarab, or dung beetle, was sacred to the Egyptians, who used it as a motif for the carved stone or gem also termed "scarab." Those shown include the top and engraved lower side of the Hyksos type, 1700 B.C. (page 3). The ring is a scarab in a modern setting.

Seals with emblematic designs long antedate the escutcheon (shield of arms), and so they form one basis for a study of the development of heraldry. Once heraldry had won a place for itself, the seal with a heraldic design was popular; it was the armorial seal of Europe which supplied the inspiration for many colonial seals.

Many seals used by States and Government Departments today are heraldic, at least in intent, although discrepancies between the seals and the laws of heraldry indicate that those laws were sometimes imperfectly understood by the designers.

George Washington wrote: "It is far from my design to intimate an opinion, that heraldry, coat-armour, etc., might not be rendered conducive to public and private use with us; or that they can have any tendency unfriendly to the purest spirit of republicanism. On the contrary, a different conclusion is deducible from the practice of Congress and the States; all of which have established some kind of *Armorial Devices,* to authenticate their official documents."

Some States and Departments prescribe the designs for their seals in heraldic terms. In describing the individual seals in this article, heraldic terms have been avoided, for the most part, since they form a technical vocabulary largely based on Norman-French, or Anglo-French, of the period, which would have little meaning to the nontechnical reader.

"Dexter" and "sinister" mean the right and left of the design itself (page 35). In the descriptions, however, the words "right" and "left" are used to indicate the position of objects from the reader's point of view.

All the deviations from the laws of heraldry are not due to designers.

In some cases devices emblematic of the States or Federal Government Departments were chosen with no attempt to represent them heraldically, or, as in the case of Virginia, a conscious effort was made to avoid any suggestion of heraldry.

Moreover, the original designs were often cluttered by additional devices prescribed by legislative amendments. Many States obtained their seals only after bitter debate.

Staff Photographer B. Anthony Stewart

"Do You Solemnly Swear . . . ?" A Notary Affixes His Seal

Open season on such scenes is around March 15, but the notary public is busy all year round and his is one of the most familiar seals seen in the United States. The paper shown is a corporate income tax statement, which requires notarization. The notary is not responsible for accuracy of statements; he merely certifies that the deponent swore to the information certified by signature and seal. Stringent penalties are imposed for making false statements under such an oath.

Once a seal is adopted, the people of the State cling to it despite bitter criticisms of its artistic merits. A seal may be admittedly inferior from purely artistic considerations but loved through tradition. The attitude that it is "an ill-favored thing but mine own" prevails.

Seals Change by Law and Accident

Many States cling to their old seals, but, even so, there are more changes than is generally realized. Puerto Rico's seal dates from 1511, but Alabama's was adopted as recently as 1939, replacing one used for 70 years. The new seal, however, is actually a restoration of the one used before the War Between the States. In 1945 the New Hampshire Legislature came within a few votes of changing its 161-year-old device.

Seals are changed not only by law but also by accident or whim. Representations on official publications and as architectural decorations are frequently inaccurate. One Colorado official said in a fit of pique, "Each printer who gets a State contract draws up his own concept of the State seal. Why, even the seals on the spittoons aren't accurate!"

Such differences can frequently be attributed to the adoption of a design which is too elaborate for the seal engraver or printer to achieve. When a worn-out seal has to be replaced, the new die frequently differs in detail even when the engraver has been ordered to prepare a "facsimile."

Since it is the actual impression of the seal, not the law establishing it, that authenticates a document, the National Geographic Society has followed the impression in preparing the color plates.

Colors of the Seals

Seals, by their very nature as impressions, can be in only one color. On documents they are frequently gold, but wafers of other colors are also used. If the impression is made directly into a document, the seal is naturally the color of the paper.

But many who request pictures of seals ask for them in color. Since the Great Seal of the United States has official colors, many authorities believe it is preferable to represent the design in colors.

The advice of a State official, usually the

The National Archives

Our Country's Eagle Seal Made V-E Day Official

When President Truman announced victory in Europe in a radio address to the Nation on May 8, 1945, he read from his official proclamation, the second page of which is shown. Note the clarity of the impression of the Great Seal of the United States, made with the press shown on page 41. The wafer has scalloped, or invected, edges, while those used by Iowa (page 13) are pointed, or serrated. A light-blue ribbon is affixed to Presidential proclamations.

secretary of state, was followed for seals of the States; the advice of the official custodians of Federal seals for the others. When the seal is considered the coat of arms, or an integral part of the arms, colors are usually officially prescribed.

South Carolina, however, merely describes the colors as "proper," the heraldic term for natural colors. It also specifies that the sky be "azure." As applied to such objects as trees and weapons, it is possible to follow such a direction. But what is the "proper" color for a woman's hair or dress?

Tradition plays a part. For example, the blue in the reverse of the Maryland seal has been used on every State publication examined. Yet there is no reference to blue in the official description.

Thirty-two States use the seal, or some feature of it, on their State flags. These have often served as guides.

Seals as Distinctive as Fingerprints

Seals are like fingerprints; no two designs can be exactly alike. They furnish irrefutable evidence of authentication.

In a period when most people can write and every official document may have to be made out in triplicate, signatures and rubber stamps often replace the beautiful seals used when writing was an accomplishment for kings and clergy and documents were on parchment or handmade paper.

But even today, when permanence, dignity, and formality are desired, there is no substitute for a seal. The proclamation of victory in Europe seemed more solemn because it carried the Great Seal of the United States.

Greatly as seals of the States differ in appearance, a study reveals that they have many devices and ideas in common.

Sixteen State seals qualify as armorial, or heraldic, in the strict sense of having a shield as the main device.

"Farm and Fight" Motif in State Seals

Landscapes depicting the region appear either as a major feature or as a background for half the seals. Mountains and plains, oceans and waterfalls—nothing is too great or too small.

Agriculture finds a place in more than half

the seals, represented in every way from a field with a farmer plowing to a single sheaf of wheat, or a plow, or the goddess Ceres. Cotton, corn, tobacco, fruits—all are there.

The number of seals with swords, bows and arrows, spears, and guns placed next to symbols honoring agriculture make it look as if our national motto were "farm and fight."

Transportation finds a place, with trains, covered wagons, and ships appearing on more than a third of the designs.

Only a few specific industries, in addition to agriculture, are symbolized: oil, mining, fishing, and salt production.

The rising sun for hope and the setting sun for the expansion of the country toward the West are popular. Many stars appear, but they usually refer to the stars in the Union rather than to the stars in the sky.

Birds, Beasts, Men, and Immortals

Of the nine animals represented, only the cow, horse, and sheep are domestic. New Jersey's heraldic horse hardly qualifies as a beast of burden.

In the case of birds, it is the eagle or nothing with all the States except Louisiana, which uses the pelican. Twelve show American eagles; the New Mexican seal has both the American and the smaller Mexican eagle. New York's eagle is a heraldic creature which never flew over the State's mountains.

When historical events find representation, it is usually in symbolic form.

The human figures may represent manly occupations such as blacksmithing (Nebraska), wood chopping (Indiana), fishing (Maryland), or the men may just be friends (Kentucky).

But for a woman to find a place on a seal, she must be an angel (Arkansas), a goddess (California), a personification of Hope (South Carolina), an Indian (Florida), or an Amazon (Virginia). Only one woman who is just a woman appears, and she is out for equal rights (Wyoming).

So frequently do the "female forms" carry wands or liberty poles surmounted by Phrygian caps that it appears as if they were invited into the designs for no other purpose.

The Phrygian, or liberty cap, has been a popular symbol of freedom for almost 3,000 years and has been represented on top of a spear or staff for more than 2,000. Originating in Asia Minor, the cap was appropriated by the Romans under the name of *pilleus* and given to emancipated slaves to show their status as freedmen.

Ribbon scrolls carrying mottoes are popular, and mottoes appear in Latin, Greek, French, Italian, and Spanish as well as in English. They convey ideas on morals, religion, freedom, justice, and union. The mottoes and their translations are frequently established by law.

Seals of the States and the District of Columbia

STATE seals are used on commissions issued by the governor, on proclamations, extradition papers, and various types of documents intended as permanent State records. There is wide variation in the extent of use of seals by individual States.

Seals of the States are popular as decorations on State publications, stationery, and flags, and they appear frequently as architectural motifs.

The official custodian or keeper of the seal is usually the secretary of state for the State or Commonwealth. The governors of Arkansas, Iowa, North Carolina, Ohio, and Tennessee, however, are custodians of their own seals. The governor of Indiana is the custodian of the seal for that State, but the secretary of state has a duplicate.

In Vermont the keeper is the Secretary of Civil and Military Affairs, while in the District of Columbia the custodian is the secretary to the Board of District of Columbia Commissioners.

Many States use direct impression into documents, but wafers or stickers are in wide use, especially for extradition and other very formal papers. Some States use two or three colors for wafers, as well as direct impressions.

Gold wafers for seals are used by the District of Columbia and all States except Maine, Massachusetts, New Jersey, and Virginia. Of these exceptions, all employ blue except Massachusetts, which uses green. In addition to gold seals, many States use other colors. Sometimes the type of document is indicated by the color of the wafer; sometimes gold and colors are interchangeable. White wafers are used by Arkansas, red by District of Columbia and New Hampshire. New York employs gold and other colors.

Ribbons are not used by Alabama, Connecticut, Delaware, Idaho, Iowa, Louisiana, Mississippi, Montana, Nebraska, South Carolina, South Dakota, Vermont, and Washington. Ribbons are used occasionally, without color specified, by California, Florida, Kansas, North Carolina, and North Dakota.

The extent to which ribbons are used by other States varies, but the following colors are those employed when occasion demands: blue by Kentucky, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Pennsylvania, Rhode Island, Virginia, and Wyoming; red by Illinois, Texas, Wisconsin, and the District of Columbia; purple by Georgia and Ohio; lavender

AUTHOR

The President's Former Coat of Arms Ornaments a White House Rug

The arms, central feature of the Aubusson rug in the Green Room, form a favorite motif in Executive Mansion decoration. Chair backs in the East Room and state china carry the arms; in bronze, they appear as a plaque in the floor at the main entrance. The new design, adopted in 1945, shows the eagle facing its own right. The coat of arms is the central device on the President's seal (pages 1, 32, and 38). The portrait above the fireplace is that of John Quincy Adams.

Staff Photographer J. Baylor Roberts

"Right There Is Washington!" School Children Inspect the Great Bronze Seal at National Geographic Society Headquarters

Visitors often walk around the seal, set in the lobby floor, apparently feeling that it is too precious to step on. Seven feet in diameter, the plaque bears the Western Hemisphere design familiar to members of the National Geographic Society for fifty years (pages 28, 34, and 39). The seal is impressed into all membership certificates; the design appears on many of The Society's publications and medals, such as the Hubbard Medal.

by Colorado; green by Missouri; white by Utah; gold by New Jersey.

Several States use two colors. Arizona uses old gold and blue; Arkansas blue and red; Maryland yellow (gold) and black; Nevada silver and blue; Oregon blue and cardinal; New Mexico gold and red; Oklahoma green and white; West Virginia blue and gold. Tennessee formerly used green but now uses red, white, and blue. Indiana in the past also has used the three national colors.

Designs from seals (or arms when they are similar) are used on State flags by Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Iowa (eagle and streamer only), Kansas, Kentucky, Louisiana, Maine, Maryland (shield from reverse), Massachusetts (on obverse of flag), Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, Oregon, Pennsylvania (arms), Rhode Island, South Dakota (on reverse of flag), Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming. Of these, 19 use a blue field with the seal design in the center.

Flags for the governors of California, Delaware, Massachusetts, Michigan, Pennsylvania, and Rhode Island also use designs found on seals.

State Guard shoulder sleeve insignia for Georgia, Kentucky, Maryland, Michigan, Pennsylvania, South Carolina, Virginia, and West Virginia are also based on the seal design.*

ALABAMA, page 17. The great seal of Alabama is a new-old design. William Wyatt Bibb originated it in 1817 when he was the first governor of the Territory of Alabama. The seal was continued until 1868 when, according to a State publication, "the Reconstruction Legislature, made up in large part of men from other States who had come to Alabama as 'Carpetbaggers' to take over the affairs of the State, after the War Between the States . . . abolished . . . the beautiful old seal which was definitely an Alabama emblem. . . . They desired to brand the people of Alabama, who had so lately been in arms against the Union, with a United States emblem." This seal showed an American eagle resting on a shield of the United States; in its beak the eagle carried a scroll with the motto "Here We Rest."

The first State seal was restored in 1939, largely through efforts of the Alabama Division, United Daughters of the Confederacy.

The seal, 2¼ inches in diameter, shows a map of the territory with the rivers clearly outlined, because, in the days of few good roads, heavy shipping was done by river boats. Selection of this natural feature is today considered prophetic. Although trains, trucks, and airplanes have robbed the rivers of many passengers and much freight, they play an even greater role as the source of hydroelectric power.

ARIZONA, page 17. The constitutional convention of 1910 adopted a design for the seal of Arizona drawn by E. E. Motter, a newspaper artist then living in Phoenix.

The seal, 2¾ inches in diameter, symbolizes the geographic resources of the State. A range of mountains, with the sun rising behind the peaks, is in the background. At the right of the mountains appear a storage reservoir and dam. Cattle graze in front of irrigated fields and orchards. On the left a miner with a pick and shovel stands before a quartz mill. The motto is *Ditat Deus*, "God enriches." The date 1912 is that of the State's admission to the Union.

The design, 15 feet in diameter, is laid in colored tile on the floor of the capitol under the rotunda. In 1944 the Motor Vehicle Division of Arizona used a windshield sticker showing the seal in colors as evidence of automobile registration for cars which carried 1942 license plates.

ARKANSAS, page 17. The seal of Arkansas as adopted in 1864 was based on the original seal designed by Samuel Calhoun Roane and adopted by the territory in 1820. The motto was modified in 1907.

The seal shows: "An eagle at the bottom holding a scroll in its beak inscribed *Regnat Populus*, 'The people rule,' a bundle of arrows in one claw and an olive branch in the other; a shield covering the breast of the eagle engraved with a steamboat at top, a plow and beehive in the middle, and a sheaf of wheat at the bottom; the Goddess of Liberty at the top, holding a wreath in her right hand, a pole in the left hand, surmounted by a liberty cap, and surrounded by a circle of stars, outside of which is a circle of rays; the figure of an angel on the left, inscribed 'Mercy,' and a sword on the right, inscribed 'Justice.'"

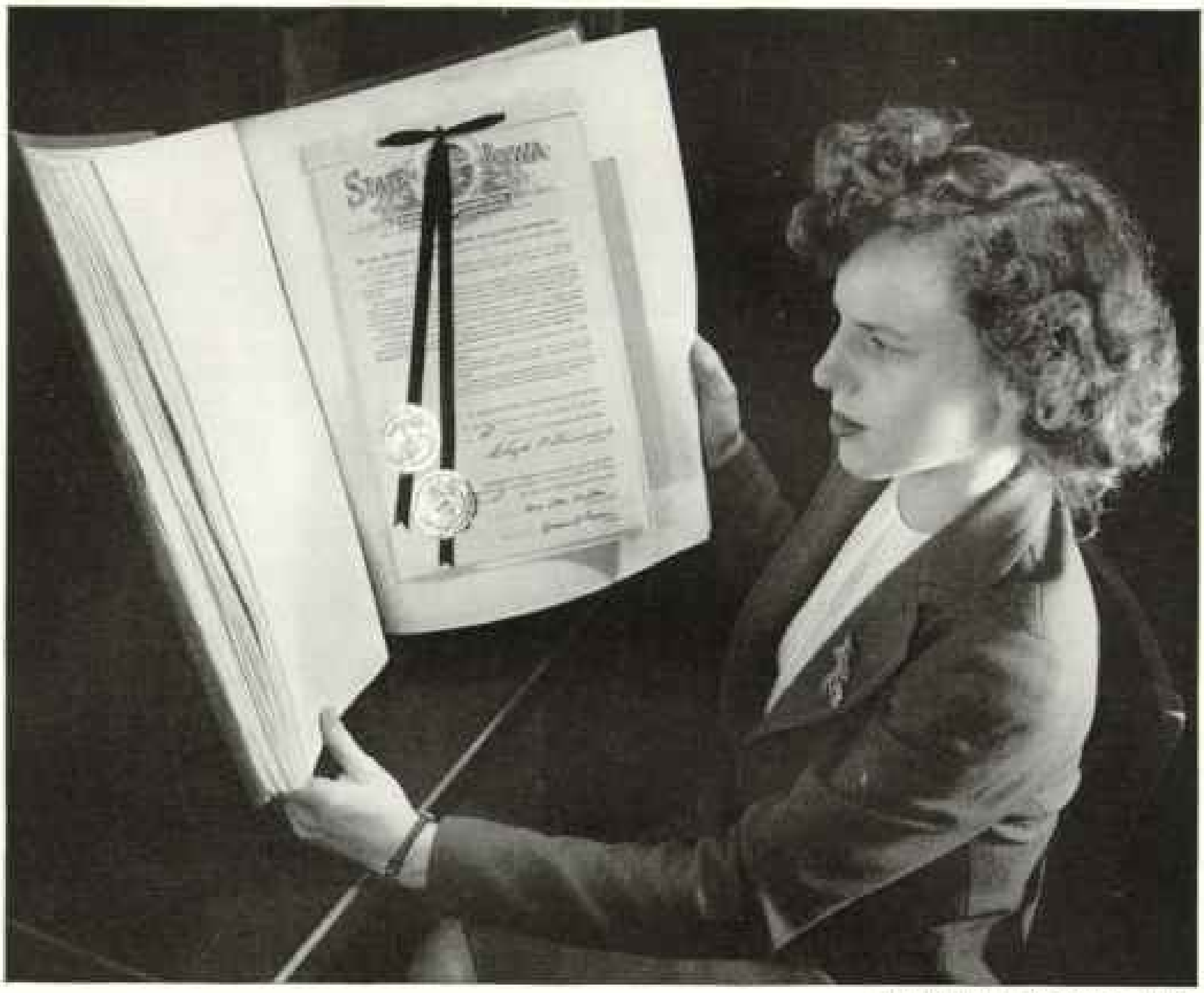
Seal is 2¾ inches in diameter. Seals of other State and county officials and courts show the same device, but the words in the annulet indicate the office to which they belong, as "Seal of the Secretary of State, Arkansas," etc.

CALIFORNIA, page 17. The design of the California seal, adopted by the constitutional convention in 1849, was drawn by Maj. Robert S. Garnett, U. S. A., who asked Caleb Lyon, assistant secretary of the convention, to present the design as his own. Mr. Lyon did; but he did not claim to be the sole author.

Thirty-one stars at the top represent the number of States upon the admission of California. The goddess Minerva, who sprang full-grown from the brain of Jupiter, typifies the political birth of the State of California, which never went through the stage of being a territory. The grizzly bear, feeding upon the clusters from a grapevine, was a famous denizen of the State at the time of creation of the seal.

The sheaf of wheat and bunch of grapes represent agricultural and horticultural interests. A miner, with rocker and bowl at his side, illustrates the golden wealth of the Sacramento. The ship stands for commercial greatness; the snow-

* See "Insignia and Decorations of the U. S. Armed Forces," published in 1945 by the National Geographic Society.



Staff Photographer B. Anthony Stewart

Gold Seals with Blue Ribbons Authenticate Iowa's Approval of the 21st Amendment

Ratifications of the constitutional amendment which repealed national prohibition are bound in this book at the State Department. The upper seal is the Great Seal of the State of Iowa (pages 15 and 19); the lower, the seal of its secretary of state. Iowa ordinarily does not use ribbons (page 9).

clad peaks of the Sierra Nevada form the background. The Greek motto, *Eureka*, "I have found it," applies either to the principle involved in the admission of the State or to the success of the miner at work.

Seal is 3⅜ inches in diameter.

COLORADO, page 17. The Colorado Legislature of 1877 approved the design of the territorial seal for the State seal; the design was the work of Lewis Ledyard Weld, first territorial secretary.

The shield has at the top three snow-capped mountains; at the bottom, a miner's pick and hammer. As a crest above the shield, golden rays proceeding from the lines of a triangle represent the eye of God (see Great Seal of the United States, page 36). Between the crest and the shield there are fasces, bearing upon a red, white, and blue band the words "Union and Constitution."

The Latin motto is *Nil Sine Numine*, "Nothing without the Deity." The date 1876 is that of Colorado's admission to the Union.

Seal is 2½ inches in diameter. The design is shown in colors above the elevator doors in the capitol. The original seal done in color "has long since disappeared," and artists' interpretations have differed materially. The colors illustrated are based on a painting made for the National Geographic Society by Miss Quantrille McClung of the Denver Public Library.

CONNECTICUT, page 17. From the first colonial seal until the one approved by the General Assembly of 1931, Connecticut seals have carried grapevines on an oval, with the Latin motto *Qui Transtulit Sustinet*, usually translated, "He who transplanted continues to sustain." The present seal shows three grapevines, two above and one below. Around the border is the legend, *Sigillum Reipublicae Connecticutensis*, "Seal of the Republic of Connecticut."

According to tradition, the first seal was suggested by George Fenwick of Saybrook in the middle 1600's. The vines are believed to symbolize the colony brought over and planted in the wilderness. The 80th Psalm contains the words,

"Thou hast brought a vine out of Egypt: thou hast cast out the heathen, and planted it." The motto implies that, since God brought the colonists to this country, He will continue to take care of them. The seal is 2½ inches high and forms an ellipse.

DELAWARE, page 17. Delaware's seal today is similar to one adopted in 1777. The Swiss-born artist Pierre Eugène du Simitière, in his *Notebooks*, said he made a drawing in January, 1777 (page 35). From 1793 until 1847, however, the supporters, a husbandman and a rifleman, were omitted; it was in 1847 also that the motto "Liberty and Independence" was first used on the seal.

The shield has a wheat sheaf and an ear of maize at the top and a ruminating ox below. The husbandman holds a hilling hoe; the rifleman, a musket. By law the crest is a ship under full sail on an azure and argent (blue and silver) wreath. State papers show the wreath as white and red. The dates on the rim refer to years in which authorization was granted for new dies. The seal is 2½ inches in diameter.

FLORIDA, page 17. Florida's first State seal, authorized by the General Assembly in 1845, showed a map of the State. That seal is the central design on the three-cent United States stamp issued in commemoration of the one-hundredth anniversary of Florida's statehood.

In 1868 the "map seal" was replaced by a new design authorized by the new constitution. The seal shows "the sun's rays over a highland in the distance, a cocoa tree, a steamboat on the water, and an Indian female scattering flowers in the foreground."

Seal is now 2⅜ inches in diameter. It was originally supposed to be the "exact size of the American silver dollar," but this coin has been 1½ inches in diameter since 1840. The motto "In God We Trust" was apparently taken from the dollar. The design is etched on the east side of the capitol.

GEORGIA, page 17. Georgia's seal is like the one adopted in 1799, except that the date 1799 was changed to 1776 by a law passed in 1914. For a short time during the Confederacy a slightly modified design was authorized but was not used.

The original design was drawn according to specifications made by the Legislature. Daniel Sturges, surveyor general of Georgia, who made the drawing, apparently answered the advertisement in the Louisville, Georgia, *Gazette*, which read: "Artists of All Nations Attend: Premium for Genius." The "premium" was $13.

Although the scene with the ship was originally intended for the obverse, since the law described that side first, the side with the pillars is now marked "obverse" on State publications and is considered the coat of arms of the State.

The obverse shows three pillars supporting an arch engraved with the word "Constitution"; this is emblematic of the constitution, supported by the three departments of government—legislative, judicial, and executive. The words "Wisdom," "Justice," and "Moderation" are engraved on the pillars in order from left to right. On the left of the last pillar a man with a drawn sword represents the aid of the military in the defense of the constitution.

On the reverse is a scene depicting the seashore. Near a wharf a ship bearing the United States flag is being loaded with hogsheads of tobacco, bales of cotton, and various other commodities. The products are emblematic of the interior of the State; the ship's cargo represents the State's internal traffic. In the background a man plowing and a flock of sheep shaded by a flourishing tree represent agriculture and husbandry. The legend carries the words "Agriculture and Commerce" and the date "1776."

Georgia is the only State which sent the National Geographic Society a wax pendant seal (page 5). Seal is 2½ inches in diameter.

IDAHO, page 17. Almost 30 years before the adoption of the 19th amendment to the United States Constitution, Miss Emma Edwards (the late Mrs. E. E. Green) found woman suffrage an inspiration for part of the design of the Idaho seal, adopted in 1891. Here is her description of the seal:

"The question of woman suffrage was being agitated somewhat, and as leading men and politicians agreed that Idaho would eventually give women the right to vote, and as mining was the chief industry and the mining men the largest financial factor of the State at that time, I made the figure of the man most prominent in the design, while that of the woman, signifying Justice, as denoted by scales; Liberty, as denoted by the liberty cap on the head of the spear; and Equality with man as denoted by her position at his side, also signified Freedom. . . . The shield between the man and woman is emblematic of the protection they unite in giving the State."

The tree represents the State's timber interests; the plowman and grain, agricultural resources; the cornucopias, horticulture. The river on the shield is the Snake or Shoshone. The elk's head refers to State game laws protecting elk and moose. The star on the rim "signified a new light in the galaxy of States."

The Latin motto is *Esto Perpetua*, "It is [*i.e.*, shall be] perpetuated" or "It is forever."

Seal is 2½ inches in diameter.

ILLINOIS, page 19. The first seal of Illinois, adopted after the admission of the State to the Union in 1818, was a design showing the American eagle, taken from the Great Seal of the United States (page 35), with a streamer in its beak proclaiming "State Sovereignty, National Union." "Aug. 26th, 1818," on the rim, is for the adoption of the State constitution. The seal was re-cut with minor changes in 1839.

In 1867 Secretary of State Sharon Tyndale tried to get a law passed to renew the seal. It was discovered that he wished to reverse the wording on the scroll so that it would read, "Na-

tional Union, State Sovereignty." The State Senate passed a law which made the wording on the new die correspond with that on the old.

The dates 1818 and 1868, on the boulder, are those of admission to the Union (December 3, 1818) and the cutting of the seal.

Seal is 2⁷⁄₁₆ inches in diameter. It is painted on the ceilings and carved on the doorknobs of the capitol.

INDIANA, page 19. The design of the Indiana State seal is found on territorial papers as early as 1801. When Indiana became a State in 1816, the design was retained as symbolic of the westward expansion of the country. The pioneer woodsman is felling a tree, while a buffalo flees from the forest and across the plains. The setting sun indicates the eyes of the country turning toward the West.

The State constitution of 1851 provided that the governor should keep a seal for official purposes. The secretary of state has a duplicate, but there is no constitutional or legislative description of the seal.

Seal is 2⅜ inches in diameter. It appears on the original brass doorknobs in the State House and is used in the bookplates of the Indiana State Library and the Historical Society Library.

IOWA, page 19. The first General Assembly of Iowa adopted its seal in 1847; since that time engravers of new dies have made many minor changes in the design, but the seal still follows the description given in the law.

It has a sheaf and field of standing wheat, with a sickle and other farming implements on the left; a lead furnace and pile of pig lead on the right. The citizen soldier stands before a plow, supporting the United States flag and a liberty cap with his right hand and a gun with his left. The steamer *Iowa* on the Mississippi River is in the background. An eagle holds in his beak a scroll with the motto "Our Liberties We Prize and Our Rights We Will Maintain."

Citizens of the State have criticized the seal because it shows "no cattle, no hogs, no corn, no prairie, no farm scene." Others have praised it as emblematic of civilization, liberty, industry, progress, and valor of "Iowa as it is and is to be."

Seal is 2 inches in diameter (page 13).

KANSAS, page 19. The first governor of Kansas, Charles Robinson, asked the Legislature to furnish a design for a seal in accordance with the constitution, which provided for it. "There were designs, designs, and designs, mottoes and mottoes. Scholars suggested and Western men insisted." When "We will" was proposed for a motto, opponents suggested that "We won't" was more appropriate. In May, 1861, the following description was accepted:

"The East is represented by the rising sun, in the right-hand corner of the seal; to the left of it Commerce is represented by a river and a steamboat; in the foreground Agriculture is represented as a basis of the future prosperity of the State by a settler's cabin and a man plowing with a pair of horses; beyond this is a train of ox wagons going West; in the background is seen a herd of buffalo retreating, pursued by two Indians on horseback; around the top is the motto *Ad Astra per Aspera*, and beneath, a cluster of 34 stars."

This description is probably the first evidence on record that a circular seal can have a "right-hand corner."

A landscape was originally suggested by a member of the State Library Committee, and John J. Ingalls, secretary of the State Senate, is credited with submitting the design accepted. State publications also credit Mr. Ingalls with the motto, although it has also been ascribed to Judge Josiah Miller.

The origin of the motto is not known, but the idea is found in Roman poetry and in European coats of arms. Translated "To the stars through difficulties," it is considered descriptive of the State's history, especially in its early period. The British Royal Air Force has a similar motto, *Per Ardua ad Astra*, which is usually translated, "Through hard ways to the stars."

The 34 stars represent the number of States when Kansas joined the Union; the date, January 29, 1861, is the date of admission.

Seal is 2⅞ inches in diameter.

KENTUCKY, page 19. According to tradition, the original design on the seal of Kentucky, adopted in 1792, was supposed to show two friends in hunter's garb, two hands clasped and the other two resting on each other's shoulders. They stood on the edge of a precipice, which gave meaning to the motto "United We Stand, Divided We Fall."

As used for many years, the friends are in dress coats and the precipice has been eroded by time. The law in 1893 made a change in the arrangement of the lettering, but the design has been essentially the same for more than 150 years. The seal is 2⅞ inches in diameter.

The motto of Kentucky may have been derived from "The Liberty Song" (1768) by John Dickinson, more famous as the author of *Letters from a Farmer in Pennsylvania*. According to investigations made by the Kentucky State Historical Society, Isaac Shelby, the first governor of the State, probably suggested the motto. The popularity of the expression is attested by its use on the seal of Missouri in 1822.

LOUISIANA, page 19. Louisiana's pelican was probably selected for the State seal by William C. C. Claiborne, first governor. The huge bird, familiar in the State, is shown as tearing its breast to feed its young, in accordance with the venerable legend that it nourishes its young on blood from its own breast. In church symbolism the pelican represents Christ's blood poured out as a sacrifice for mankind.

In 1864 when Henry W. Allen was governor of the Confederate portion of the State, and Michael Hahn governor of the Federal, each

had a pelican seal. The bird in the Confederate seal had its head turned to its left, with a nest full of young; the Federal had the bird's head turned to the right, with just four young.

The present seal, adopted in 1902, with the pelican's head left and only three young, represents a compromise. It is the first seal authorized by law and is 2 inches in diameter.

The early seals carried the motto "Justice, Union and Confidence"; during the Civil War period, without apparent authority, the motto was changed to read "Union, Justice & Confidence."

MAINE, page 19. The first Maine Legislature adopted the State seal in 1820. A moose reclines under a pine tree on a shield. The moose is native to Maine, and at the time the seal was designed the eastern white pine (*Pinus strobus*) was considered the most useful of American pines for ship masts. The husbandman resting on a scythe represents the land as well as agriculture. The seaman resting on an anchor represents the sea as well as commerce and fisheries.

The crest is the North Star, indicating that Maine was the most northern State at that time. Minnesota has now taken this honor. The star as a guide for sailors exemplifies the motto *Dirigo*, "I direct."

The designer is not officially known, but the Portland *Gazette* in 1820 gave the credit for the idea to Benjamin Vaughan of Hallowell and the interpretation to Col. Isaac G. Reed. The original sketch, now Paper No. 4 in the State archives, is believed to be the work of Miss Bertha Smouse, Colonel Reed's stepdaughter.

Maine has two seals. One is 2⅜ inches in diameter; the other 2¼. The first is hand-operated; the second is an electric sealing machine. They are used interchangeably. The seal design appears in a carpet of the Senate Chamber opposite the door leading to the governor's office in the capitol and on china used in the Blaine House, the governor's residence.

MARYLAND, page 19. Why Maryland should use the reverse of her seal and never have a die cut for the obverse remains a State historical riddle; records give no answer.

Maryland has had a number of seals, but in 1854 an attempt was made to restore the old Calvert seal used by the Lords Baltimore from 1648 to 1692 and from 1716 to 1776. The 1854 seal differed from the original, and in 1876 the Legislature re-established the 1648 seal.

The obverse of the seal shows Baron Baltimore (the second Lord Baltimore, who sent the *Ark* and the *Dove* to Maryland) as a knight in full armor, with drawn sword and plumed helmet. His horse, adorned with his family arms, gallops on the seashore, which is remarkable for having flowers growing in the sand at the water's edge. The inscription contains his names and titles: *Cecilius Absolutus Dominus Terrae Mariae et Avaloniae Baro de Baltimore*, "Cecilius, Lord Proprietor of Maryland and Avalon, Baron of Baltimore." Avalon was the colony in Newfoundland founded by George, first Lord Baltimore.

The reverse of the seal shows a shield with the Calvert and Crossland arms quartered. The Calvert arms in the first and fourth quarters consist of six pales, or vertical bands, alternately gold and black with a bend dexter counterchanged—that is, a diagonal stripe on which the colors are reversed.

The Crossland arms in the second and third quarters consist of a quartered field of red and silver charged with a Greek (equal-arms) cross classified as "botonée," because its arms terminate in trefoils. The Crossland arms are also counterchanged—that is, the red is on the silver ground and the silver on the red. The Crossland arms came from Alicia Crossland, heiress mother of the first Lord.

The shield is surmounted by an earl's coronet and full-faced helmet, which indicates Lord Baltimore's rank in America as that of a Count Palatine, or one with royal prerogatives. His rank in England was that of a baron only. On the helmet is the Calvert crest, a ducal crown with two half bannerets, one gold and one black. The escutcheon is supported by a farmer and a fisherman, symbols of the two estates, Maryland and Avalon. Behind the escutcheon and coronet is an ermine-lined mantle.

On the scroll under the shield is the Italian proverb *Fatti Maschii Parole Femine*, chosen by the first Lord Baltimore, who had studied in Italy. The motto is generally translated "Manly deeds, womanly words," or "Deeds are male; words, female." In the 1920's feminists tried to have the motto changed. An Italian scholar several years ago commented that the unknown creator of the phrase was not "throwing bouquets at the fair sex."

The Latin motto around the rim, *Scuto Bonae Voluntatis Tuae Coronasti Nos*, "With favor wilt thou compass us as with a shield," is based on the 12th verse of the Fifth Psalm. The date 1632 refers to the granting of the first charter to George Calvert.

Seal is 3 inches in diameter. Two circular paintings of the seal were made by Robert G. H. Pennington in 1876 and now hang in the main vestibule of the State House at Annapolis. Colors used on State publications differ somewhat from these paintings (page 8).

MASSACHUSETTS, page 19. In 1780 Nathan Cushing was appointed a committee to prepare a seal, and his description was adopted. In 1898 the design was reapproved as the arms and as the design of the seal.

An Indian, dressed in shirt and moccasins, holds a bow with his right hand and an arrow with his left. Above the Indian's right hand is a five-pointed silver star. By law, the wreath is blue and gold, but on State publications it is gold and blue; on it is a gold right arm, the hand grasping a broadsword.

The motto is *Ense Petit Placidam sub Libertate Quietem*. It is the second of two lines presumably written about 1659 by Algernon Sydney, an

Alabama

Florida

Colorado

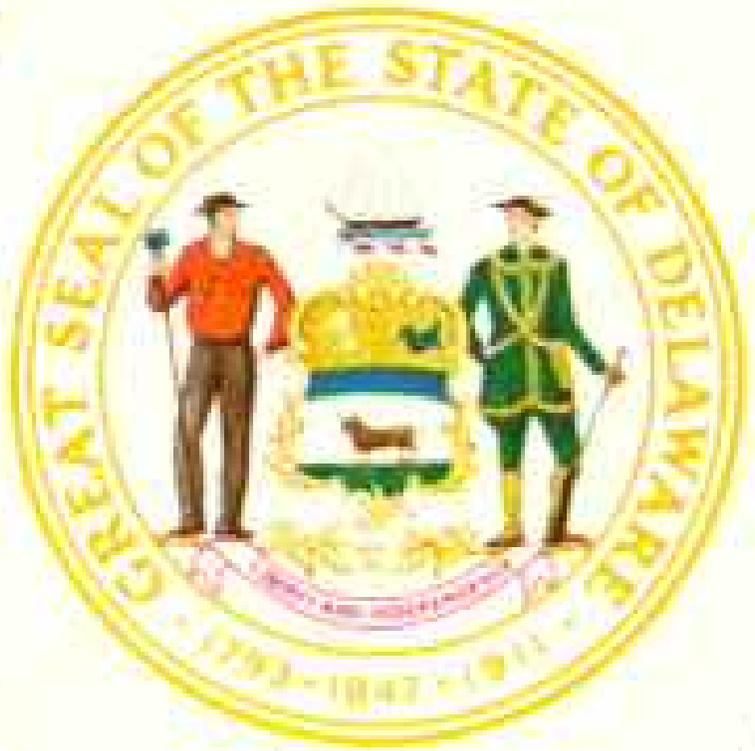
Arizona

Georgia

Arkansas

Connecticut

Georgia



Delaware

California

Idaho

Seals of the States

English patriot who had served under Cromwell, in the *Book of Mottoes* in the King's library at Copenhagen. At that time French influence was great in Denmark, and the French ambassador, feeling that the lines were a slur on Louis XIV, whom Sydney regarded as a "king of slaves," was so angry that he is reported to have torn them out of the book.

Massachusetts translates the motto, "By the sword we seek peace, but peace only under liberty." John Quincy Adams made two translations of both lines, the one in 1842 being more literal:

> This hand, the rule of tyrants to oppose,
> Seeks with the sword fair freedom's soft repose.

The motto was popular with the Colonies and was adopted in 1775 by the provincial congress as a message for England.

Around the seal, 2¾ inches in diameter, are the words *Sigillum Reipublicae Massachusettensis*, "Seal of the Republic of Massachusetts."

MICHIGAN, page 19. Lewis Cass, Michigan's second territorial governor (1813-1831), designed the seal and coat of arms. Adopted in 1835, the design underwent a series of changes; in 1911 the Legislature readopted the original.

Michigan's seal is very similar to that of the Hudson's Bay Company, but uses different animals. The shield shows a man on a peninsula bordered by a lake. The motto *Tuebor*, "I will defend," may have come from the arms of Viscount Torrington of Kent, England. The motto refers to Michigan's position on the frontier and is her promise to defend her sister States.

The Ambassador Bridge at Detroit between the United States and Canada, however, is more representative of Michigan's relation to her neighbor. It bears the inscription, "The visible expression of friendship in the hearts of two peoples with like ideas and ideals."

The American eagle appears over the shield as a crest. The streamer carries the words *E Pluribus Unum* (see Great Seal of United States, page 35).

The supporters are an elk and a moose. The streamer on which they stand has the motto *Si Quaeris Peninsulam Amoenam Circumspice*, "If you seek a pleasant peninsula, look about you." This is based on the inscription on the north door of St. Paul's Cathedral, London, which memorializes Sir Christopher Wren, architect of the building. The Wren inscription is translated, "If you would seek his monument, look around you."

Seal is 2½ inches in diameter. The design hangs on the walls of the executive chamber, the office of the secretary of state, the supreme court room, and the houses of the Legislature.

MINNESOTA, page 21. The Minnesota seal was adopted in 1858, the year of the State's admission to the Union. The seal's "essential designer" was Col. John J. Abert, of the Topographical Engineers, though the original design was modified by Capt. Seth Eastman and Governor Henry H. Sibley.

The plowman watching the Indian riding toward the setting sun is interpreted as the advance of white civilization upon the Indian.

The gun resting against the tree stump shows an era of transition, when it was still necessary for the settlers to protect themselves from the Indians; it also reveals the necessity of supplementing agriculture with hunting.

The waterfall represents a characteristic feature of the State; it may be the Falls of St. Anthony.

The motto *L'Etoile du Nord*, "Star of the North," is a reference to Minnesota's geographic position. (See the Maine seal, page 16.) The use of French is a reminder that the territory was first explored by men from France.

As seal presses have been worn out and replaced, minor changes have crept in. At one time the Indian rode slowly toward the West; at present he is galloping. One commentator writes, "Doubtless the engraver thought that the design would be improved by a little show of action." Seal is 2⅛ inches in diameter.

MISSISSIPPI, page 21. The seal of Mississippi has been used since 1817, when the State was admitted to the Union. This seal was based on the territorial seal, which in turn was based on the Great Seal of the United States (page 35). By law the design is an American eagle with four arrows in the right talon and a fruited olive branch in the left.

The specimen supplied for this study, however, shows the olive branch in the eagle's right talon and a single arrow in its left. The olive branch in the right talon accords more closely with the United States Seal, and it is heraldically preferable, since it implies that peace is offered first and that war is threatened only after peace has been refused.

Although the law specifies four arrows and the actual seal has one, State publications show three. The star on the rim has only five points, although the law specifies six.

Seal is 2¼ inches in diameter. In 1918 the Legislature provided that each county should provide itself with a seal "with the name in the margin and in the center an eagle."

MISSOURI, page 21. Approved by the General Assembly in 1822, the seal of Missouri was designed by Judge Robert William Wells, who described the design in heraldic terms and explained its significance in minute detail.

The circular shield in the center is divided; the left side represents the State, and the right the United States. The crescent at upper left was adopted as indicating that the State would increase in wealth and population.

In heraldry, the crescent is used as a "label" to indicate a second son, and Missouri was the second State (Louisiana was the first) formed out of territory not in the original territorial limits of the United States.

Illinois

Indiana

Iowa

Kansas

Kentucky

Louisiana

Maine

Maryland

Maryland

Massachusetts

Michigan

Seals of the States

For the second State symbol the judge selected what he called the grizzly or white bear (the silvertip bear), which he believed unknown outside that region. It represents power, courage, and hardihood, and suggests the great resources of the State and the character of its citizens.

The buckled band encircling the State devices and the United States coat of arms (page 30) indicates that, although Missouri and the United States form one government, they are separate for certain purposes.

The motto around the circle is "United We Stand, Divided We Fall." Kentucky has the same motto (page 15).

The crest over the arms is a helmet of gold with six bars, symbol of sovereignty.

Above the helmet is a cloud with a constellation of 23 stars. Drawings and descriptions of the seal show one star larger, but the big star does not appear on the impression in The Society's collection. The large star was intended to show Missouri rising to join the confederation of States and the difficulty besetting that attempt, the Missouri Compromise.

The supporters are Missouri bears; they symbolize the fact that, although the people of the State support themselves by their internal strength, they also support the Federal Government. The bears stand upon a scroll inscribed *Salus Populi Suprema Lex Esto*, "Let the good of the people be the supreme law." The date MDCCCXX is that of the State constitution. Seal is 2¼ inches in diameter.

MONTANA, page 21. The territorial seal approved in 1865 by the first territorial legislature was adopted in 1893 as the State seal. Judge Francis M. Thompson, designer of the seal, stated: "The idea was to present the Great Falls of the Missouri as the centerpiece of the seal, with the sun shining over the Rocky Mountains, the buffalo and other wild animals then abounding, the plow, the shovel and the pick, indicating our reliance upon agriculture and mining as the chief occupations of the people, with the timbered mountains showing their wealth of virgin forests."

The buffalo and other animals "then abounding" have now disappeared and are not mentioned in the description of the seal given in the *Revised Codes of Montana*, 1935. The words *Oro y Plata*, "Gold and Silver," refer to the State's mineral wealth.

Seal is 2½ inches in diameter. The design is used on the cornerstone and on the doorknobs of the capitol.

NEBRASKA, page 21. The first Legislature of Nebraska prescribed the seal in 1867. Mechanical arts are represented by the blacksmith; agriculture by shocks of grain and corn growing near the settler's cabin; transportation, which hastened the settlement of the State, by the train and by the steamboat on the Missouri River.

When the capital of the State was moved from Omaha to Lincoln early in December, 1868, rumors were that an injunction would be served on State officers to prevent their moving the seal from the old to the new capitol.

Thomas P. Kennard, secretary of state, went to the Omaha capitol on a Sunday morning, took the seal, wrapped it carefully, and put it under the seat of his buggy. He met the governor early on Monday morning and put the impression on the governor's proclamation that the capital of the State of Nebraska was at Lincoln, County of Lancaster, Nebraska, and is "now open for business."

The legend on the seal, "Equality Before the Law," has had two interpretations. One is that it referred to slavery and the equal rights of people before the law, regardless of color. The other is that it referred to early controversies about public lands and expressed the frontier belief that every man should have an equal opportunity to obtain a home on the public domain.

The idea for the design came from Isaac Wiles, a member of the Nebraska House of Representatives, with additions by Judge Elmer S. Dundy. The artist is not known, but may have been an Omaha jeweler.

Many efforts have been made to change the seal. It is 2⅝ inches in diameter.

NEVADA, page 21. The seal, adopted by the Legislature in 1866, has a plow, sheaf, and sickle in the foreground, representing agricultural resources. Immediately behind these devices are two large mountains with a quartz mill at the right and a tunnel penetrating the silver leads of the mountain at the left. A miner is running a carload of ore out of the tunnel near a wagon loaded with ore for the mill.

In the middle ground, a train crosses a mountain gorge; in pictures, a telegraph line follows the railroad, but this does not show on impression. In the background a range of snow-clad mountains is capped with the rising sun.

The motto of the State, "All for Our Country," is carried on a scroll at the bottom of the seal, which is 2¾ inches in diameter. The 36 stars represent the number of States when Nevada was admitted to the Union, October 31, 1864.

NEW HAMPSHIRE, page 21. Adopted in 1784 and confirmed in 1785, New Hampshire's seal was redescribed in 1931 when a new seal press was made from a drawing by Pierre de Chaignon la Rose. The design has been basically unchanged for more than 160 years.

In the spring of 1945 the New Hampshire House of Representatives adopted a measure which would have changed the seal materially, but the State Senate by a small margin preserved the historic design.

The sun rises behind a broadside view of the frigate *Raleigh* on the stocks. The United States flag, "as authorized by Congress on June 14, 1777," flies from an ensign staff at the stern. Pennants fly from a jury staff on the mainmast and foremast. The *Raleigh* was one of the first 13 vessels ordered for the American Navy; she was built at Portsmouth in 1776.

The National
Geographic Magazine

Minnesota

Nebraska

New Jersey

Mississippi

Nevada

New Mexico

Missouri

New Hampshire

New York

Montana

Seals of the States

North Carolina

In 1945 the Legislature adopted a State "emblem" showing a view of the Old Man of the Mountains. This device is planned for use on publications and stationery; it should not be confused with the State seal design, used for the same purpose for many years. Seal is 2 inches in diameter.

NEW JERSEY, page 21. In 1776 Francis Hopkinson was authorized by the Legislature of New Jersey to engage an artist to design a seal according to a description drawn up by a State committee. He gave the commission to Pierre Eugène du Simitière (see Great Seal of the United States, page 35). That artist's design differed in several particulars from the specifications laid down by the State committee, but it was accepted.

Used with numerous changes in details, the seal was minutely described by a law enacted in 1928, and Warren E. Deming, a Jersey City artist, drew the official picture.

The shield shows three plowshares. The supporters are two female figures, Liberty and Ceres. The crest is a horse's head. The sovereign's helmet, the mantling, and the date, introduced by Du Simitière, were retained. The words "Liberty and Prosperity," originally added without legislative approval, were given official sanction in 1928.

Seal is 2½ inches in diameter. A painting of the seal now hanging in the office of the secretary of state and a stained-glass window in the rotunda of the State House show early interpretations of the colors. A mosaic of the seal in the portico of the State House follows the colors established in 1928.

NEW MEXICO, page 21. In 1913 the State Legislature appointed a committee to select a seal for the State and provided that the territorial seal, with the word "State" substituted for "Territory," be used until a new one could be provided. The original seal is still in use.

The Mexican eagle grasps a serpent in its beak and the cactus in its talons. It is shielded by the large American eagle, grasping arrows in its talons. The motto is *Crescit Eundo*, "It grows as it goes," taken from Lucretius' *De Rerum Natura*, "Concerning the Nature of Things."

The Mexican eagle with the serpent in its mouth appears on the Mexican coat of arms. According to a legend, Montezuma was born in Pecos Pueblo, New Mexico. When he was a young man he mounted the back of an eagle and started south, followed by a number of his people. When the eagle alighted upon a cactus and seized a serpent with his bill, Montezuma recognized this as a sign that he had reached the place where he should found the city which became the capital of the Aztec Empire, the future Mexico City.

The New Mexican historian who supplied this legend commented, "The Montezuma birthplace is absurd, but in the 1880's, when the territorial seal was designed, the story was very popular."

The date 1912 is that of the State's admission to the Union.

Seal is 2¾ inches in diameter.

NEW YORK, page 21. The seal of New York was originally approved by the provincial congress in 1778, but several changes were made in later years. No official description of the seal could be found in State records; so the Legislature in 1882 adopted the seal again, describing it from a specimen of one used in 1778.

The seal carries the arms of the State. The shield has a landscape with the sun rising behind three mountains. A ship and sloop are passing on the river which flows below the mountains.

The crest is a heraldic interpretation of the American eagle, standing on two-thirds of a terrestrial globe; the globe is turned to show the Atlantic Ocean and the outlines of its shores.

Liberty is the supporter on the left side of the design. Her hair is disheveled and decorated with pearls. She holds a staff with a Phrygian cap (page 9). At her foot is a royal crown. Justice, at the right, also has pearls in disheveled hair. Her eyes are bound. She holds a sword in her right hand and scales in her left. The motto is *Excelsior*, "Higher," sometimes translated "Ever Upward."

Seal is 2½ inches in diameter. The arms which form the center of the seal are prescribed by law to be painted on wood or canvas and hung upon the walls of the executive chamber, court of appeals, office of the secretary of state, and in the State Senate and Assembly chambers.

NORTH CAROLINA, page 21. The North Carolina seal, in use since 1893, is the fourth adopted since the first State seal of 1779.

The first seal carried the figure of Minerva, goddess of war, on the obverse, and Ceres, goddess of agriculture, on the reverse. The figures in the current seal are called "Liberty" and "Plenty." In her left hand Liberty has a pole surmounted by a liberty cap, and in her right a scroll with the word "Constitution." Plenty has three heads of wheat in her right hand; she holds a horn of plenty with her left.

At the top is the date May 20, 1775, in honor of the "Mecklenburg Declaration of Independence." The motto is *Esse Quam Videri*, "To be rather than to seem." It is taken from Cicero's essay, *De Amicitia*, "Concerning Friendship."

Seal is 2¼ inches in diameter.

NORTH DAKOTA, page 23. The territorial seal of North Dakota, designed by William Shober, was adopted by the State constitution; the only changes were in the arrangement of the words in the motto, and "three bundles of wheat" were substituted for the "bundles of sticks" of the original.

A tree in an open field is surrounded by the three bundles of wheat. A plow, anvil, and sledge are at the right. A bow crossed with three arrows, and an Indian on horseback pursuing a buffalo toward the setting sun, are on the left. The foliage of the tree is surrounded with 42 stars, number of States in the Union in November, 1889, month of North Dakota's admission. The date October 1, 1889, is that of its constitution.

North Dakota

Pennsylvania

South Carolina

Ohio

South Dakota

Pennsylvania

Oklahoma

Tennessee

Rhode Island

Texas

Oregon

Seals of the States

The motto, "Liberty and Union, Now and Forever, One and Inseparable," recalls that the territory was established at a period when States' rights were a matter of conflict, 1861. It is from what is frequently considered Daniel Webster's greatest speech, made in 1830 in defense of the Union against the doctrine of Nullification. Seal is 2½ inches in diameter.

OHIO, page 23. The State constitution of 1802 provided for a seal, but did not specify a design. One spring night Secretary of State William Creighton and several other officials worked on State affairs until daybreak. Among other things, they discussed the need for a seal.

Standing on the lawn before separating, the men saw the sun rising behind the Mount Logan range. The sight inspired Creighton to exclaim, "The rising sun of the new State!"

This scene was adopted in 1803 as the seal design; the bundle of 17 arrows (the number of States in the Union) and a sheaf for agriculture were added later. Many subsequent changes were made, but in 1868 the original design was restored by law. Today the rising sun is interpreted as the "advance of the power and wealth of the State."

The design is painted on the center of the rotunda in the Ohio capitol and appears in bronze above the directory in the north and south vestibules of the Ohio Departments Building, better known as the Ohio State Office Building, in Columbus. Seal is 2½ inches in diameter. A similar seal with "The Supreme Court of the State of Ohio" on the rim is used by the State's highest tribunal.

OKLAHOMA, page 23. Designed by a committee appointed by the constitutional convention, and adopted by the State constitution, Oklahoma's seal is a combination of six seals: the one for the Indian Territory and the tribal seals of the Five Civilized Tribes in the territory.

On a circle a large star represents Oklahoma; it is surrounded by 45 smaller stars to show that Oklahoma was the 46th State in the Union. In the center of the great star is the territorial seal. Under the motto *Labor Omnia Vincit*, "Labor conquers all things," is a figure representing Justice and Statehood. On her right is the American pioneer farmer, on her left the aboriginal American Indian. Shaking hands under the scales of justice, the figures symbolize equality under the law.

Beneath the figures are a cornucopia of plenty and the olive branch (wreath) of peace. Behind the figures are the sun of progress and symbols of progress and civilization—a farmer plowing, rural home, railroad train, compress, mills, elevator, factories, churches, schools, the capitol, and a city.

The five tribal seals are: upper left ray, a seven-pointed star partially surrounded by oak leaves for the Cherokee Nation; top ray, an Indian warrior with bow and shield for the Chickasaw Nation; upper right ray, a tomahawk, bow, and three crossed arrows for the Choctaw Nation; lower right ray, a village with houses and a factory beside a lake on which an Indian is paddling a canoe, for the Seminole Nation; lower left ray, a sheaf of wheat and plow for the Creek Nation.

The date 1907 is that of Oklahoma's admission.

Colors for the seal, which is 2⅜ inches in diameter, have not been officially prescribed, but Miss Muriel H. Wright of the Oklahoma Historical Society designed one in color which has met with favor in the State. Some State publications show a similar color scheme, but with a gold annulet instead of red.

OREGON, page 23. Designed by Harvey Gordon, Oregon's seal was approved by the first Legislature in 1859. In 1903 a new seal was ordered because the one in use was "so at variance with the law that it is a wonder someone did not question it when offered in evidence on documents."

The seal has a shield supported by 33 stars, the number of States when Oregon joined the Union. An American eagle is the crest. On the shield the Pacific Ocean is shown with a British man-of-war departing and an American steamer arriving, representing the early settlements and the end of the joint occupancy of the country by Great Britain and the United States. An elk with branching antlers stands on the mountains, symbolizing native game.

The covered wagon recalls the settling of the State. The sheaf, plow, and pickax are for husbandry and mining. The date 1859 is that of Oregon's admission.

Alis Volat Propiis, "She flies with her own wings," was the territorial motto, and for years was generally accepted as the State motto, although it was never formally adopted. "The Union" is now accepted as the motto, since it is on the seal, but this, too, has never been officially recognized. Seal is 2⅜ inches in diameter.

PENNSYLVANIA, page 23. The State constitutional convention of 1776 provided for a seal for Pennsylvania. Since that time the obverse has been redrawn several times, but the final form adopted in 1893 conforms to the original.

The obverse carries the shield of the coat of arms. Used as early as 1777, the arms were changed several times and officially adopted in 1874. The shield has a ship in full sail at the top, a plow in the center, and three golden sheaves at the bottom. An American eagle is the crest. The horses used as supporters on the arms are replaced on the seal by a stalk of Indian corn and an olive branch.

The reverse of the seal is the same as originally used. It shows a woman with a wand topped by a liberty cap in her left hand and a drawn sword in her right. She is trampling a lion, representing Tyranny crushed. The inscription is "Both Can't Survive," the "both" meaning Liberty and Tyranny. No colors are provided for the reverse.

The double seal is used on important documents signed by the governor.

Staff Photographer R. Anthony Stewart

Vermont's Coat of Arms, in Marble, Graces the Washington Monument

The arms, showing a natural scene, are less conventional than the seal, although official descriptions of both are similar (pages 26 and 27). Controversy has raged as to the direction the cow should face. Since 1933 the cow and buck's head on the arms have officially faced dexter (opposite the arrangement in picture). Other States are represented in the interior of the Monument shaft.

Seal is 2¼ inches in diameter. Similar seals, but with different wording around the rim, are used by State government departments; they use only the obverse.

RHODE ISLAND, page 23. The motto "Hope" and an anchor have been on Rhode Island seals since 1647. The motto pointed to the uncertain future which the young settlement faced with confidence.

The anchor symbolized both the principle of civil and religious liberty which led to the founding of the Colony and the faith which served its citizens as an anchor.

The present seal, adopted in 1875, carries the full name of the State, "Rhode Island and Providence Plantations." Roger Williams, founder of the Colony, took the name "Providence" for his settlement to acknowledge "God's providence to him in his distress" at the time he was driven from Massachusetts. The date 1636 is the year in which Williams established his new plantation.

Seal is 2 inches in diameter.

SOUTH CAROLINA, page 23. The General Assembly of South Carolina approved a design for a seal in 1776, and it was first used in 1777. The obverse was the design of William Henry Drayton and the reverse is attributed to Arthur Middleton.

A palmetto tree on the seashore is symbolic of the fort on Sullivans Island, in Charleston harbor, which was built of palmetto logs. At the base of the tree is a torn-up oak tree typifying the British fleet, which was constructed of oak timbers and defeated by the fort. Two shields just below the palmetto branches are inscribed "March 26" for the ratification of the State constitution and "July 4" for the Declaration of Independence.

Twelve spears bound crosswise to the palmetto's trunk represent the first 12 States to join the Union. The band around the spears is inscribed *Quis Separabit*, "Who shall separate?" Under the oak is the inscription *Meliorem Lapsa Locavit*, "Having fallen, it has set up a better."

The date 1776 represents the year the constitution of South Carolina was adopted, the year

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Utah

Washington

West Virginia

Vermont

West Virginia

Virginia

District of Columbia

Wisconsin

Virginia

Wyoming

**Seals of the States
and of the District of Columbia**

of the battle at Sullivans Island, the Declaration of Independence, and the year the seal was ordered. Around the rim is the motto *Animis Opibusque Parati*, "Prepared in mind(s) and resources."

On the reverse a woman walks on the seashore over swords and daggers. This typifies Hope overcoming dangers, which the rising sun is about to disclose. In her right hand she holds an olive branch for the honors gained at Sullivans Island.

The sun shows that the battle on the island was fought on a fine day; it also suggests good fortune. On the rim are the words *Dum Spiro Spero*, "While I breathe, I hope." The word *Spes*, "Hope," is below the figure.

From the description it will be seen that the design was made immediately after the battle fought on June 28, 1776, between the unnamed, and at the time unfinished, fort on Sullivans Island and the British fleet. The fort was later named Moultrie.

The seal is not used now because its size, 4 inches in diameter and 5/16 inch thick, makes it inconvenient. But the original seal forms the pattern for all seals of the State. In use at present is a 2½-inch disk which incorporates the obverse and reverse of the official seal, compressing the circular designs into ovals.

The design of the original is in relief over the doorways of public buildings in Columbia. A painting of it hangs on the walls of the Senate Chamber, and two panels in stucco are decorated with it. For colors, see page 8.

SOUTH DAKOTA, page 23. The constitution of 1889 gave South Dakota its seal. On the left are a smelting furnace and a range of mountains. On the right is a farmer at his plow with a herd of cattle and a field of corn behind him. The center is marked by a river bearing a steamboat.

According to an official statement, "The plowman symbolizes agriculture; the steamboat, transportation; the smelting furnace, the mining industry; the cattle, grazing and dairying; the trees, lumbering." The motto is "Under God the People Rule." The date 1889 is that of admission to the Union. Seal is 2½ inches in diameter.

In 1945 studies were made looking toward the adoption of a new seal, but a satisfactory design has not been found.

TENNESSEE, page 23. A seal was authorized by the State constitution of 1796, date of admission to the Union, but a press was not ready for use until 1802.

The Roman number XVI refers to the numerical position of Tennessee among the States. The top half shows a plow, wheat sheaf, and cotton plant in honor of agriculture. The boat below with the word "Commerce" honors industry.

Changes have been made in details of the design, but the present seal has been in use since 1866. It is 2⅜ inches in diameter. A gray-and-white picture of it decorates the ceiling of the capitol at Nashville. The design was formerly used on uniform buttons and belt buckles of the State militia.

TEXAS, page 23. The seal of Texas, adopted with slight modification from the seal of the Republic of Texas, was authorized by the constitution of 1845. The device is a five-pointed star encircled with a wreath of olive and live-oak branches, symbols of a desire for peace but the strength to fight.

One of the most popular legends of its origin tells that when the need for a seal arose, Provisional Governor Henry Smith used a large brass button from his overcoat to make an impression. Papers of the Republic, authenticated by an obviously homemade seal, carry a device presumably made from the "button seal," but the design is reported to look more like an eight-petaled daisy than a five-pointed star.

Llerena Friend, historian of the seal, writes that "in a Commonwealth famous for its brands, the lone star is the official governmental brand," but that the origin of the brand is obscured by time. Seal now in use is 2¼ inches in diameter.

UTAH, page 26. Adopted by the first State Legislature in 1896, date of admission to the Union, Utah's seal carries on it the beehive, first used in 1850 on the territorial seal. Deseret, the name given originally to the territory, came from the *Book of Mormon* and meant "the honeybee."

The industrious nature of the State's citizens is further emphasized by the word "Industry" above the hive. On both sides of the hive are sego lilies, the State flower. The date 1847 commemorates the founding of Utah by a company of Mormons. An eagle, arrows, and flags complete the design. Seal is 2½ inches in diameter.

VERMONT, page 26. The seal of Vermont, designed by Ira Allen and cut by Reuben Dean in 1778, was accepted by the General Assembly in 1779. Several variations of the design were used, but in 1937 the Assembly provided for a "faithful reproduction" of the original.

Attempts to interpret the seal were characterized in 1937 as "frankly guesswork." The wooded hills are the Green Mountains. The sheaves represent agriculture; the cow, dairying. The top wavy lines may be clouds; the bottom ones, the waters of Lake Champlain and the rivers of the State. The object opposite the cow may be a spontoon (a short pike used by commissioned officers of the early United States militia), a fleur-de-lis, or just a decoration.

The pine tree was familiar in New England on early flags, shillings, and the like. The 14 branches without a "leader," or center branch, rising directly from the trunk, may recall Vermont's reaction to its exclusion from the Thirteen Original States.

One version of the tree's origin is that it was made from a carving on a horn cup. The tree on the cup was drawn from a 175-foot giant near the town of Arlington. The tree is now owned by the town as a memorial to the seal.

Alaska

Hawaii

Puerto Rico

Virgin Islands

Guam

American Samoa

Canal Zone

Seals of the Territories, Island Possessions, and the Philippine Commonwealth

Philippine Islands

Seal with Ribbon

National Geographic Society

NATIONAL GEOGRAPHIC SOCIETY

Seal with Ribbon

Since Vermont was the fourteenth State admitted to the Union, the motto "Freedom and Unity" may imply that the United States should be free and that Vermont should be united with it.

Vermont's coat of arms, ordinarily shown in color, has the same devices of tree, cow, etc., but it is pictorially portrayed in such a way as to present an entirely dissimilar appearance (page 25). Even so, the arms and seal have at times been confused. Seal is 2½ inches in diameter.

VIRGINIA, page 26. When the State convention was held in 1776, a seal was authorized. George Wythe was probably the designer, although Pierre Eugène du Simitière (page 35), according to his *Notebooks*, made a drawing of a seal in August, 1776.

When new seals were necessary in 1930, an official description was given. On the obverse, Virtus, the genius of the Commonwealth, dressed as an Amazon, rests on a spear in her right hand; she holds a parazonium, or sheathed sword, in her left. Virtus has her left foot on the form of Tyranny, represented by the prostrate body of a man; a crown has fallen from his head; he has a broken chain in his left hand and a scourge in his right. The motto is *Sic Semper Tyrannis*, "Thus ever to tyrants."

On the reverse is a group consisting of Aeternitas with a globe and phoenix; Libertas with a wand topped by a liberty cap; and Ceres with a cornucopia and ear of wheat in her hands. *Per-severando* above the figures is translated "By Persevering" or "By Perseverance."

Feeling against monarchy and the admiration for the republican form of government as exemplified in ancient Rome were the bases for Virginia's selection of a seal avoiding heraldic symbols and based on classical mythology.

Virginia has two seals. The Great Seal is 2¾ inches in diameter; the Lesser is 1⅞ inches. The Great Seal has both sides; the Lesser has only the obverse. Official colors have been established for the obverse, as used in the State flag. The reverse is shown in blue, the wafer color (page 9).

WASHINGTON, page 26. Shortly before Washington became a State in 1889, a committee visited the jewelry store of the Talcott Brothers in Olympia with an elaborate scenic design which the members wanted cut as a seal to be ready for the opening of the Legislature. Charles Talcott suggested that the design would be outmoded as the State grew. Using an ink bottle and a silver dollar, he drew concentric circles and printed between them "The Seal of the State of Washington, 1889." Pasting a postage stamp in the center, he said, "That represents the bust of George Washington."

Without more ado, the committee accepted the design. The Washington bust was copied from an advertisement for Dr. Jane's Cure for Coughs and Colds. Grant Talcott did the lettering, and George Talcott sank the die.

Three subsequent seals have been cut, with changes in the portrait but not in the basic design. Seal is 2⅛ inches in diameter. Its design is used in the Legislative Building as a decorative motif. It appears on all doorknobs for rooms opening off the main corridor. A bronze reproduction four feet in diameter is in the marble floor under the rotunda. The seal on one-and-one-half-foot disks appears twelve times on bronze railings of the balcony beneath the rotunda.

WEST VIRGINIA, page 26. Based on suggestions and designs made by the Hon. Joseph H. Diss Debar of Doddridge County, West Virginia's seal was adopted in 1863.

The obverse has in the center "a rock with ivy emblematic of stability and continuance, and on the face of the rock the inscription, 'June 20, 1863,' the date of our foundation, as if graven with a pen of iron in the rock forever."

The farmer at the left has a plow and an ax, suggesting that, though the territory is partly cultivated, it is still in the process of being cleared.

The miner at the right stands in front of an anvil to represent the mineral wealth of the State and the "mechanic arts."

The hunters' rifles and Phrygian cap in the foreground indicate that the State won its freedom and will maintain it by force of arms. The motto is *Montani Semper Liberi*, "Mountaineers (are) always free."

The reverse shows a log farmhouse on a cultivated slope. On the side of a mountain is a representation of the viaduct on the line of the Baltimore and Ohio Railroad in Preston County with a train about to pass over it. A factory, a river with boats, and a derrick and shed show some of the State's industries, including the production of salt and petroleum. The cattle and sheep in the foreground are for agriculture.

Above the rays of the sun is the motto *Libertas e Fidelitate*, "Freedom from Loyalty," which suggests that the State's freedom is the result of its faithfulness to the Union.

Seal is 2½ inches in diameter. A Lesser Seal is slightly smaller. The reverse has not been used in recent years except for decoration.

WISCONSIN, page 26. Governor Nelson Dewey and Edward G. Ryan, later chief justice of the State supreme court, designed the seal of Wisconsin while sitting on the steps of a Wall Street, New York, bank in 1851. In 1881, when it was necessary to replace the seal, the engraver made a few changes.

The design is the State coat of arms. A quartered shield carries a plow for agriculture, a crossed shovel and pick for mining, an arm holding a hammer for manufacturing, and an anchor for navigation. The United States shield, encircled with a garter bearing the words *E Pluribus Unum*, is superimposed on the large shield (see Great Seal of the United States, page 35).

The United States emblem is a symbol of the State's loyalty to the Union. The large shield rests on a cornucopia, representing the general resources of the State, and on a pyramid of pig lead, typifying its mineral wealth.

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Senate

House of
Representatives

Great Seal

Archives

Supreme Court

Great Seal

Library of Congress

Great Seal of
the United States
and Other Federal Seals

Smithsonian Institution

The supporters are a sailor with a coil of rope, for labor on water, and a yeoman with a pick, for labor on land. The crest is a badger, for the "Badger State." The motto on the streamer is "Forward." The 13 stars at the base are for the original States. Seal is 2⅜ inches in diameter.

WYOMING, page 26. The seal of Wyoming was approved by the second Legislature in 1893 and amended by the 16th in 1921. The figure of the woman, based on the statue Winged Victory, in the Louvre, has links of a chain hanging from her wrists; with her right hand she holds a banner inscribed "Equal Rights." The figure represents the political status that women have always enjoyed in the State.

The two pillars support lamps of knowledge; on the left pillar are the words "Live Stock" and "Grain"; on the right, "Mines" and "Oil." These words do not show on the actual impressions of the seal. They represent the industries of the State; the men are clothed to show the occupations suggested by the words.

By law the figure XLIV is placed at the top of the shield (*i.e.*, in chief), indicating this is the 44th State admitted to the Union. Impressions of the seal do not show the figure, but it appears when the design is used for decorative purposes. The dates 1869 and 1890 are for the organization of the territorial government and the admission to statehood. Seal is 2⅜ inches in diameter.

DISTRICT OF COLUMBIA, page 26. In 1871 the Legislative Assembly of the District adopted a seal which was placed in the office of the Secretary of the District. In 1874 that office was abolished, but the Secretary to the Board of Commissioners of the District now uses the same seal.

In the background the Potomac River separates Virginia and the City of Washington. A statue of George Washington stands on a pedestal. The figure Justice has a wreath in her right hand and a tablet with the word "Constitution" in her left. At the right is the Capitol of the United States. At the left are an eagle and a sheaf of wheat and other agricultural products. The date 1871 is that of adoption of the seal, which is 2¼ inches in diameter. The scroll carries the motto *Justitia Omnibus*, "Justice for All."

The seal is now "dated," for the District no longer has extensive farm lands.

Seals of the Territories, Island Possessions, the Canal Zone, and the Philippine Commonwealth

SEALS are used in the Territories of Alaska and Hawaii, the island possessions, the Canal Zone, and the Philippine Commonwealth for the same purposes as those used by the States.

Direct impressions of the seals are made by all those in this group except Alaska, which always employs a wafer, usually gold but sometimes red.

Gold wafers are also used by Hawaii, the Virgin Islands, and the Philippine Commonwealth. In addition to gold, Hawaii has blue and red wafers; the Virgin Islands blue. Puerto Rico uses red, and the Canal Zone white or colored.

Blue ribbons are used by Puerto Rico, blue and red by Hawaii, and red, white, and blue by the Philippines. For special occasions, other seals in this group carry ribbons, but of no specified colors.

Flags for Puerto Rico, Guam, and the governor of the Canal Zone feature devices from the seals.

ALASKA, page 28. In 1884 Congress provided for a civil government for Alaska, and the first governor, "on his own motion," designed and had made a seal for the District of Alaska. The seal was used until 1910, when Governor Walter E. Clark said the seal placed too much emphasis on icebergs, northern lights, and native people. He had a draftsman in Juneau draw a rough draft of a new seal, which incorporated the original features plus symbols for mining, agriculture, fisheries, fur seal rookeries, and a railroad.

The design was approved by the Acting Attorney General of the United States. A "more refined" drawing was made by an unknown person in the Department of the Interior, and the new seal was ready for use early in 1911. After Alaska was changed from a District to a Territory in 1912, the new designation was substituted the next year. Seal is 2⅛ inches in diameter.

HAWAII, page 28. After the Hawaiian revolution of 1893 drove Queen Liliuokalani from the throne the people set up a provisional government, followed by a republic. The Hawaiians ceded their sovereignty to the United States in 1898, and in 1900 the islands became a Territory. The present seal of Hawaii is the same as the one for the Republic, except that it is smaller and the word "Territory" is used. If granted statehood, a change will probably be made in the seal.

The shield has stripes of the United States flag in the first and fourth quarters; the second and third quarters have a pierced ball on a staff. A small superimposed shield bears a gold star.

The supporter at the left is King Kamehameha I, who united the islands in 1791. The figure is based on the bronze statue in front of the Judiciary Building, formerly called *Aliiolani Hale* (Hall of Chiefs), in Honolulu. The supporter at the right is the Goddess of Liberty, wearing a Phrygian cap and laurel wreath; she holds the Territorial flag.

The crest is the rising sun. The date above it, 1900, is that of creation of the Territory.

Below the shield a phoenix rises from flames, symbolizing eternal life. Eight taro leaves, ba-

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Agriculture

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Commerce

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State

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Seals of the President and the Government Departments

nana foliage, and tall maidenhair ferns complete the design. The motto is *Ua Mau Ke Ea O Ka Aina I Ka Pono*, "The life of the land is preserved by righteousness."

The design appears as a mural in the office of the governor, and the colors in the National Geographic Society's painting are based on a Kodachrome taken especially for this series. Seal is 2¼ inches in diameter.

THE VIRGIN ISLANDS, page 28. Originally created during the naval administration of the Virgin Islands, the seal carries the same design as the Great Seal of the United States (page 30).

The seal used from 1917 until July, 1921, had on the rim "Department of the Navy, Virgin Islands of the United States." In the latter year Rear Admiral Sumner E. W. Kittelle, U.S.N., governor, had the inscription changed to "Government of the Virgin Islands of the United States."

Although there is no Executive order or authority on file for the adoption and use of the seal, its continued use was authorized in 1933 by the Secretary of the Interior. Seal is 1¾ inches in diameter.

PUERTO RICO, page 28. Puerto Rico's beautiful seal is the oldest in the series. King Ferdinand of Aragon signed the following royal decree on November 8, 1511:

"A green shield, round, bearing a silver lamb, resting upon a red book, bearing a flag with cross and banner, as shown in the device of Saint John, and having for border castles, lions, flags and crosses of Jerusalem—and having for a device an 'F' and an 'I' with its crowns and yoke and arrows, and a motto round it as follows: '*Joannes Est Nomen Ejus.*'" Usually translated "His name is John," the motto is apparently based on the Gospel according to St. Luke, 1: 63, "His name is John."

The devices are explained: "The lions and castles represent Castile and Leon, the hereditary kingdoms of Isabella, under whose special patronage Columbus discovered the New World. The flags bear devices from the coats of arms of the various kingdoms at that time under Spanish rule. The crosses of Jerusalem represent the fact that Spain was entitled to credit for taking part in the Crusades because of the campaigns against the Moors in her own territory.

"The yoke and arrows are explained by the Spanish historian Oviedo as tokens of mutual affection between Ferdinand and Isabella, each taking for a personal device an emblem the initial of which corresponded with the name of the other; his being a yoke, *yugo* (Isabella being at that time often spelled with Y) and hers being a sheaf of arrows, *flechas*. These latter devices were used on the public coin, on furniture, books, and other private property of Ferdinand and Isabella."

In some representations the banner carried by the lamb is marked with stripes; on earlier versions the lamb was standing on the book.

Tradition also has suggested that the lamb is the symbol of peace and tranquillity, possibly representing the "Lamb of God." The letters "F" and "I" may also stand for *Fiel Isla*, "Faithful Island." Seal is 1⅝ inches in diameter.

GUAM, page 28. The National Geographic Society has a blueprint of Guam's seal dated July 4, 1917, but it was apparently used before that time. The design was confirmed in 1930 by executive order of Capt. Willis W. Bradley, Jr., U.S.N., then governor.

The old seal has not been found since the liberation of the island on August 1, 1944, and it has not been determined whether it was destroyed before the Japanese occupation on December 10, 1941, or was confiscated by the enemy. However, the island now has a new one with the same design.

The Guam seal has a coconut tree to represent the most important product of the island. The outrigger canoe symbolizes the early fame of the native people, the Chamorros, for their skill in manning these canoes, called "flying proas" by Magellan.

Seal is 2⅝ inches high. The design is very popular on the island. The Bank of Guam uses a reproduction of it on its jeep, and native craftsmen use it on bracelets, rings, inlaid wooden trays, and articles woven from *agag*, a species of pandanus leaf.

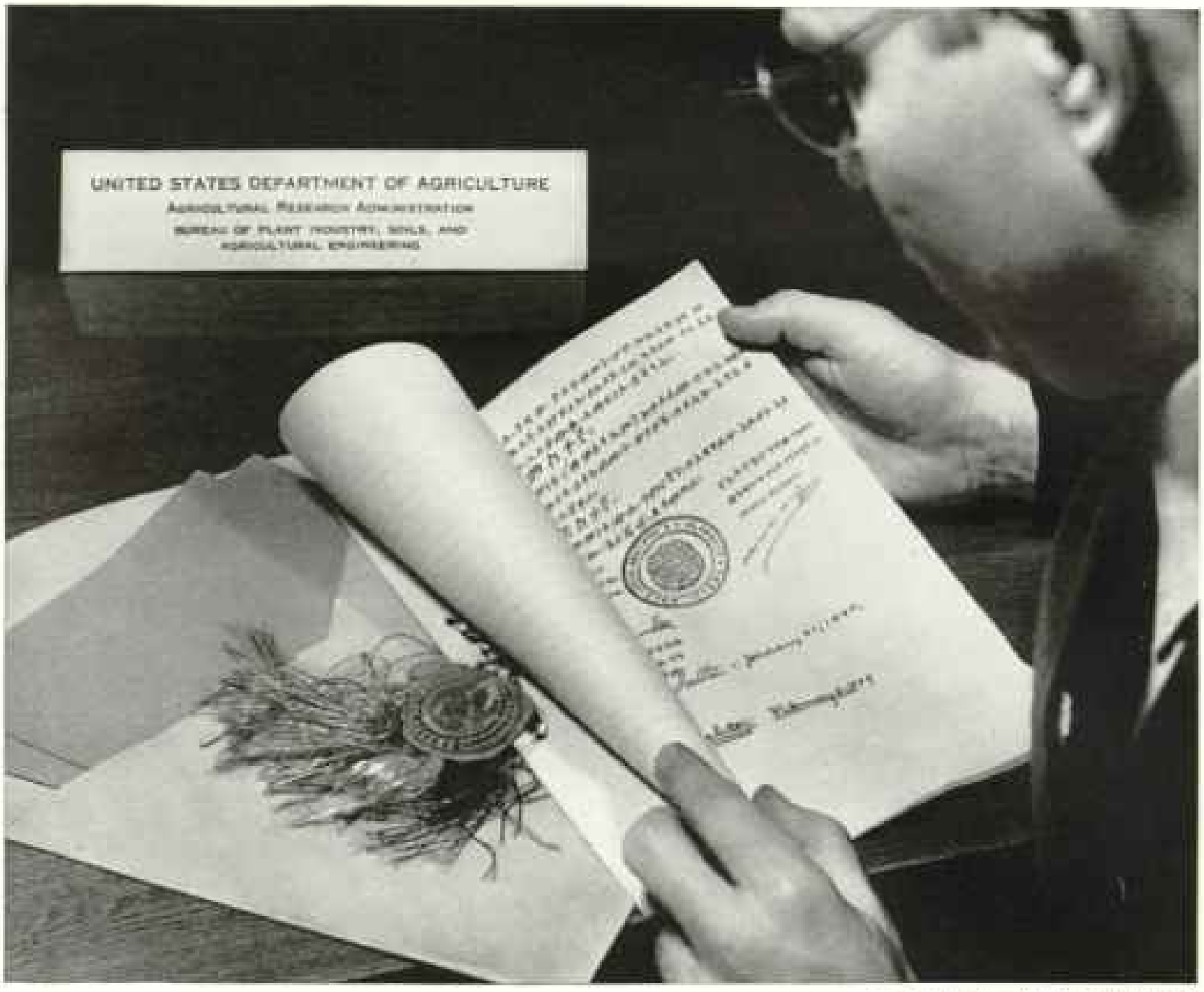
AMERICAN SAMOA, page 28. No official seal has been adopted by American Samoa, but the naval governor uses the design shown. The Attorney General of American Samoa is the custodian of the seal. The seal, 1⅞ inches in diameter, is always used as a direct impression on the document. So that the design will show, it is illustrated in gold in the color plate.

CANAL ZONE, page 28. Originally planned by the Isthmian Canal Commission, the seal of the Canal Zone was approved in 1905. The design was the work of artists of Tiffany & Company, New York City, with the aid of the late Gaillard Hunt of the Department of State (see Great Seal of the United States, page 36).

The only official description of the seal is in an Executive order of 1915. For the governor of the Zone it designates a flag which carries the seal. The shield shows at the bottom a Spanish galleon of the 15th century under full sail coming head on between two high banks. The sky is yellow with the glow of sunset. At the top are the colors of the arms of the United States. Under the shield is the motto, "The Land Divided, the World United."

A beautiful painting of the seal hangs in the Washington, D. C., office of The Panama Canal. The seal itself is 2½ inches in diameter.

PHILIPPINE COMMONWEALTH, page 28. Originally adopted in 1905, the seal of the Philippines carries the coat of arms of the



Staff Photographer B. Anthony Stewart

Seals Proclaim Authenticity in Every Tongue, Including the Amharic

This "Memorandum of Understanding" attests the promise of Ethiopia to assist the United States Department of Agriculture in its sugar plant investigations and assures the African country, in its court language, that reciprocal services will be extended. Under the agreement, seeds of many varieties of sorghum are being collected and brought to the United States. The red wax seal fastens the cords which bind the document.

islands. The three cultures of the islands are symbolized. The three gold stars are for the native peoples of the three major geographic regions—Luzon, the Visayas, and Mindanao. The castle of Castile and the sea lion of Aragon represent the Spanish period. The American eagle used as the crest represents the association of the Philippines with the United States.

The Great Seal is in the custody of the President of the Philippines. It is 3 inches in diameter.

The arms of the Philippines are used on seals for the Supreme Court, the Congress, and other departments of the Philippine Government. It is anticipated that when the Philippines are granted their independence in 1946, the term "Commonwealth" will be dropped and only the name "Republic of the Philippines" will be used.

NATIONAL GEOGRAPHIC SOCIETY, page 28. This seal is added to the series in the belief that The Society's members will be interested in the device which appears on membership certificates and on many of its publications and maps (page 39).

Today The Society has more than 1,450,000 members. In 1896, when it was so small that its members could all meet and hear papers read aloud, it authorized a seal. At the 130th Regular and the 8th Annual Meeting, article IX of the bylaws was adopted, as follows:

"The seal of The Society shall consist of . . . the Western Hemisphere, from 0° to 180° west from Greenwich, with the legend 'National Geographic Society' above & 'Incorporated A.D. 1888' below, as in design herewith."

The design was made under the personal supervision of the late Gardiner Greene Hubbard, who was at that time president of The Society.* The seal, 1⅞ inches in diameter, is now used as a direct impression and on gold or other color wafers. Ribbons are frequently used; three colors, blue, brown, and green, symbolize the geographic elements of sky, earth, and sea. The ribbon colors are those of the National Geographic Society's flag.

* See "The National Geographic Society and Its Magazine," by Gilbert Grosvenor, NATIONAL GEOGRAPHIC MAGAZINE, January, 1936.

The design is used on the reverse of some of the medals presented by The Society for outstanding scientific achievement in the field of geography. At The Society's Washington headquarters, bronze casts of the seal appear on the elevator doors and in the floor of the lobby of the main building (page 11). A smaller bronze cast is inlaid at the entrance to the doorway of the building which was the first addition to Hubbard Hall, The Society's original permanent headquarters.

Great Seal of the United States and Other Federal Seals

TOPPING all seals in authority and importance is the Great Seal of the United States. Originally designed for Congress, this is now the seal of the Nation. Congress has two seals, one for the Senate and the other for the House of Representatives.

Since seals are of primary legal importance, it is appropriate that this series show the seal for the Supreme Court, the country's highest tribunal. Seals are also shown for the National Archives, the Library of Congress, and the Smithsonian Institution, since they are three great depositories of records and specimens of our national culture.

All the seals in the group can be used as direct impressions. White wafers are used for the seals of the United States and the Supreme Court; gold by the Senate, the House, the Archives, and the Library. Red is also used by the Archives; bronze by the Smithsonian. The Great Seal is unusual for its invected, or scalloped, edge; the others are serrated, or pointed.

Ribbons are used on two types of documents bearing the Great Seal: light blue for Presidential proclamations, and red, white, and blue for treaties. Green is used by the Senate and the Smithsonian; red by the Archives and the Library. The Supreme Court fastens together several sheets of a document with red.

GREAT SEAL OF THE UNITED STATES, page 30. On the very day the Continental Congress declared the United States an independent country, it appointed a committee to design a seal so that the new government could function properly. A second committee was appointed in 1780 and a third in 1782. The committees called in Pierre Eugène du Simitière, who designed seals for several States (see Delaware, New Jersey, and Virginia); also Francis Hopkinson and William Barton as advisers. Yet no designs met with favor.

In June, 1782, the designs were turned over to Charles Thomson, Secretary of the Congress. Thomson used features from all the designs, consulted with Barton, and proposed a design which was accepted on June 20, just one week after he had been given the task. Originally it was the seal of Congress and was entrusted to Thomson as secretary to that body. In 1789 Congress designated it as the seal of the United States and made the Secretary of State the official keeper.

The seal is now used on Presidential proclamations, treaties, full powers, exequaturs, and Presidential warrants for the extradition of fugitives; on commissions for Cabinet officers, ambassadors, ministers, and certain others.

There have been either six or seven dies of the seal, ranging in diameter from 2¾ to 4½ inches. They differ in details. For example, it was not until 1841 that five-pointed stars were used. The present matrix was cut in 1903 by Bailey, Banks, and Biddle of Philadelphia (page 41).

The seal of 1825 was the largest and most interesting. This was always used as a pendant seal; it was suspended by heavy tasseled cords which held the document in its blue-velvet cover. For protection of the inch-thick seal, it was enclosed in a metal case, or skippet (compare page 40). The case was five inches in diameter, one and one-half inches thick, and usually made of silver.

Pendant seals were usually reserved for use on treaties, but Commodore M. C. Perry had such a seal in a solid gold skippet for his mission to Japan in 1853-54. The pendant seal has not been used since 1871.

Congress authorized the use of direct impressions in 1854, but at present the seal is usually impressed in a white paper wafer. Early wafers were serrated; since 1888 the edges have been invected (pages 5 and 8).

Officially the seal, 3 inches in diameter, is described in heraldic terms, as follows:

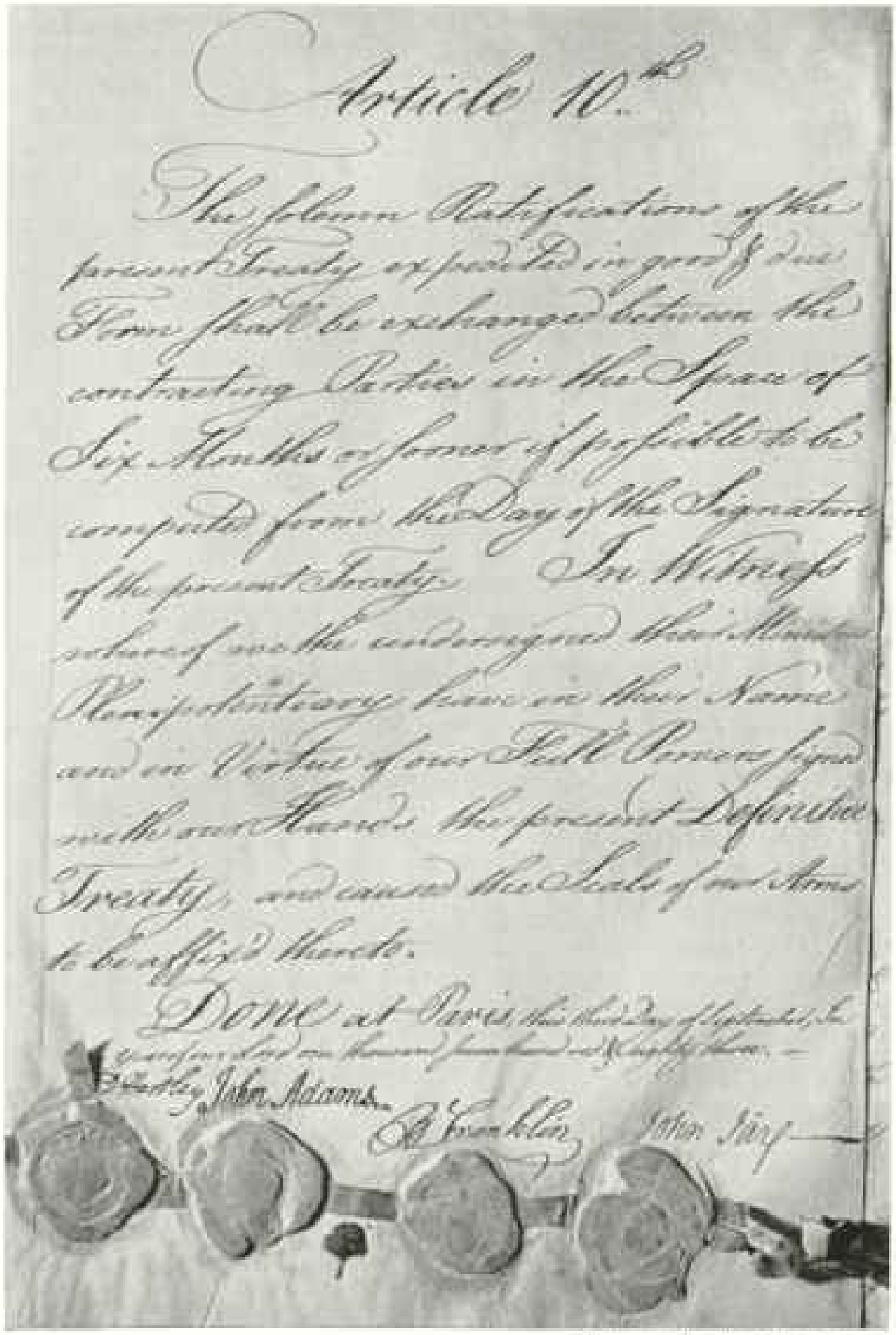
ARMS. Paleways of thirteen pieces, argent and gules; a chief, azure; the escutcheon on the breast of the American eagle displayed proper, holding in his dexter talon an olive branch, and in his sinister a bundle of thirteen arrows, all proper, and in his beak a scroll, inscribed with this motto, *E Pluribus Unum*.

For the CREST. Over the head of the eagle, which appears above the escutcheon, a glory, or, breaking through a cloud, proper, and surrounding thirteen stars, forming a constellation, argent, on an azure field.

REVERSE. A pyramid unfinished. In the zenith, an eye in a triangle, surrounded with a glory proper. Over the eye these words, *Annuit Cœptis*. On the base of the pyramid the numerical letters MDCCLXXVI. And underneath the following motto, *Novus Ordo Seclorum*.*

The white and red stripes on the shield represent the Thirteen Original States. The upper blue part of the shield represents Congress. The colors are those of the United States flag, but the flag

* Definitions of the terms used in the description are: *Paleways*, vertically; *argent*, silver (or white); *gules*, red; *chief*, top of shield; *azure*, blue; *escutcheon*, shield; *displayed*, wings spread; *proper*, natural colors; *dexter*, right (of the design, not of the observer); *sinister*, left; *crest*, figure above the shield; *glory*, a circle of rays; *or*, gold.



Staff Photographer B. Anthony Stewart

Four Seals Attest This Birth Certificate of the United States

By the Treaty of Paris in 1783, Great Britain recognized the advent of a new country. D. Hartley signed for Great Britain, while John Adams, B. Franklin (thrifty even in his signature), and John Jay signed for the United States. Each signature is accompanied by the signer's personal seal impressed into sealing wax. The seals are connected by a ribbon. The document is now preserved in the National Archives in Washington, D. C.

has seven red and six white stripes, in contrast with the shield, which has seven white and six red stripes. The olive branch and arrows represent the power for peace and war, peace in the right talon being offered first. The constellation denotes a new state taking its place among other sovereign powers. The escutcheon borne without supporters indicates that the United States of America ought "to rely on their own virtue."

The motto *E Pluribus Unum*, "One Out of Many," suggests that the Government was formed by uniting many States. The motto was used on the title page of the *Gentleman's Magazine*; originally it was probably from the *Moretum*, or "The Farmer's Breakfast," which has been attributed to Virgil.

The pyramid on the reverse of the seal signifies strength and duration. The eye of God and the motto *Annuit Cœptis*, "God Has Favored Our Undertakings," refer to the many interpositions of Providence in favor of the American cause. The date 1776 (in Roman numerals) and the words *Novus Ordo Seclorum*, "A New Order of the Ages," are for the Declaration of Independence. The mottoes on the reverse are based on Virgil.

The obverse is used as the basis for other seals; see seals for the President, Department of State, Virgin Islands, Supreme Court, Library of Congress, and National Archives. It is used on medals, currency, official stationery and publications, Army service caps and uniform buttons, and as an architectural adornment. In large size and full color it is placed above the entrances to U. S. embassies, legations, and consulates all over the world.

The reverse has never been cut as a seal. The design was used in 1882 when a centennial medal was issued by the United States Mint to celebrate the 100th anniversary of the adoption of the seal. Since 1935 the reverse has been a decoration on the back of dollar bills.

The complex history of the Great Seal of the United States was carefully investigated by the late Gaillard Hunt, of the Department of State, and further researches have been made by Richard S. Patterson, also of that Department.

SENATE, page 30. In 1885 Senator William P. Frye of Maine, who introduced a bill for a seal for the Senate, said: "The Senate is without any official seal. There is a legend of one, three women very slightly clothed, but it is only a legend. The Secretary of the Senate is annoyed a great deal by requests that the seal be attached to papers."

In recent years it has been discovered that the early seal, never used, was designed by R. P. Lamphear, a French artist residing in Washington, and engraved in 1851 by Edward Stabler, postmaster at Sandy Spring, Montgomery County, Maryland, from 1828 until his death in 1883 (see below and pages 40 and 42).

To meet the need pointed out by Senator Frye, the Senate's Committee on Rules was authorized to obtain a seal, and a design by Louis Dreka of Philadelphia was approved by the Senate in 1886. The seal shows a liberty cap, the shield with stars and stripes, crossed fasces, laurel and oak leaves, and the national motto. The design and press cost just $35. The seal is 1½ inches in diameter.

Electoral votes for the President and Vice President of the United States and the credentials of Senators are authenticated by this seal. It is painted on the ceiling of the office of the Secretary of the Senate.

HOUSE OF REPRESENTATIVES, page 30. In 1830 the Annual Report of the Clerk of the House of Representatives contained an item, "Seal $100." The die was cut by Edward Stabler, of Sandy Spring, Maryland. No law authorizing the seal and no information about its designer have been found in the records, but the seal was used until 1912. At that time it had to be replaced, and the House authorized a seal identical with the first, except that the stars on the rim were increased from 24, the number of States in the Union when the original was cut, to 48. The stars retained their six points.

The seal shows the Capitol in 1830. The House and Senate wings were added in 1857 and 1859. The figure "Freedom" was added to the completed dome in 1863.

The seal, 2½ inches in diameter, is in the custody of the Clerk of the House. It is affixed to all writs, warrants, and subpoenas issued by order of the House, as well as to all certifications of the Speaker to the District Attorney of the District of Columbia as to the contumacy of witnesses appearing before the House committees. Colors have not been established officially for the House seal, but an artist's interpretation of it in colors is permitted.

NATIONAL ARCHIVES, page 30. Based on the Great Seal of the United States, the National Archives seal adds above the American eagle's head a scroll with the Latin proverb, *Littera Scripta Manet*, "The written word remains." The date 1934 is that of establishment of the organization.

Reproductions of records bearing the device in red with a red ribbon must be accepted as having the same validity as an original document, when offered in evidence.

The seal is 2 inches in diameter. The design is used on vehicles owned by Archives.

SUPREME COURT, page 30. The Supreme Court of the United States met for the first time on February 1, 1790, "at the Hall of the Exchange" in New York City. Failure to have a quorum caused it to adjourn to the following day, when the Court was organized. On February 3 the Court ordered that the "Seal of this Court shall be the Arms of the United States, engraved on a circular piece of Steel of the Size of a Dollar, with these words in the margin—'The Seal of the Supreme Court of the United States.'"

The present seal, in use since 1905, is 2¾ inches in diameter and is used by the Clerk of the Court to authenticate mandates, writs, and processes. The impression of the seal is made on a white wafer on certificates of admission to the Supreme Court Bar.

LIBRARY OF CONGRESS, page 30. The seal used by the Library for many years showed a book resting on a wreath and surmounted by an eagle. In 1941 the seal illustrated, a conventionalized American eagle based on the Great Seal of the United States, was designed by the sculptor Sidney Waugh. The seal, 2 inches in diameter, was cut late in 1945. A ¾-inch die is used to impress some rare books, music, and law materials. It is the only seal in the series which does not have a rim.

The new design is used on Library of Congress stationery. Thomas Mann, as consultant in German literature at the Library, used this stationery on which to write his story of Moses, "Thou Shalt Have No Other Gods Before Me," published in 1943 in the anthology, *Ten Commandments*. The author presented the original draft to the Manuscript Division of the Library.

SMITHSONIAN INSTITUTION, page 30. The seal of the Institution, authorized by the Board of Regents in 1893, was designed by Augustus St. Gaudens. The center circle shows an outline map of the world, signifying that the Institution's work is not confined to any one country but is world-wide in scope. The Latin words, *Per Orbem*, "Throughout the World," convey the same idea. Torches of knowledge flank the map. The motto, "For the Increase and Diffusion of Knowledge Among Men," is the term used in the will of James Smithson, an Englishman who bequeathed his fortune to the United States in 1826 for the establishment of a scientific institution. The date on the seal, 1846, is the year in which the organization was actually founded.

Executive officer of the Institution and official custodian of its seal is the Secretary, Dr. Alexander Wetmore, who is also Vice-Chairman of

the National Geographic Society's Research Committee and a member of its Board of Trustees.

Branches of the Smithsonian are the National Museum, the National Gallery of Art, the National Collection of Fine Arts (including the Freer Gallery of Art), the International Exchange Service, the Bureau of American Ethnology, the National Zoological Park, and the Astrophysical Observatory.

The seal, 2⅛ inches in diameter, is impressed on a bronze wafer on formal letters of introduction. The design appears on the Institution's publications.

Seals of the President and of the Government Departments

THE Chief Executive of the United States and all of the ten executive departments headed by Cabinet officers have seals. The President's seal is considered personal, but the others are departmental devices.

The Cabinet officer is the official custodian of his departmental seal, but for practical purposes a deputy is usually appointed to do the actual affixing (page 41).

Seals are used for all commissions and for legal documents issued by the Departments.

The President's seal is always impressed into dark-red sealing wax. Departmental seals are either direct impressions made into documents or impressions made on wafers or stickers gummed to the documents. Direct impressions are occasionally used by all.

Wafers or stickers are employed by all Departments. Some Departments use several colors. In some cases the color of the wafer identifies the type of document; in others the color has no significance.

Gold wafers are used by all except the State, Treasury, and War Departments; red wafers carry seals of the Commerce, Interior, Justice, Navy, and State Departments. Blue stickers are employed by the Navy and War Departments, green by Agriculture, and white by the Treasury.

Ribbons are used regularly by some Departments, but by others only when necessary to bind several sheets of paper together. Blue ribbons are used by Commerce, Interior, Labor, Post Office, Treasury, and War; red ribbons by Justice and State, and green by Agriculture. The Navy Department disavows the use of ribbons, employing red or blue "cotton tape" when necessary.

The designs of the seals appear in many ways; special uses are indicated under individual seals. Most Departments have their seals on departmental publications and on stationery for departmental heads. All the Secretaries have flags, and the design on the seal or some adaptation of it is shown on all the flags except those for the Secretaries of War and the Navy.

PRESIDENT, page 32. The design of the President's seal is the Presidential coat of arms, surrounded with the words, "Seal of the President of the United States." The arms were used for many years on a blue field as the personal flag of the Chief Executive; in each corner of the flag was a white star. Although the four stars were placed on the flag for artistic purposes, not as indications of rank (the President does not have "rank" in a military sense), it was felt that the creation by Congress in December, 1944, of 5-star generals and admirals rendered the President's flag inappropriate. Therefore, when a new Presidential flag was necessary, a new coat of arms, seal, and flag were simultaneously adopted by Executive order of President Truman on October 25, 1945.

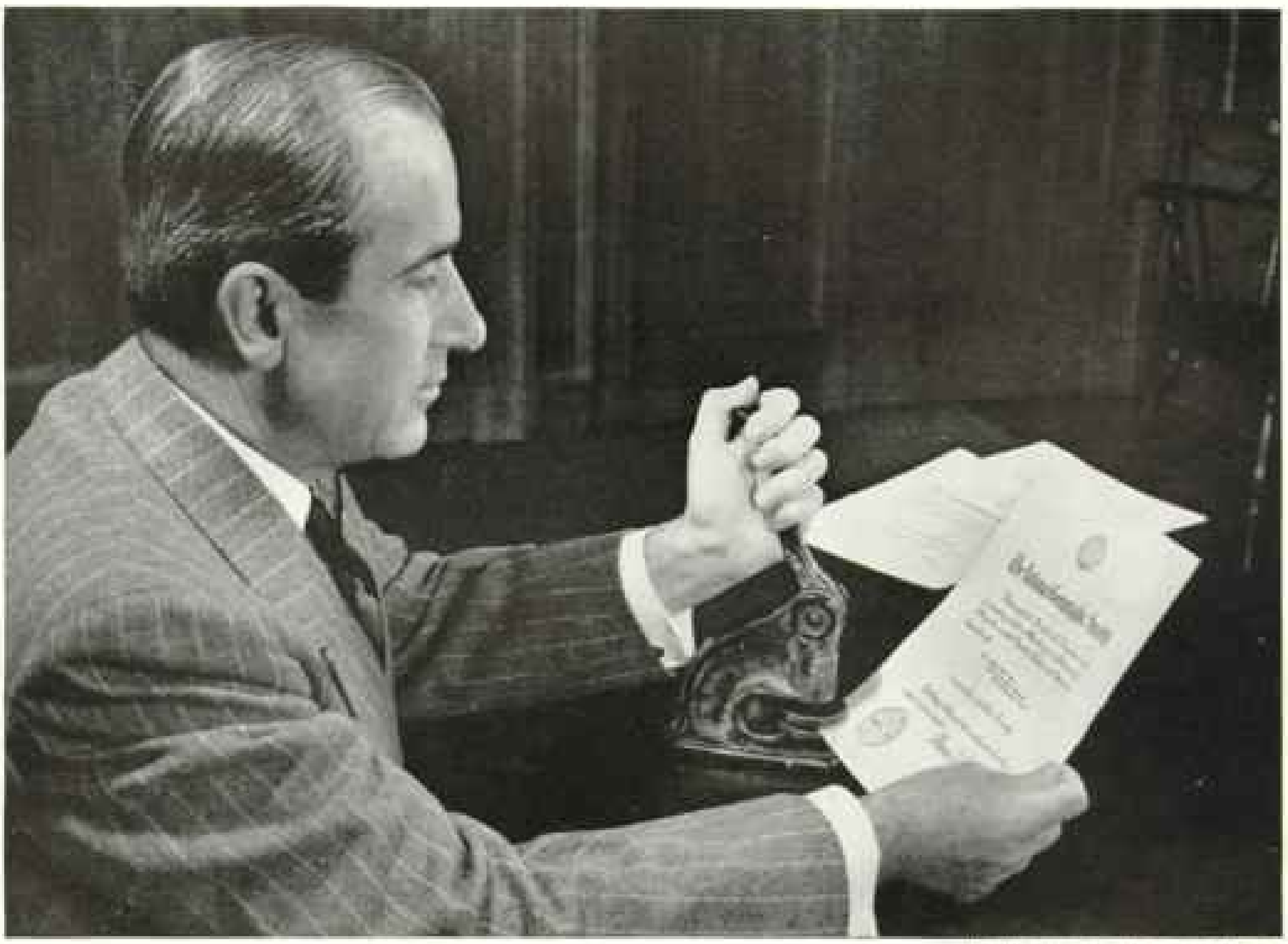
Diligent search by the President's staff had failed to reveal the date of adoption of the old seal or any information about the original matrix. There was no statutory authority for that seal.

President Franklin D. Roosevelt had requested Commodore Byron McCandless to make suggestions for a new flag, but the designs reached Washington after the President's death. President Truman, after consulting members of his staff, suggested that a circle of 48 stars surround the eagle. Commodore McCandless's painting with the stars in a circle was then submitted to the War and Navy Departments for comment. The final design was drawn under the supervision of Mr. A. E. Du Bois, Chief Heraldic Consultant of the Office of the Quartermaster General of the Army.

The new arms have met with general approval, especially since the eagle's head now faces to dexter, the bird's own right, the side of honor. President Truman also wanted the eagle in natural colors rather than in white, as it had appeared in the old design.

The President's seal is applied to close official envelopes bearing messages or other documents from the President to the Congress of the United States. When a seal is to be affixed to a document signed by the President, the Great Seal of the United States is affixed by the Secretary of State. The President's seal never serves for this purpose.

The seal is 1¾ inches in diameter, a quarter-inch larger than the old one. President Hayes was the first to place the old arms on Executive Mansion invitations. President Theodore Roosevelt had the seal in bronze set in the floor at the entrance to the White House. President Wilson put the arms on the President's flag and on the White House china. When the Executive Office was remodeled during the administration of President Franklin D. Roosevelt, the seal was set in the ceiling of the President's office. None of these will be changed, under present plans, but the new design will be used for future decorations (see page 10).



Staff Photographer Volkmar Wentzel

The National Geographic Society's Secretary Impressing The Society's 50-year-old Seal on the Certificate of a Newly Elected Member

Secretary Thomas W. McKnew signs and dates a certificate, then places the impression over the date. Each of The Society's members, who now number 1,450,000, receives this credential upon election to membership, which must be on nomination of someone already a member (page 34).

AGRICULTURE, page 32. In 1862 President Lincoln approved an act of Congress creating a Department of Agriculture whose chief officer was called "Commissioner of Agriculture." In 1889 President Cleveland approved an act making it an executive department and its Secretary a member of his Cabinet. These two dates are shown on the Department seal. A third date is implied, because the 44 stars represent the number of States in the Union in 1894 when Congress authorized a seal.

The design is the work of A. H. Baldwin, an artist in the employ of the Department agrostologist (specialist in grasses), with the advice of artists of Bailey, Banks, and Biddle, Philadelphia. The shield in the center carries a shock of corn and a left-handed plow; that is, one that turns the furrow to the left rather than to the right. This plow has caused much comment, but in 1894 "high-class farmers would use no other kind," according to one authority. Left-handed plows are still listed in the Sears Roebuck catalogue. The streamer carries the motto "Agriculture Is the Foundation of Manufacture and Commerce."

The seal is 2⅜ inches in diameter. The design in color is on the pediment over the center of the South Agriculture Building in Washington, D. C., and it appears on special exhibits prepared by the Department.

COMMERCE, page 32. When Congress passed the bill for creation of a Department of Commerce and Labor in 1903, provision was made for a seal to be approved by the President. President Theodore Roosevelt subsequently approved a design recommended by the chief designer of the New York jewelry firm of Tiffany & Company.

The seal depicted a shield with a full-rigged ship under sail at the top and an anvil and hammer below.

In 1913 a separate Department of Labor was created, and the Department of Commerce, with the approval of President Wilson, changed the anvil and hammer to a lighthouse.

The ship represents commerce, and the blue background indicates constancy. The lighthouse illustrated what was once an important function of the Department; the illumination is a symbol of duty in commercial enlightenment, and the gold denotes purity and sterling worth. The crest, on a wreath of gold and blue, is the American eagle and denotes the national scope of the Department.

Staff Photographer B. Anthony Stewart

A Tasseled Silver Skippet Protects the Seal of Queen Victoria

This box encases the wax seal attached to the British ratification of the Hay-Pauncefote Treaty, regarding a ship canal to connect the Atlantic and Pacific. Although Edward VII signed the ratification in 1902, the seal of Victoria was used. Around her portrait is a Latin inscription signifying "Victoria by the Grace of God Queen of Britain, Defender of the Faith, Empress of India." The top of the case, reflected in the mirror, bears the royal arms. The skippet, 6¼ inches in diameter, is in the National Archives in Washington, D. C.

The Bureau of Lighthouses was transferred from the Department of Commerce to the Coast Guard in 1939, and this made the lighthouse inappropriate for the seal. The Solicitor for the Department, however, stated that the transfer has no legal effect upon the continued use of the seal. Revision of the seal is under consideration.

Seal is 2½ inches in diameter. An impression of the seal was included in the material placed in the cornerstone of the Commerce Department Building, Washington, D. C., in 1929.

A colored decalcomania of the seal is placed on the passenger cars of the Secretary of Commerce and other top officials of the Department.

The design is on all publications of the Department, on the bronze doors at the main entrance to the Commerce Building, and on all charts issued by the Coast and Geodetic Survey. It also serves as the Commerce Department library bookplate.

INTERIOR, page 32. Although the Interior Department, created in 1849 as the Home Department, is almost a hundred years old, its seal has the newest basic design of any of the executive departments.

Ten days after the Department was created, Edward Stabler (page 37) was authorized to design a seal. He used an American eagle. This seal was replaced in 1913 by a new one with a similar design. In 1917 a seal with a buffalo was adopted. In 1923 the Department went back to an eagle. The present seal, the fifth, adopted in November, 1929, revived the buffalo. It was designed by Oscar Webb, an engraver in Washington, D. C.

The buffalo stands on a prairie with mountains and a rising sun in the background. The seal commemorates the conservation of the bison by the Department and symbolizes the coordination of conservation groups under one Federal department. It recalls the early settlement of the West, where much of the activity of the Department is confined. Seal is 1¾ inches in diameter.

JUSTICE, page 32. This Department was established in 1870, although the first Attorney General was appointed in 1789. A seal for the Justice Department was authorized by law in 1872, but the design varied from time to time, depending upon the ideas of the individual Attorneys General.

The design now used was made by Attorney General William D. Mitchell and Ugo Carusi, his executive assistant, in 1933 and approved by President Roosevelt in 1934.

The designers based the seal on one used by the Attorney General in 1869 as shown by Benson J. Lossing, the historian and wood engraver. The only major difference is that the legend is now "Department of Justice," whereas the earlier seal used "Attorney General of the United States." The drawing for the new seal was made by Arthur E. Du Bois of the War Department.

The meaning of the Latin inscription, *Qui Pro Domina Justitia Sequitur*, has been characterized as "a never-ending source of speculation." The most commonly accepted translations are: "Who prosecutes in behalf of our Lady Justice" and "He who seeks justice for the people."

Seal is 2⅜ inches in diameter. The design frequently serves for decorative purposes in the offices of the Department, on official automobiles, etc.

LABOR, page 32. The newest executive department, Labor, was established in 1913, and the departmental seal was adopted at that time. The seal bears a shield with symbols of labor: an anvil at the top; a pulley and lever and an inclined plane in the center; a plow at the bottom. The eagle crest is on a gold wreath.

Seal is 2¼ inches in diameter. Similar seals 1⅞ inches in diameter are used by bureaus within the Department; the legend in such cases is "Department of Labor, U.S.A." in the upper arc and the name of the bureau in the lower arc.

Staff Photographer B. Anthony Stewart

This Press Has Been Affixing the Great Seal for 43 Years

Official documents must be signed by the President and countersigned by the Secretary of State before the United States seal can be affixed. As deputy for the Secretary, Mrs. Clydia Mae Richardson is inserting a white wafer while her assistant prepares to impress the seal by rotating the double-knobbed arm. Above the special cabinet in which the press is kept appears a picture of the coat of arms, identical in design with the seal (pages 30 and 35).

NAVY, page 32. After the Revolutionary War there was no real United States Navy for a number of years. When the country's commerce began to expand, when war with France appeared imminent, and when American ships had trouble with the Barbary pirates, the need for a navy became apparent and a Navy Department was established in 1798.

Benjamin Stoddert of Maryland was the first Secretary, and it is suggested that he may have been the designer of the seal, similar to the one now in use. Robert Scott cut the die.

The present design shows a ship in full sail, an anchor, and an American eagle.

The seal, 2¼ inches in diameter, is impressed on commissions for naval officers and on all official documents. The office of the Secretary of the Navy has a painting of the seal.

Some of the doorknobs of the State Department still carry the Navy seal, a reminder that the building once housed the State, War, and Navy Departments.

POST OFFICE, page 32. The design of the Post Office Department seal antedates the establishment of the country. In 1776 the Continental

Congress appointed Benjamin Franklin as Postmaster General for a year, and, according to historian Benson J. Lossing, Franklin issued a circular letter "on which there was a rude woodcut of a postrider on horseback, with saddlebags behind for carrying mail matter."

In 1789 the Post Office was placed under the National Government, but the Postmaster General did not have a place in the Cabinet until 1829. Lossing believed that Franklin's postrider continued in use from 1776 until the time he wrote (1869), but there was apparently a period in which a different design was used.

The first statutory reference to a Post Office Department seal, under date of March 5, 1825, merely specified that the Postmaster General should procure a seal to authenticate postmasters' commissions and other papers issued by the Department. Departmental records and files were destroyed by fire in 1836, but old commissions (1824, 1834, and 1835) show a winged Mercury, surrounded by clouds, flying over the world marked "Americas," and the whole encircled by the words "Seal of the General Post Office Department."

The present seal was authorized in 1837 by Postmaster General Amos Kendall to be a "post horse in speed with mail bags and rider." Seal is 2 3/10 inches in diameter.

STATE, page 32. The Department of Foreign Affairs was created by Congress on July 27, 1789. An act of Congress of the following September 15 changed the name to "Department of State" and authorized the making and use of a seal. Earliest-known employment of this seal was on May 28, 1790.

The design of the first die was patterned after that of the Great Seal of the United States (page 30), but with certain changes. Later dies cut and used in the 19th century, although they differed more or less from the first die and also from one another, likewise bore modified versions of the Great Seal design.

The dies in present use reproduce the Great Seal design almost exactly, though in smaller size, and they have around the rim the words "Department of State" and "United States of America."

A seal of 2¼-inch diameter is used in certifying copies of documents for miscellaneous purposes; a seal of 1¼-inch diameter is impressed on all passports issued at the Department of State.

TREASURY, page 32. The seal of the Treasury Department is older than the United States Government. The Continental Congress in 1778 appointed a committee of finance, or board of treasury, and John Witherspoon, Gouverneur Morris, and Richard Henry Lee were authorized to design a Treasury seal. The earliest example of the seal is found on papers dated 1782. When the United States Government was established in 1789, the Continental seal was continued in use.

In 1849 the Treasury needed to replace its badly worn seal and ordered Edward Stabler (page 37) to make a facsimile. Apparently Mr. Stabler carried out his orders with reservations, for his seal showed differences from the original; but they are so minute that a casual observer would not notice them.

The dots on the shield are the heraldic way of depicting gold. The 13 stars on the bend on the shield are for the Thirteen Colonies. The scales represent those held by the blind goddess Justice. The key is commonly used in heraldry to denote offices of state. The legend *Thesaur. Amer. Septent. Sigil.* is an abbreviation of the Latin *Thesauri Americae Septentrionalis Sigillum*, "The Seal of the Treasury of North America." Seal is 1 7/8 inches in diameter.

The Treasury seal should be the most familiar in this series, for it is on all United States paper money: in green on Federal Reserve notes; in red on United States notes; in blue on silver certificates; in brown on national currency notes. Brown seals are also shown on special currency for Hawaii.

Special currency issued during the late war for North African military purposes carried the seal in yellow. The illustration in blue is for the silver certificate. War and Victory bonds also show the seal.

WAR, page 32. The Continental Congress in 1776 appointed a committee to be called the Board of War and Ordnance. Changes were subsequently made, and in 1777 a new board was appointed.

Soon after its formation the 1777 board adopted a seal. This contained a group of military trophies (coat of mail, gauntlet, flags, and weapons), with a Phrygian cap between a spear and musket. Over the device was a serpent, a favorite emblem with the colonists. Beneath the trophies was the date MDCCLXXVIII and around the circumference the words "Board of War and Ordnance, United States of America."

A glance at the present seal shows only two major differences from the first seal: a streamer inside the loop of the snake carries the words "This We'll Defend," and the words around the rim are "United States of America War Office."

The original seal was lost in a fire in 1800, and records of its color and composition were destroyed in 1814 when the British burned the White House.

The present seal was made in 1906. The flag at the left is apparently intended for a regimental flag; it carries no design. Both the impression and departmental pictures of the seal show the stars on the United States flag in rows, not in a circle.

The seal, 2 inches in diameter, is impressed in a blue sticker with a blue ribbon for commissions for "top generals." Commissions for other officers merely carry the impression.

Colors have not been officially prescribed for this seal. Colors shown in The Society's painting, however, have been used for special purposes by the War Department.

High Country of Colorado

By Alfred M. Bailey

Director, Colorado Museum of Natural History

With Illustrations from Photographs by the Author and Robert J. Niedrach

JAGGED mountain crests, some fifty of them rising above 14,000 feet; treeless savannas where the winds of winter and summer carry the chill of arctic wastes; dense forests of spruce and pine giving way to rolling sage—this is the High Country of Colorado.

Mineral wealth, timber, and grazing lands make the area a rich asset to the Nation in war or peace. But now that man has laid down his weapons and resumed a peaceful way of life, this broken country of the West, with its picturesque villages, will be visited by thousands bent on getting close to Nature.

The vast, thinly populated region calls all who care for the out-of-doors. It is a land of contrast—sunshine and clouds, forests and open glades, fields of snow and wild flowers.

While getting material to show the wild life of the alpine, timberline, coniferous forest, and sage areas in large panoramic habitat groups at the Colorado Museum of Natural History, in Denver, we found that each elevation had its interesting forms of animals and plants and that a lifetime in the High Country is not long enough to solve its mysteries.

The sage country may be drear and monotonous to those in a hurry, but to me it never grows tiresome. Year after year, in early spring, we have pitched our tents in the fragrant sage near some little trout stream and have taken our time in an endeavor to learn something of the life histories of the creatures near by.

Courtship Secrets of the Sage Grouse

Prairie dogs and white-tailed jack rabbits are common, but the chief citizen, so far as we are concerned, is the sage grouse, finest of all our western game birds. Only in recent years have we solved some of its remarkable courtship secrets.

This large grouse, the males averaging about six pounds, presents a fine example of protective coloration. Its feather pattern is such a perfect match for the glistening highlights of the sage leaves that the motionless bird virtually melts into its surroundings.

In spring, however, the males seek not concealment but display (p. 44). Their white neck pouches are inflated to enormous size, and the birds gather in large bands, often a hundred or more in a group, to stage elaborate performances for the attraction of mates.

Their assembling places in parklike areas in the sage are historic dancing grounds, for year after year the birds return to identical spots to carry on their romances. Why the grouse should choose the same places, when there are thousands of sites apparently as suitable, is difficult to understand (pp. 46, 47).

We have learned of several such courtship grounds, and last spring we visited a favorite one to make a motion-picture record. Snow-capped peaks of the Elkhead Mountains, northeast of Craig, looked down upon the valley, through which ran a stream bordered with thick-leaved mertensia and snow lilies (Plate XVI). It was the second week in May and well toward the end of the mating season.

As we approached the courtship arena late one evening, we saw about fifty white-breasted males gathered for a twilight performance, but we were forced to flush them in order to erect our photographic blind.

Dawn on the Dancing Ground

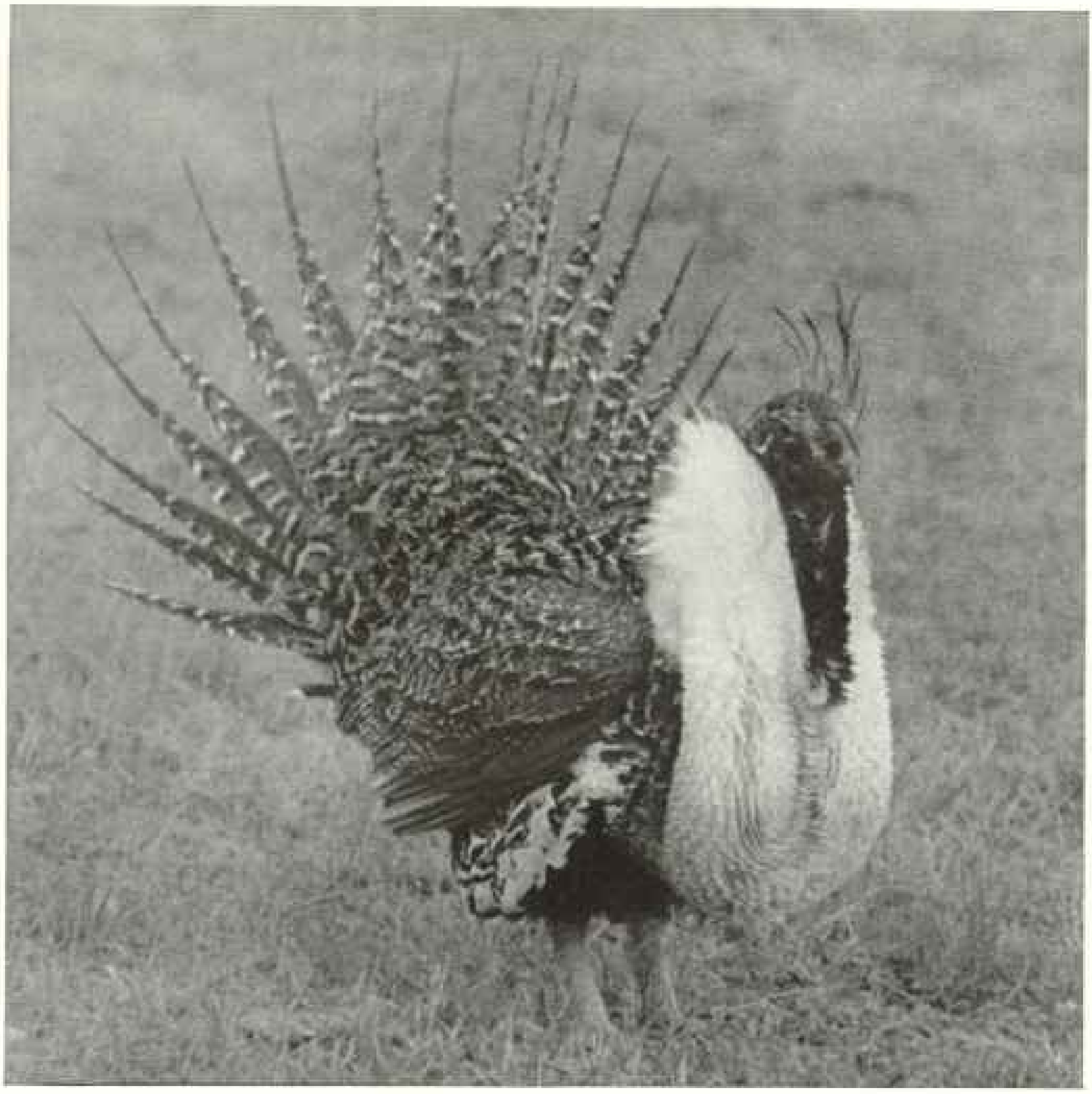
Next morning we were out of our sleeping bags by 2:30. A nearly full moon rode high as we neared our blind, and the guttural notes of grouse could be heard as occasional birds flushed and whirred away into the blackness.

It was chilly while we crouched for several hours in our hiding place, but finally the sun climbed over the eastern hills and bathed the dancing ground with a golden glow. To our delight we had more than a hundred grouse about the blind, each one performing.

This peculiar arrangement, whereby the males assemble in groups and the hens choose their mates, seems to be a family trait, for prairie chickens and sharptailed grouse also dance on places to which they return year after year.

Each sage grouse seemed to strut on a territory of his own. It was customary for two neighbors to get together, crouching on the property line as if daring the rival to fight. Sometimes they jumped at each other, rapping viciously with their wings in hot, brief combat.

Appearance of a female on the grounds was the signal for real activity. Then the males inflated their great neck pouches and erected their fan-shaped tails. With black heads drawn down within the folds of the neck skin so far that the eyes were almost concealed,



Chest Inflated and Tail Spread Wide, a Sage Grouse Struts to Lure a Mate

Each spring sees hundreds of cocks assembled in parklike areas for courtship activities (pages 46, 47). Males try to impress the hens waiting near by. They accompany their performance with throaty grunts and the popping of two rubbery sacs in the center of their neck pouches. Each bird has his own area. Occasionally a male encroaches on another's territory, and the two fight like gamecocks.

they threw their pouches upward, bringing the stiff bristlelike feathers against the drooping wings with a swishing noise which could be heard fifty feet away.

In the center of the pouch were two rubberlike sacs which were inflated and deflated with a popping sound, the little balloons appearing and disappearing in a fraction of a second.

Viewing the strange performance from our photographic blind was like watching a three-ring circus. When a female walked nonchalantly across the strutting expanse, feeding slowly as she went, all the white-breasted fellows in the vicinity faced the demurely dressed lady and attempted to attract her. Standing on their tiptoes, they threw their neck pouches upward and emitted their guttural, piglike grunts.

A Golden Eagle Halts the Romance

One morning, after a late snowstorm had drifted the sage country, we awaited the coming of the sun. The moon, nearly full, was dropping in the west, and the males before our hiding place were going through their courtship performance on the moonlit expanse like so many black ghosts on a silver screen.

When the sun finally threw a brilliant light

across the flats, we had grouse within a few feet of our blind. They were particularly active and noisy, their grunts, popping of rubberlike sacs, and swishing of stiff neck feathers against wings being especially loud.

Just as we were ready to start photographing, a sudden silence fell; then every bird on the strutting area flushed with startled cries and curved off to a distant hillside. Looking quickly from a slit in the blind, we saw a golden eagle flying majestically overhead.

We feared that the grouse would not come back, but finally a few of them returned. One old male walked a hundred yards from the line of sage and stopped on a strip bare of snow near the front of the blind. Then a hen made her entrance, and the pompous cock-of-the-sage performed while we recorded the unusual display in slow-motion color film (page 47).

At this same time of year, the golden eagles range for food far from their aeries in high yellow pines or along precipitous canyon walls. In past years we have inspected many nesting sites and have remained concealed in blinds for hours, hoping to film the old ones returning to their downy white young.

Unfortunately for the photographer, the eagles have an excellent sense of hearing. No matter how well concealed we have been, almost invariably the old ones have heard the whirring of the camera or the click of the shutter and have refused to cooperate. Only after many hours of work have we succeeded in getting a few pictures (pages 66 and 67).*

Other birds of prey which nest early in the High Country are the great horned owls and goshawks. The former choose old magpie sites in yellow pines, and often we have found large young in snow-covered trees.†

The goshawks usually choose the lodgepole-pine country—a little higher than the yellow-pine belt—for their summer range, and to find the eggs and young is like looking for a needle in a haystack. The adults are vociferous in their disapproval when a cameraman attempts to pry into their family secrets, and the nearly full-grown young hiss vehemently when posing for portraits.

"Catbird Trying to Commit Suicide"

The sage country is about the dividing line in the ranges of the round-tailed and bushy-tailed pack rats, the precocious rodents that appear willing to swap useless objects for things of value. The bushtails are found in the high mountains, while the former seek lower elevations. One pack rat tramping around the ceiling of a cabin sounds like an army on the move.

When the warm winds of June melt the snow on the hillsides, the moist valleys of the parks are usually massed with wild flowers.‡ Shooting stars, the beautiful but poorly named louseworts (also called wood betony or pedicularis), arnica, and wallflower make mosaics beyond description (Plates XIII and XVI). Even the great cumulus clouds are massed over distant snowclad peaks as if to invite the photographer.

The slate-gray water ouzels, or dippers, build their domelike nests close to the rushing mountain streams and dive headlong into the swift waters. One time when we were in the High Country a bewildered eastern boy rushed back to our camp and breathlessly announced he had seen a "bob-tailed catbird trying to commit suicide."

At Spring's Touch, Life Quickens

As spring pushes into the higher country, the snow disappears from among the aspens and spruces. The columbine thrusts its green fingers from the rich wood soil, and soon buds open and lavender blossoms are waving in the wind. I like to roam the High Country at this time.

The forest folk are on the move. Deer and elk start migration to higher ranges, and birds which have been waiting in the prairie below come trooping to their summer homes. The male Natalie's and red-breasted sapsuckers, flickers, and hairy woodpeckers make the deep forests ring with their constant hammering, while their mates are busy depositing white eggs in dark holes dug in pines and aspens.

Chipmunks and ground squirrels come from their places of hibernation and, where humans are available, soon become expert panhandlers. The wary tuft-eared squirrel and the porcupine are active in early morning, but usually remain in concealment throughout the bright hours of the day.

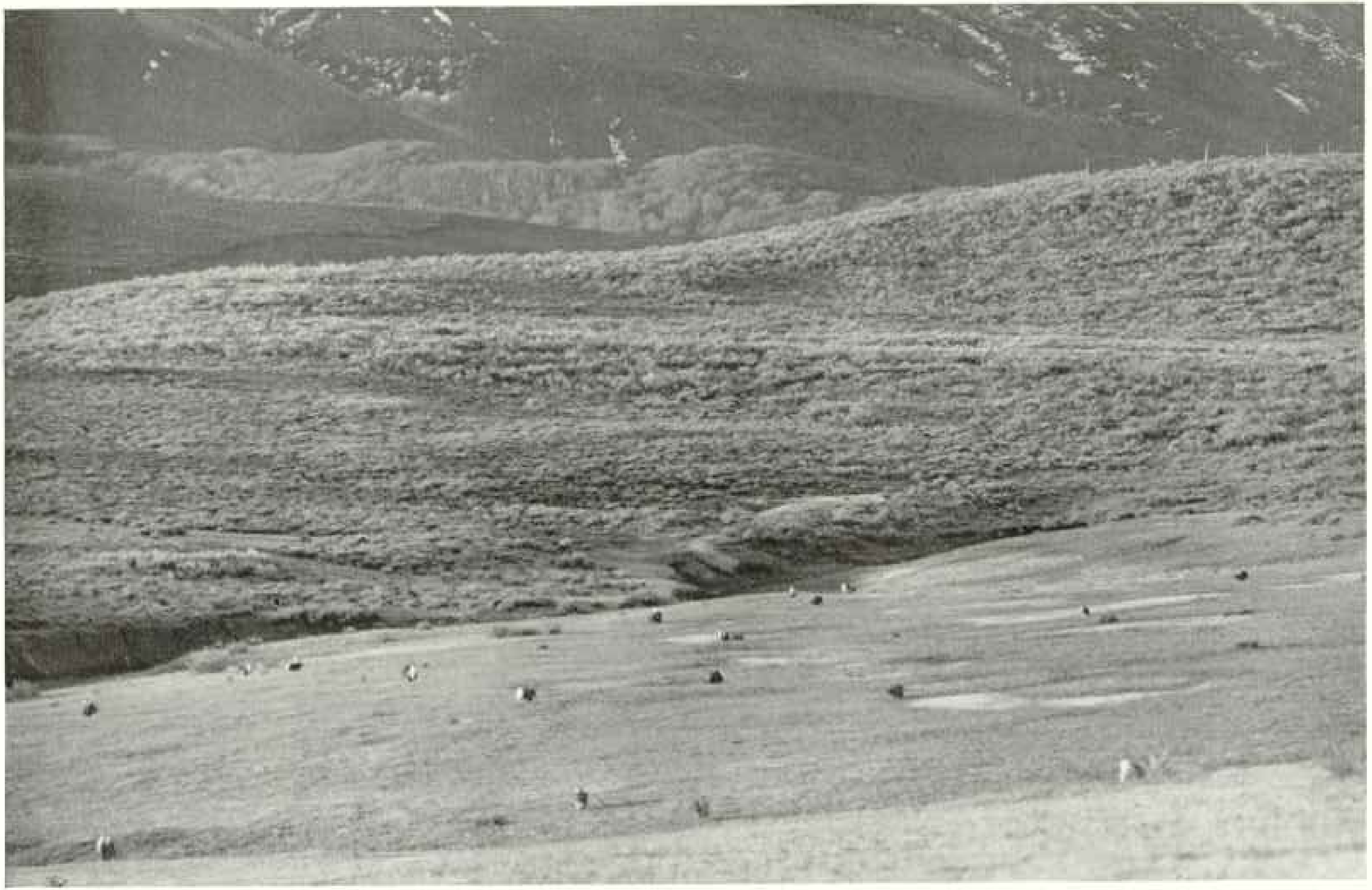
Holes in trees have always intrigued me, for a casual thump on the trunk of a big pine often produces unexpected results. Once, early in spring before many hole-nesting birds had occupied their nesting sites, we saw an opening high overhead. As a matter of course we gave a lusty whack with a stick and almost immediately were rewarded with the appearance of a wide-eyed saw-whet owl, who certainly was not more surprised than we.

Ninety-nine holes out of a hundred are on

* See "In Quest of the Golden Eagle," by John and Frank Craighead, NATIONAL GEOGRAPHIC MAGAZINE, May, 1940.

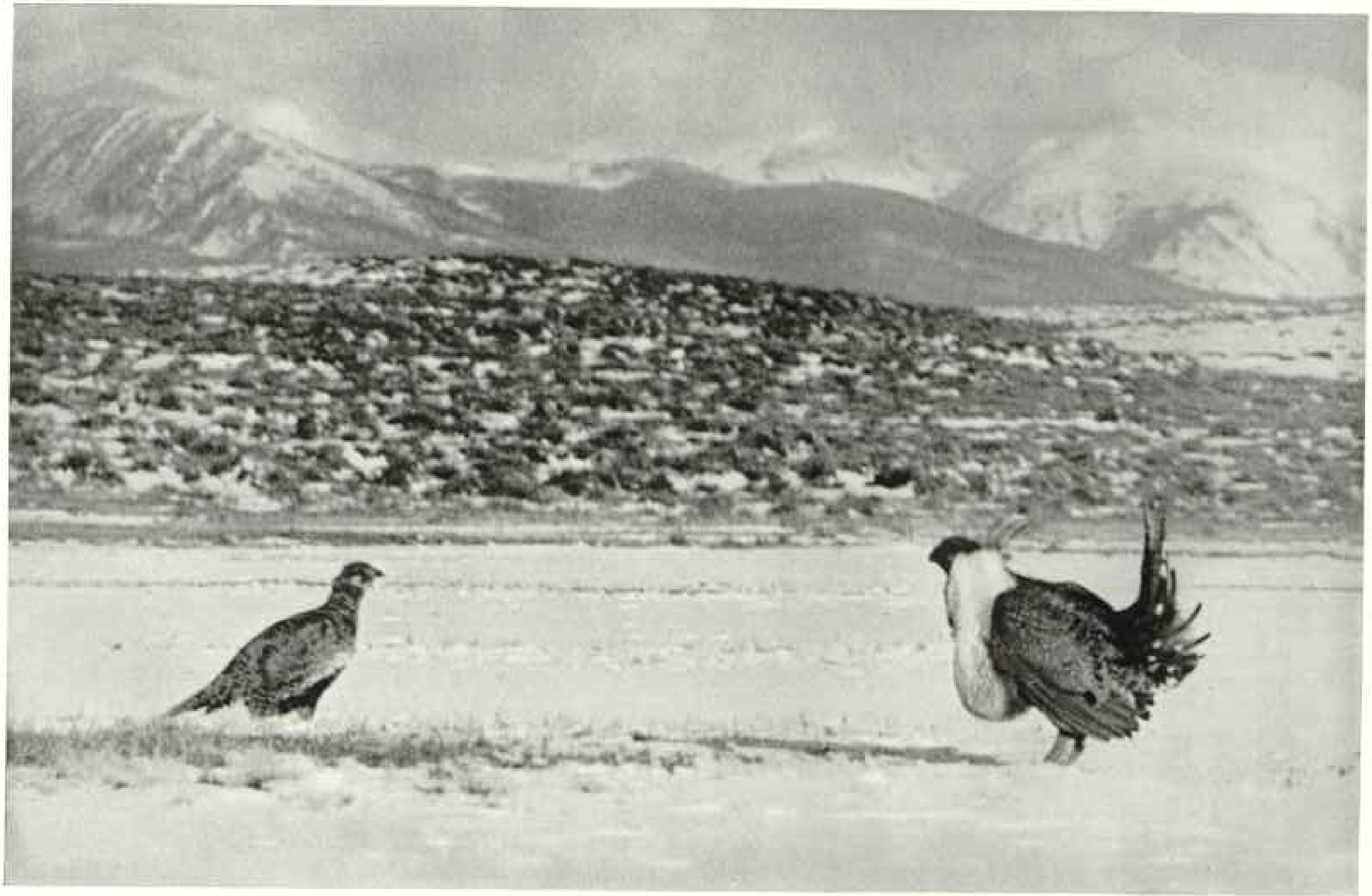
† See "Photoflashing Western Owls," by Lewis W. Walker, NATIONAL GEOGRAPHIC MAGAZINE, April, 1945.

‡ See "Wild Flowers of the West," by Edith S. Clements, NATIONAL GEOGRAPHIC MAGAZINE, May, 1927.



Not Grazing Cattle, but Lovelorn Grouse Strutting in Their Arena of Sun-bathed Sage

Year after year, these cocks of the western plains choose the same mating areas, although there may be thousands of similar spots in the near vicinity. Assembling before daybreak, a hundred or more males will fight among themselves and go through their strange dance to attract hens.



Strutting Male and Coy Female Grouse Perform Their Courtship Dance on a Snow-covered Stage

Just before Dr. Bailey snapped this photograph from his blind, a large band of cocks had been performing. Suddenly all took wing as a golden eagle sailed overhead (page 45). Later, the male at right stalked from the sage and walked across the clearing to be joined by his ladylove.

the east or south sides of trees, but this had a northern exposure where photographic light never filtered in. Fortunately, however, our bird did not mind a mirror flashed in its face, and our cameras caught him (Plate VIII).

An inspection of the nesting cavity showed that deer mice were the main source of food. It also revealed four astonishingly nonphotogenic young that only a saw-whet owl could love. When we placed them on a log, they closed their eyes against the strong light and leaned against each other for warmth.

It is surprising how quickly the quiet forests become animated. The trees will be bare, and sheltered slopes will be massed with snow. Then will come a few days of warm rain. Almost overnight the white expanses disappear, buds break, and the fresh green of opening leaves welcomes the feathered summer residents.

Aspen forests are the favored habitats of many of the High Country folk, and with the aid of photographic blinds we pried into their home life. We watched mountain bluebirds make repeated trips to their nesting holes, carrying luscious-looking worms (Plate VII). Red-breasted and Natalie's sapsuckers brought beakfuls of ants to their wheezy young, while warbling vireos swayed on their hanging nests and paid us in song for the hours we remained in concealment.

Black Widow Spider on Vireo's Menu

Their near relatives, the plumbeous vireos, often revealed their nesting sites, for the males have the habit of singing as they incubate the beautiful spotted eggs. These inconspicuously colored birds take rather kindly to photographers, and one brooding vireo was so tame that it took insects from our fingers and passed them on to its young.

The bird even fed upon a black widow spider, and one photograph showed the spider's silken thread attached to its beak. When the sun was directly upon the nest, the old one would stand with wings outspread to shelter the young.

On the edge of the moist ravines grow big yellow pines, and a pair of Natalie's sapsuckers had excavated their home in the live trunk of one old monarch.

Their habits seemed identical with those of red-breasted sapsuckers and hairy woodpeckers, which we photographed in aspens; the adults of all three species kept busy carrying ants and other insects to their strident young. They would come to their home and alight above the nesting entrance, backing down with abrupt jumps as they supported themselves with stiff tails pressing against the rough bark.

It is always a surprise to the stranger in the West to find that robins are the most common of mountain birds. These hardy fellows are found to timberline and, since they raise two broods, are the most conspicuous birds in August when most species have concluded their housekeeping. Adaptable, the robins nest in thick spruces close to the ground or in the tops of the highest trees.

A Jewel on Whirring Wings

The jewel bird of the aspen and yellow-pine country is the broad-tailed hummingbird. To see one of these winged creatures with its flashing gorget as it poises on a tip of willow along some rushing mountain stream, with snow-clad peaks rising high above, is one of the rich delights of roaming the high places.

Fortunate indeed is the discoverer of one of the tiny lichen-covered nests of this beautiful little bird (Color Plate V).

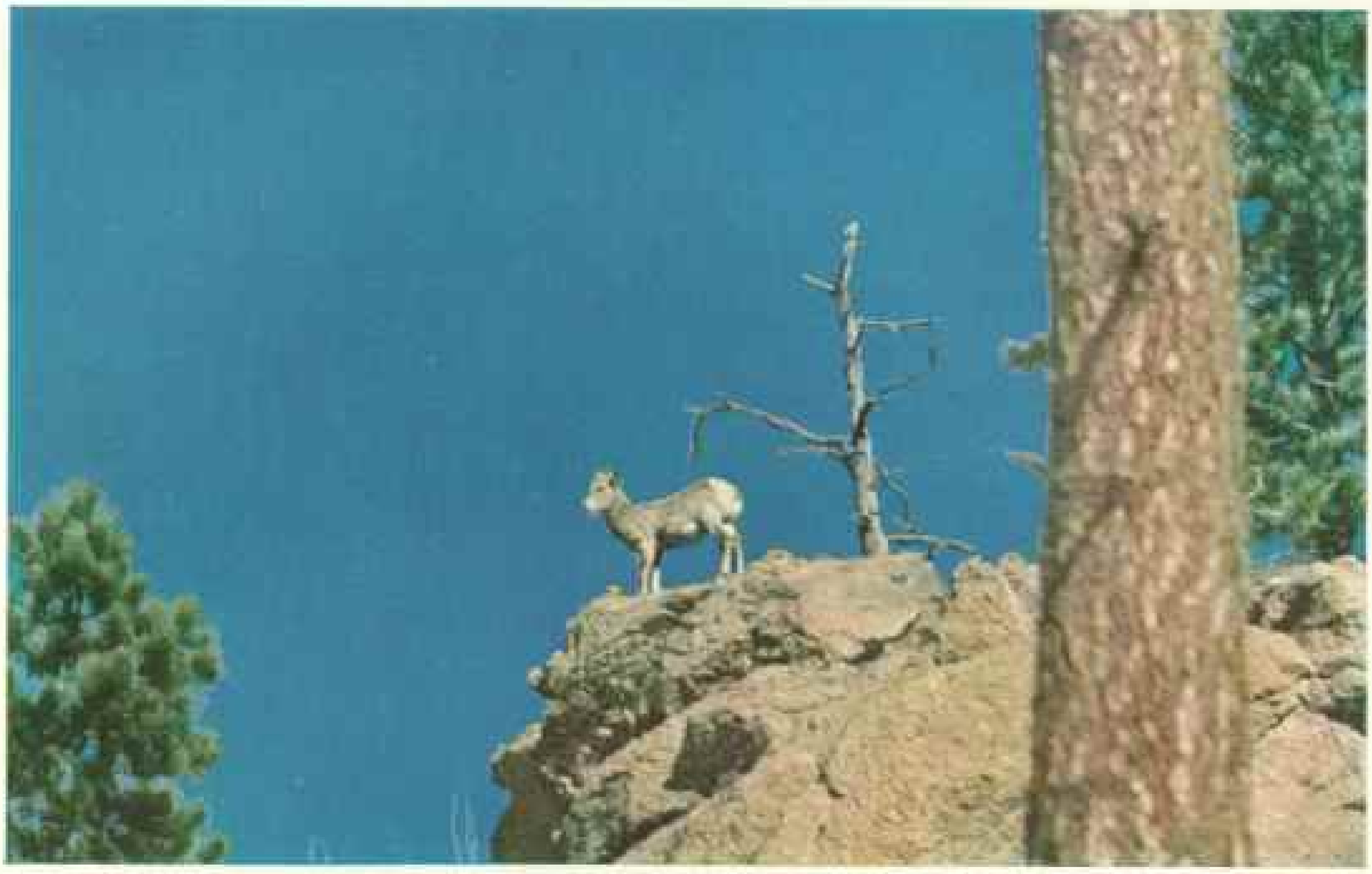
We have learned by experience that the male will not disclose the hiding place. Although we have found many nests, we have never seen a male near by. The females are usually tame and will hover over their young on fast-moving wings, feeding them by regurgitation even though an interested spectator is only a few feet away.

Often broad-tailed hummingbird nests are high overhead on some swaying limb, and almost invariably they are in dark places where photography is difficult. Recently, however, we located the ideal nest. The fluffy cup with two tiny eggs was within a foot of the ground in a young spruce; it was in the dark, but since the female did not object to light reflected by a mirror, we took pictures to our hearts' content.

On our first visit she alighted on the nest, settled snugly upon the eggs, and calmly shifted about until facing away from the glare. On our next, the eggs were hatched, and two black little mites scarcely larger than blueflies nestled in the center of the cup.

In the following two weeks we made repeated trips to record the progress of the youngsters. When last seen, the two overflowed the nest, and the little parent came every half hour to thrust her pointed beak down the throats of the eager young and pump food to them. Minute insects seemed to make up the bill of fare.

There was a constant change of plant life. One week the forest floor was covered with columbine; a few days later the blossoms were gone and the seed was maturing. Wild rose, geranium, and parsley grew rank in the moist valleys, and as the season progressed the wood lilies came into bloom (Plate XVI).



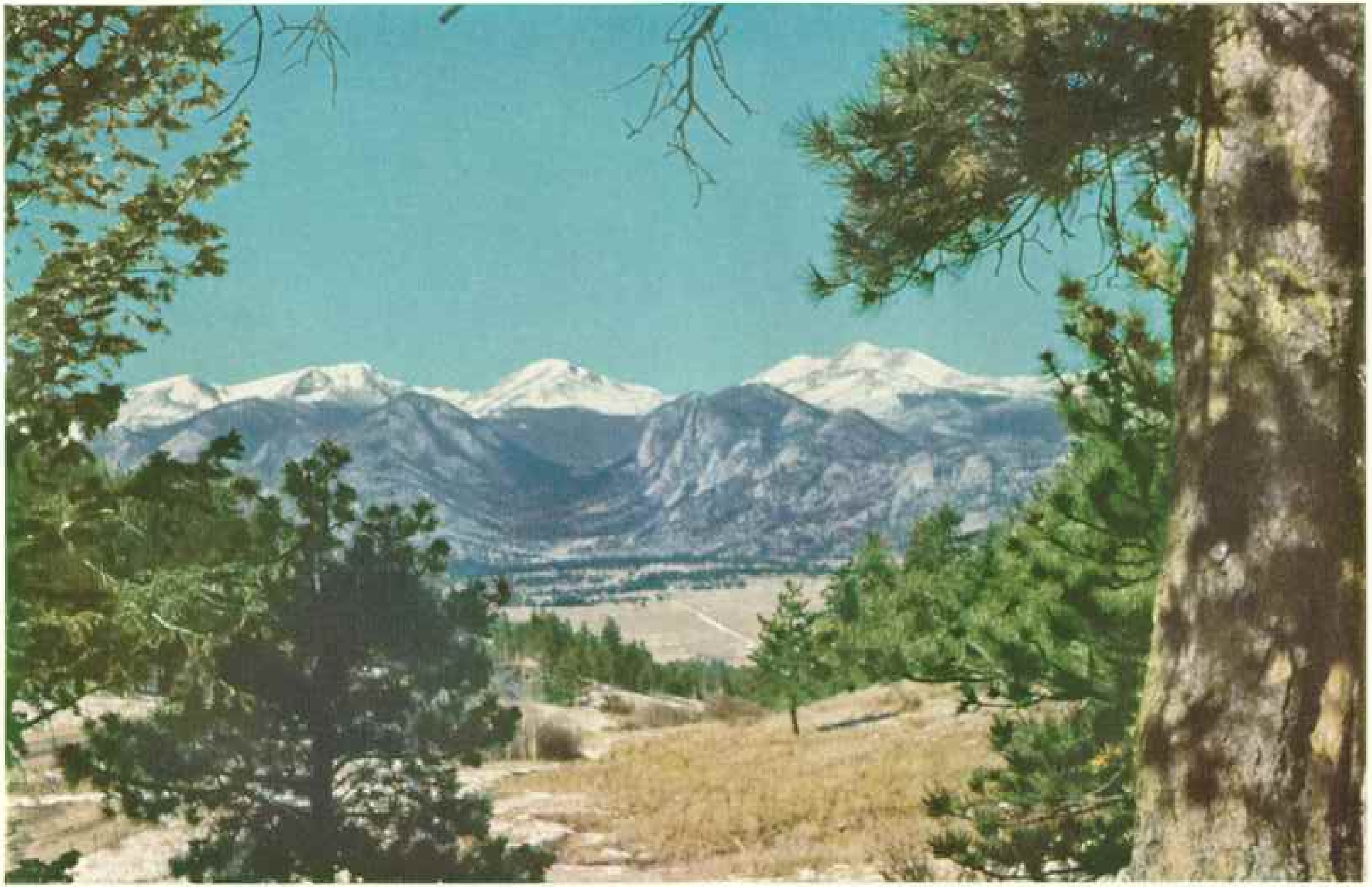
Rocky Mountain Sheep Find Refuge among Colorado's Granite Crags

Here a lamb poises against blue sky in the Tarryall Mountains, home of several hundred bighorns. In the fall they descend to the comparatively warm lower slopes in search of winter food.

 Kodachromes by Alfred M. Bailey and Robert J. Niedrach

Weathered Red Boulders Offer Sure Footing to Three Wary Bighorn Ewes

In echelon formation, they stand ready to flee at the slightest alarm. Once greatly reduced by poaching and disease, the Tarryall bighorns have been increasing. To prevent crowding, Colorado moved many to new ranges.



Reflections by Alfred M. Bailey

Lordly Peaks, Treeless Savannas, Rolling Sage Hills, Forests of Spruce and Pine—This Is the Colorado High Country

Rocky Mountain National Park, straddling the Continental Divide, is workshop and playground alike for the naturalist, the photographer, the hiker, the sportsman, and the vacationist with no special hobby. Amid scenic grandeur like that above, the author gathered material on High Country flora and fauna.

Kodachrome by Alfred M. Bailey

With Fluttering Wings, Mother Ptarmigan Attempts to Decoy Human Intruders from Her Hidden Brood

High-ranging Colorado birds, the white-tailed ptarmigan are well equipped for mountain life. Feathered feet support them on snow, and in white winter dress they are almost invisible when motionless. In summer their dark plumage blends with lichen-covered boulders.

A Pileolated Warbler's Anxious Eye Gleams over Naked Young

True inhabitants of the Canadian zone at 10,000 feet are these hardy birds. They range northward beyond the Arctic Circle. Their inconspicuous nests are tucked away on the ground or in low shrubbery.

Kodachromes by Alfred M. Bailey and Robert J. Niedrach

Feeding Young Pine Grosbeaks Is a Job for Both Parents

Here three mouths yawn hungrily. Adults gorge themselves on insects and marigold seed, then feed the nestlings by regurgitation. Pine grosbeaks nest in high conifers at about 11,000 feet.

Baby White-crowned Sparrows Demand Constant Attention

Both parents must make repeated visits with insects to satisfy their fast-growing young. Their nests are found in willow bogs at 10,000-foot altitude and among sprawling shrubs above timberline.

 Kodachromes by Alfred M. Bailey and Robert J. Niedrach

Winged Jewel of the Highlands: the Broad-tailed Hummingbird

Here a mother, after stuffing herself with small insects, jabs swiftly with needlelike bill to feed her young. These hummers often nest on the plains, but they prefer the higher forests.

Kodachrome by Alfred M. Rouse and Robert J. Niedrach

Gray-headed Juncos Leave Their High-altitude Homes Only When Snows Make Food Scarce

Their nests usually are well hidden near the base of a wiry mountain plant, such as the cinquefoil above. When seeking food at lower levels in winter, large numbers of these birds appear about cabins and wilderness camps. Several other junco varieties are found in the Colorado High Country in winter.

Housing Is No Problem to a Mountain Bluebird

This one perches outside the quarters it has established in an old aspen hole. Sometimes nests formerly used by woodpeckers are taken over. The mountain bluebird is slightly larger and more brightly hued than its eastern cousin. It is a common species in the High Country in summer.

Kodachromes by Alfred M. Butler and Robert J. Niedrach

A Red-shafted Flicker Brings Home the Groceries

No aspen grove would be complete without a family of these noisy birds. Members of the woodpecker family, they occasionally drill through weather-boarding to nest in barns or deserted buildings. If the entrance hole of a bird box is too small, they enlarge it to suit their needs.

Kodachrome by Alfred M. Bailey and Robert J. Niedrach

Downy Young Cooper's Hawks Will Grow Up to Be Killers

Preying upon other birds, as well as small mammals and reptiles, chicken hawks flit through the forest like deadly shadows. They even raid poultry yards in the face of irate owners' attempts to frighten them away.

Kodachrome by Alfred M. Bailey and F. G. Brandenburg

"Who's That Knocking at My Door?"

When the author whacked a pine tree with a stick, this startled saw-whet owl popped its head from the nesting cavity. Also in the hole were found four homely nestlings "that only a saw-whet owl could love."

Rich Rewards Await the High-Country Angler

Cold waters fed by melting snows are preferred by rainbow and native trout such as these. Perch, sunfish, and other less hardy species are found at lower elevations.

Reproduction by Alfred M. Bailey

Soon They'll Sizzle in a Frying Pan

Worthy of any fisherman's skill and patience are these trout, taken with dry flies from a mountain stream. State and Federal hatcheries annually release many millions of fingerlings in Colorado's waters.

Kodachrome by Alfred M. Bailey

The Sky's the Limit for Campers Exploring the High Country

Here a party has pitched tents and tethered pack animals among the alpine firs of the Gore Range, west of Denver, 11,000 feet above the sea. In the High Country are 12 national forests. Some 50 peaks rise above 14,000 feet; hundreds of others exceed 10,000 feet. Climbing is a year-round sport.

Kodachrome by Alfred M. Bailey

Crystal-clear Streams, Fed by Mountain Snows, Challenge the Fly-caster

Jim Haywood, Colorado angler, tries his luck in a tributary of the Rio Grande. Cold mountain waters like these are stocked with hardy varieties of native and imported trout. Best catches are made in streams accessible only by hiking or on horseback.

Kodachrome by Alfred M. Bailey

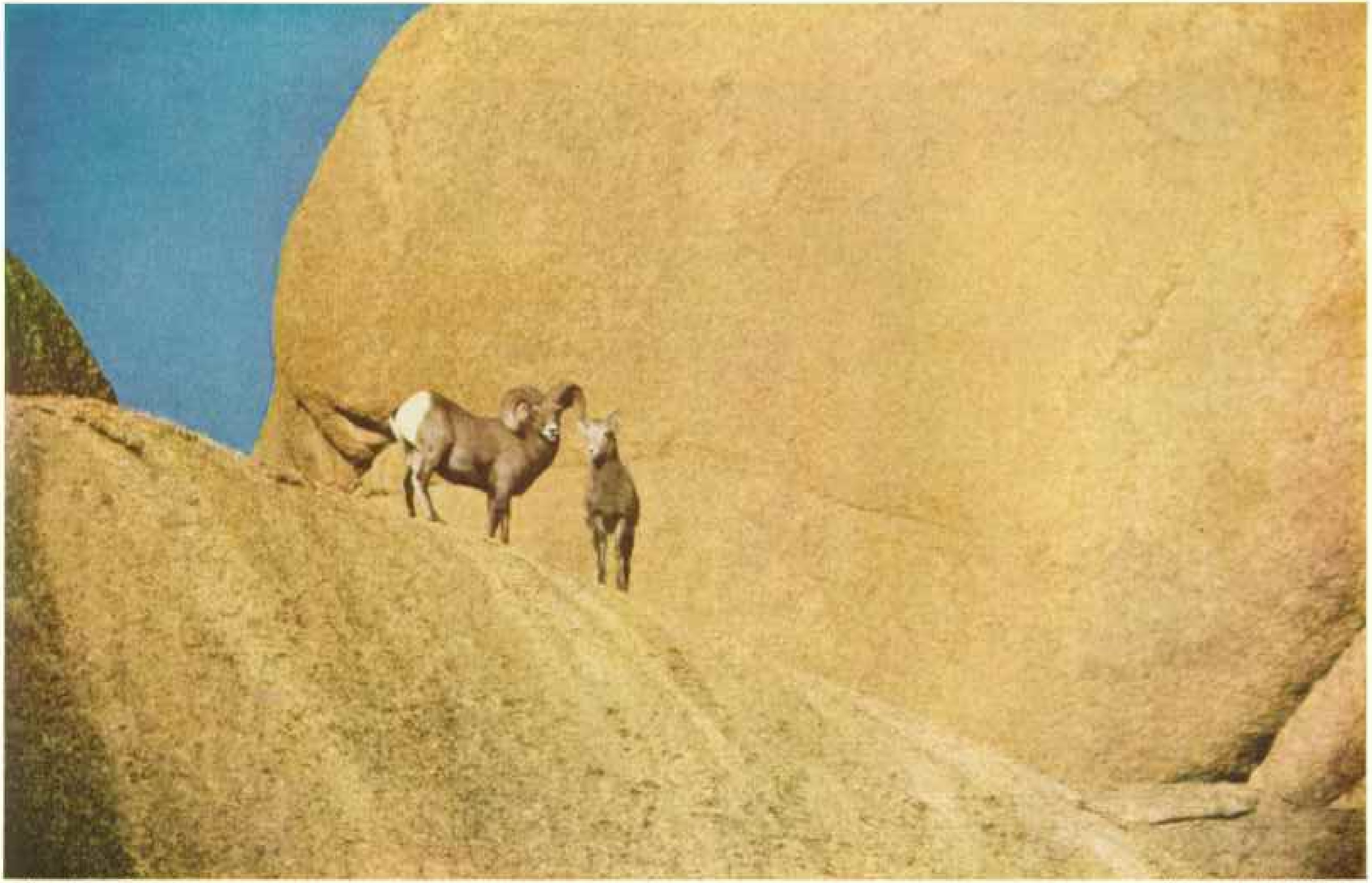
Alpine Meadows above Timberline Form the Summer Range of American Elk

Shifting clouds give this region an ever-changing skyline. The slopes are the favorite haunt of ptarmigan, and bighorn sheep forage there when winter snows drive them from the loftiest crags. In the distance is Longs Peak, near Estes Park, rising to 14,255 feet. The silver streak at left is Trail Ridge Road.

Kodachrome by Alfred M. Bailey

Many Varieties of Wild Flowers Compete for Elbowroom in High-Country Meadows

Here hikers stride through masses of one-headed arnica, wild onion, and shooting stars in South Park, on the eastern slope of the Great Divide. Columbine, the Colorado State flower, blooms abundantly in the upland parks, along with lilies, Indian paintbrush, asters, marigolds, and hundreds of others.



Kodachrome by Alfred M. Bailey

Bighorn Ram and Ewe Make Rare Trophies for the Cameraman

Tedious hours of stalking rewarded the author with this photograph. First he sighted the male at rest on a boulder. Apparently catching a glint from a lens aimed between two rocks, the animal slowly climbed to its feet. Just then the ewe joined the ram, providing this tableau. A few seconds later both had disappeared.

Kodachrome by Alfred M. Bailey

Breast-high Snow Drives the Mule Deer to Lower Levels in Search of Food

These animals pass the cold months where the sage country merges with spruce and pine. One of the greatest wintering areas is in the broad Gunnison Valley. Herds of mule deer are frequently surprised close to mountain highways, but usually they remain in heavy cover in remote regions.

Midsummer Brings Wood Lilies to the Highlands

They grow in moist, sheltered places among aspens and evergreens. Blooming with them during June and July are lavender Mariposa lilies, maroon-centered gaillardia, dwarf cornel, mountain rue, and wild four-o'clock.

© National Geographic Society — Kodachromes by Alfred M. Bailey

Spring and the Snow Lily Arrive Together

The bulbous root of this plant extends a foot under the surface. It is one of the earliest-blooming mountain flowers. The snow lily often grows in areas where sage grouse strut in their courtship dance.

Then, when spring merged into summer in the yellow pines and aspens, we climbed higher —from the Transition into the Canadian zone at 10,000 feet—where plants identical with species which had flowered a month earlier at lower altitudes were blooming in late July.

Rocky Mountain jays, which had long since completed their nesting, gathered noisily about camp sites to steal food. We had been fortunate, a few seasons before, in locating one of their nests in a thick stand of spruce high on a mountainside, and the old birds graciously posed for portraits.

Nutcrackers cruised noisily through the woods as they searched for nests to plunder, while busy little kinglets and Audubon warblers sang from the topmost branches.

Each area had its interests. Where willows lined mountain lakes, there was a busy avian concentration. Lincoln and white-crowned sparrows called from prominent perches, advertising well-concealed nests tucked away near at hand; pileolated warblers crept stealthily through the intricate tangle, carrying food to small young; and a family of juncos had its home under a flowering cinquefoil in a glade at the edge of the forest (Plates IV, V and VI).

Hidden Home of the Pine Grosbeak

The marsh marigold and elephantella were in bloom in moist places, and along the border of one little mountain lake we discovered a flock of the most beautiful of all birds of that altitude—the pine grosbeaks. For years we had endeavored to find them nesting, but season after season had rolled around without success.

This time, however, we were determined to stay with them until they revealed their nesting sites, and my associate, Mr. Robert J. Niedrach, trailed the birds from their marshy feeding ground as they flew from spruce to spruce, calling musically in a conversational tone. On they climbed, higher and higher up the mountainside, and it took hours of patient work before he was sure of the general nesting place.

A pair of birds had been coming and going at half-hour intervals throughout the day, and occasionally one was noted with a dropping, indicating it had just left the nest. It was evident the birds had their home somewhere near on this mountain hillside. Finding it now was merely a matter of isolating the nesting tree from a thousand others of its kind.

Niedrach found that the adults did not go directly to the nest, but alighted a hundred yards or more away and then moved slowly toward it. Finally he heard the call the female gives as she leaves her young, and he was fortunate to get a glimpse of the protectively colored bird as she darted from the shadows high up in an Engelmann spruce. He had discovered the needle in the haystack—one of the few nests of this rare bird that have been known to science.

Since the home life had not been recorded, either in black and white or in color so far as we knew, a blind was erected in a neighboring tree and repeated visits were made to study the life history of this grosbeak of the High Country (Plate IV).

The three fuzzy little young were only a day old when we discovered them, wobbly fellows that had difficulty in stretching their necks full length for food. The female brooded them during the first day we had them under observation, occasionally leaving the nest to get food. Her carmine-red mate made repeated trips with more nourishment than the young could possibly handle.

During the days that followed we made color motion film of the family life of this grosbeak. We observed adults gathering in groups in the swampy area below to feed on the half-ripened seed of the marsh marigold. They literally gorged themselves, and then each pair left for its own nest, where the eager young were fed by regurgitation.

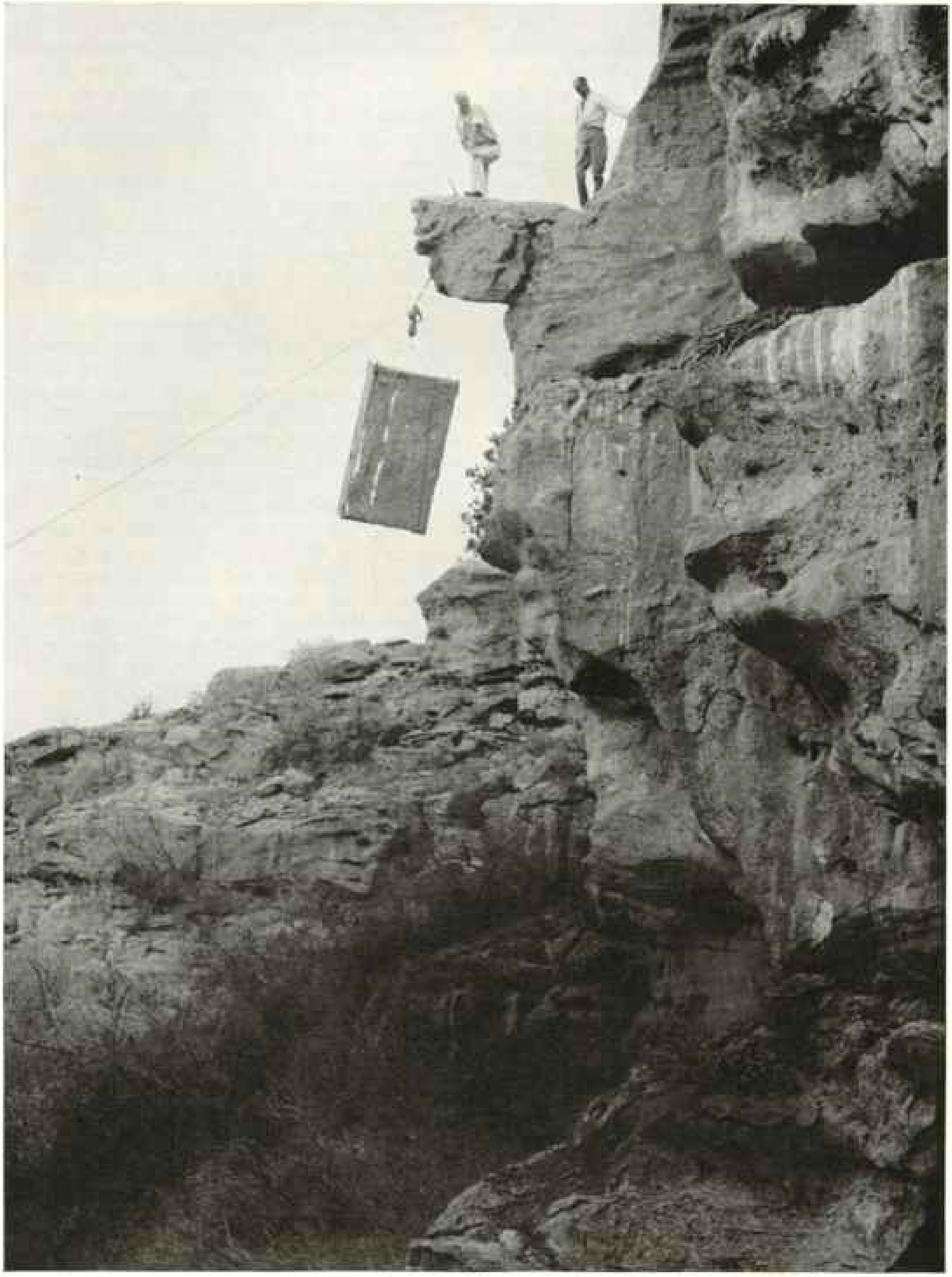
Life of the Treeless Mountaintops

A thousand feet or so above the nesting place of the grosbeak is timberline. Ravens perch upon gnarled branches or fly low over the bristlecone pines and other scraggly growth; this gives way to treeless savannas and boulder-strewn mountain summits where the shrill-voiced conies, or pikas—small mammals resembling guinea pigs—live throughout the year.

The plants and animals of the treeless mountaintops are related to those of the Arctic, and the low-growing mat plants, such as bistort, king's crown, mountain sunflower, and golden avens, present a constant and ever-changing array of color. Birds are not numerous here, only the pipits, rosy finches, and ptarmigan finding conditions to their liking.

The white-tailed ptarmigan is well fitted for life in the north or on the tops of high mountains, for its feet are feathered to give support on the snow and its plumage changes from the dark lichen-colored feathers of midsummer to pure white in winter. When the snows mass over the inhospitable slopes, the white dress of the ptarmigan makes it inconspicuous so long as it remains motionless.

Since this bird is comparatively rare, visiting naturalists place it first on the list



Erecting an Eagle Blind Calls for Engineering Skill—and Luck

After this structure had been secured to a ledge in the foothills south of Denver, Dr. Bailey hid inside to spy on golden eagles nesting on the shelf at upper right. Hours of watching rewarded him with the photograph on the next page. Usually he found rattlesnakes sunning on the ledge when he climbed from the blind.

Ready for Trouble, a Golden Eagle Stands Guard over Its Young

The author got this unusual photograph after a long vigil in the blind shown on the preceding page. Golden eagles range for food far from their aeries in high pines or along steep canyon walls. Almost invariably the adult birds, returning to the nest, were frightened away by the whir of Dr. Bailey's movie camera.

of desirable birds to see. Consequently, we have made many journeys along the Continental Divide in an effort to locate flocks, and we have been fortunate, on occasion, in getting photographs (Plate III and page 72).

One little hen with her brood performed nicely while we made color film, for the young crouched motionless as the old one circled with drooping wings and endeavored to decoy us from the vicinity; and, finally, when one of the young was captured, she climbed upon the outstretched hand of a delighted young lady who was viewing the birds of the High Country for the first time.

When the young are full-grown, in the fall, they are vinaceous-colored, exactly matching their surroundings. It is always surprising to find that a rounded granite rock has an eye in it.

The summer home of the big game is at timberline and above. The shadows of the forests provide excellent refuge for the deer and elk, which are difficult to photograph against the dark background, but they are often seen in the alpine meadows and there we were able to film them in motion.

Elk and deer stay at high altitude until the chill winds of autumn start them on their seasonal trek to lower elevations. Early in the fall the bugling elk occasionally are seen with their harems in open parks, but they usually prefer dense cover. The deer also range from the heavy forests into scrub oak and sage.

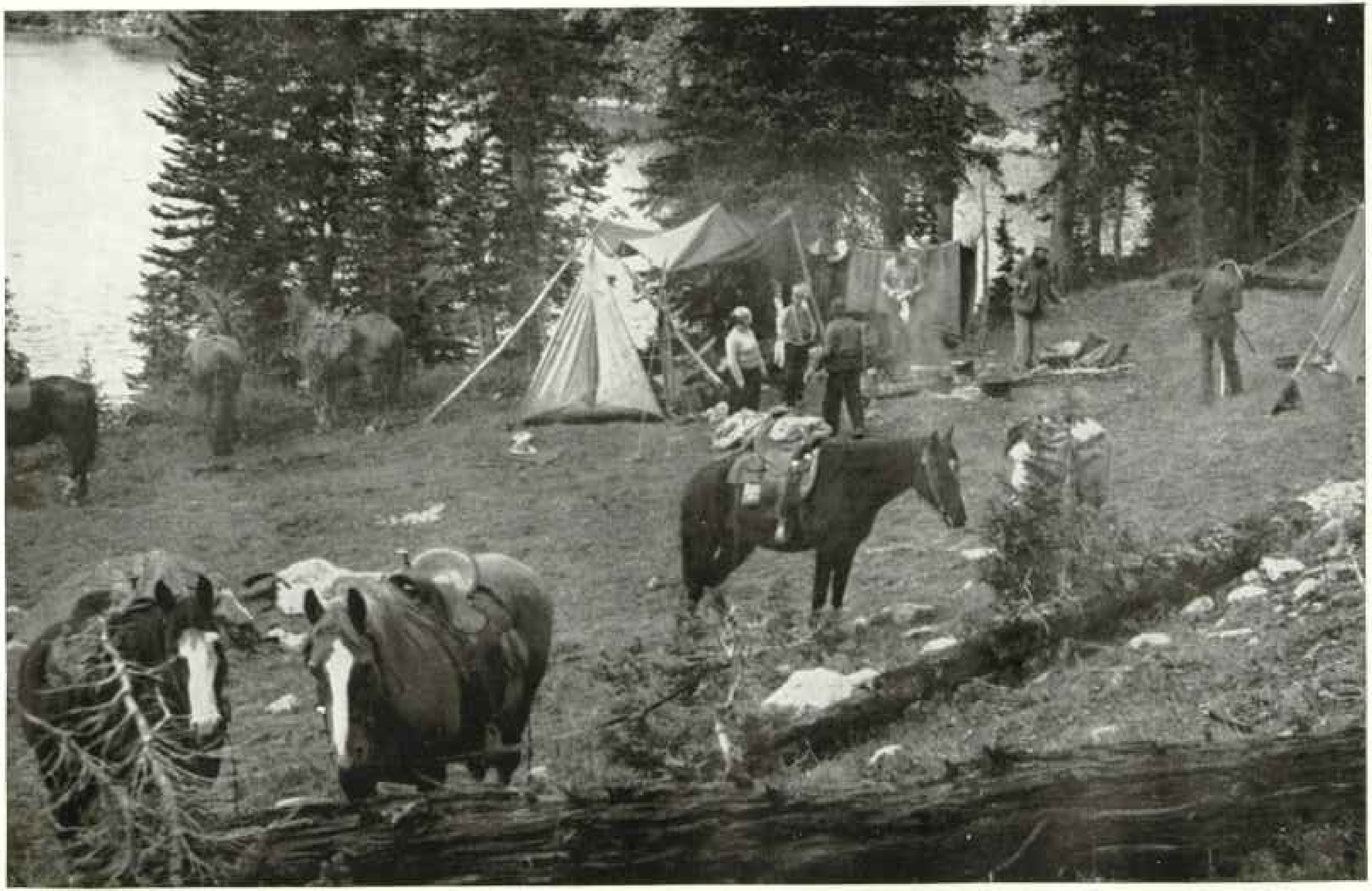
Bighorns, Kings of Cloud-tipped Crags

But to me, the climax of all work in the high places is to invade the haunts of the Rocky Mountain sheep. Their summer home among the cloud-tipped crags far above timberline is a land apart. Mountainsides drop into purple valleys, and far beyond are other snow-patched peaks cutting into the blue of cloud-flecked skies.

Oftentimes the rattling of stones down steep cliffs is the only indication that the sure-footed animals have hastily departed, but at times we have stalked unsuspecting rams with their ewes and lambs and have had them pose for their photographs (Plates I and XIV).

The bighorns belong to a vanishing race. Formerly abundant in the mountains of the West, they have now become rare over much of their former range.

Unfortunately, they are susceptible to disease, and as domestic sheep have been



To Reach Out-of-the-way Nooks High in the Rockies, Give a Man a Horse He Can Ride

Pack and saddle animals have carried this party to a site beside a glistening lake where trout rise to fishermen's lures. Mountain climbing, hunting, skiing, boating, nature study—these are a few of the recreations available to thousands who visit the High Country annually.

Best for Winter Travel in the High Country Is an Old-fashioned Sled Behind a Sturdy Team

Here a party of naturalists rides along a back-country trail toward the mule deer's haunts in the Gunnison Valley (Plate XV and pages 71, 72). Heavy growths of spruce, like that above, offer refuge from the storms. Twenty-below-zero weather often made cameras useless.

grazed in the high mountains, the wild animals have been exposed to sicknesses for which they have no natural immunity. Also, like other big-game animals, the bighorns drop from the high mountains to lower elevations in winter and have been subjected to poaching; hence, through the years they have gradually decreased until conservationists are seriously alarmed.

Probably the outstanding herd in the United States is the one in the Tarryall Mountains, northwest of Colorado Springs. Many years ago domestic sheep were driven through the area and, according to ranchers living in the vicinity, an epidemic broke out among the wild animals. Thousands died in one winter and fewer than a dozen bighorns survived.

From this pitiful remnant the herds have gradually increased again until there are several hundred, an encouraging number to serve as a breeding stock.

These animals occupy a favorable location, for the great granite peaks rise sheer from the yellow-pine country and there are grassy valleys where they may graze unmolested.

Seeds of New Bighorn Herds Sown

To prevent overcrowding there and to replenish the stock elsewhere, bighorn rams, ewes, and lambs have been successfully trapped by the Colorado Game and Fish Commission and transported by truck to distant ranges, including Mesa Verde National Park, 368 miles away by road, where the last bighorn was killed 40 years ago.

Probably the most important requirement for the safeguarding of the mountain sheep is that there be sufficient wintering ground where they are safe from poachers. Such areas are far too few; but fortunately the ranchers along the Tarryall Mountains take a real interest in the welfare of these vanishing Americans, the bighorn sheep.

We have made many trips to the Gold-Williams ranch for pictures and have benefited by the hospitality of Mrs. Edith Williams, who has always had coffee ready when we arrived long before daybreak. Charlie Williams, as gnarled as a wind-blown pine and as hardy, has wrangled the horses and led us by devious routes along precipitous trails in our endeavor to film the wily sheep in their native habitat. Since one of the main wintering concentrations is on the Williams ranch, we have had many opportunities.

The Tarryall Mountains are like a stage setting; the red granite boulders, weathered into fantastic formations, look like artificial props for an outdoor nature play. The sheep come down from their topmost pinnacles to this comparatively low altitude in late October, occasional ewes with lambs at first, and then the big, glossy, dark-brown rams.

Bighorn Battle Heard Half-mile Away

Often we saw the bighorn rams in groups of three, heads together as they circled shoulder to shoulder with eyes rolling white. They would knee each other with resounding thumps, and sometimes two would break away by mutual consent, walking off some distance; then, wheeling rapidly, they would charge head on and crash together with thumps that could be heard for half a mile.

Time after time I have tried to get this performance on film, and although these efforts have not met with much success, the pursuit has given me an opportunity to make many studies of the agile mountain sheep.

On one memorable occasion I crawled to within a short distance of a band of sixty at rest—an unforgettable experience—and photographed individuals at close range as they lay in an open grassy pocket and contentedly chewed their cuds. There were ewes and lambs, and one big, black old ram that we affectionately called "Old Joe."

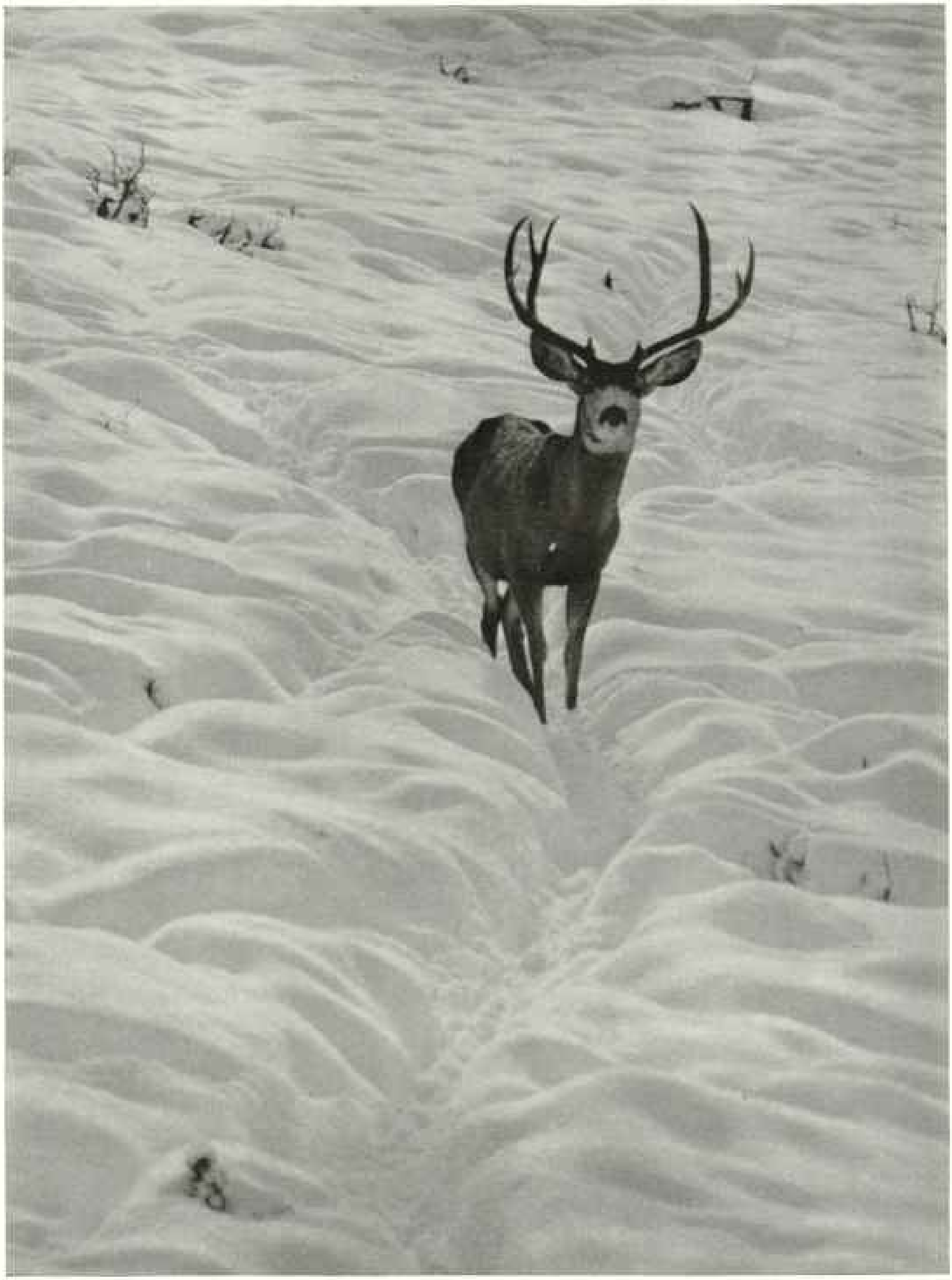
As a climax for the film, which I was to show before the National Geographic Society, I wanted a close-up of rams on red boulders etched against the dark-blue Colorado sky. As frequently happens, the coveted shots were obtained in a brief flash of luck after days of rather unsuccessful endeavor.

Patiently we worked the hills, with motion-picture camera on tripod ready for instant action, and finally one morning I located a fine ram at rest high on a cliff. Stalking him carefully, I thrust the lens through a crack in the rocks. The ram apparently saw a glint of light reflected from the camera, and he slowly climbed to his feet as the film raced through the machine.

A ewe came over the top of the rock and joined the old chief of the flock; then the two stood statuelike as I secured the prize of all my big-game pictures (Plate XIV). After the camera was rewound, the male came around a sharp corner, full size on the screen. He was followed closely by another ram of equal size; then both literally flowed down the mountainside and out of sight among the aspens below.

It was one of the thrills which occasionally come to the Nature photographer—just one of the incidents which more than compensate for days of effort.

Winter in the High Country is only for the hardy few. After sudden storms sweep across the hills, the lodgepole pines are massed high with their burden of white, and the towering



Winter Drives Mule Deer to the Sage Flats for Their "Austerity" Diet

Pawing the snow, they uncover a meager fare of grasses and shrubs. This gaunt old buck was photographed along Soap Creek, a tributary of the Gunnison River. Near by is the Harding Ranch, center of a great wintering area for High-Country game animals, where Dr. Bailey made his headquarters (Plate XV and page 72).

Snow in Early October Finds a White-tailed Ptarmigan Changing to Winter Dress
Brown and black summer plumage of this grouselike bird is a marvel of protective coloration. "It is always surprising to find that a rounded granite rock has an eye in it," says the author. As winter advances, white feathers gradually replace the dark ones until the ptarmigan becomes snow-white (Plate III and p. 65).

spruce are like glistening Christmas trees against the blue-black Colorado skies. The forest floor is a drifted, untracked carpet, for the varying hares and lesser folk remain in the snug warmth of their warrens until hunger forces them from their places of refuge.

Where mountain roads cross the Divide, however, there is easy access to the skiing slopes; so, as soon as the highways are cleared, the young people of Colorado flock to Loveland and Berthoud Passes. From elevations of 12,000-14,000 feet they travel down glistening slopes at express-train speed, while photographically inclined naturalists make haste more slowly on snowshoes.

Winter Haven for Deer

The game animals have long since dropped to lower elevations, the deer spending the winter where the sage country merges with the spruce and pine. One of the greatest wintering areas is in the broad valley of the Gunnison, and we have made many photographic trips to one of its tributaries, Soap Creek (Plate XV and pages 69 and 71).

There, stalking animals in the sage, we have come abruptly upon gigantic old bucks posing like statues against the sky, and we have hidden along game trails and watched gaunt old-timers following the network of deer-made paths as they searched for feeding places.

The Harding Ranch, well up Soap Creek, has been our headquarters, and with sled and horses we have traveled far back in the picturesque hills while the 20-below-zero weather made the runners squeal on the dry snow and froze our cameras to useless ornaments. However, milder days were to follow, and we had no difficulty in getting our shots.

Once a little fawn came nimbly along a trail, closely followed by three big old bucks. As I thrust my face into the camera, my companion whispered, "A little child shall lead them."

Thus the curtain falls on a brief glimpse of the High Country of Colorado. We have followed spring to peaks at 14,000 feet and then, as spring merged into summer and fall, we have retraced our steps with the big-game animals. Now we leave them there in the broad valley of the Gunnison, where spruce forests encroach upon flats of rolling sage.*

* For additional material on birds and animals mentioned in this article, see *The Book of Birds*, 2 volumes, and *Wild Animals of North America*, both published by the National Geographic Society.

Forest Lookout

By Ella E. Clark

"YES, I was entirely alone, but I was never lonely . . . No, I was never afraid."

How many times I have given these replies since September, 1943, at the end of my first summer in a lookout station of the United States Forest Service! That season I had been located on a mountain road and could drive to my cabin door. After my second summer, though I had lived an hour's climb from a road, I could still make the same answers truthfully.

When the same questions were asked at the end of the season of 1945, I had to reply, "I was never lonely, but I was afraid—or at least very nervous."

In fact, some of the paragraphs which follow were written partly to free myself from nervousness, by turning my attention from "the mighty space of air" displayed below my windows to the mountains and ravines at greater distances.

Wartime Service in the Wilderness

You may wonder, as others have, why I, a woman, should choose to spend three summers "roughing it" alone in the wilderness. When I learned in the autumn of 1942 that the United States Forest Service planned to employ women the following year, I knew that I had found my wartime service for summer vacations: I should be a lookout, or forest guard, on some mountain peak.

I was sure I could adapt myself to the isolated life and to the outdoor environment with which I had become acquainted through essays of students who had introduced me to the beauty of the virgin forests of the Northwest's Cascades, Bitterroots, and Olympics.

So in the spring of 1943 I wrote letters of application to eleven district rangers, accepted my first offer, and in June drove to the Mount Adams District of the Columbia National Forest, in my home State of Washington (Plates I, IV, VII, and pages 75, 91).

In September I returned to my college community and, to my surprise, to a barrage of questions which are repeated every time a new acquaintance discovers my experiences.

But before I begin to answer those questions in writing, I want to present, as background, some facts which I have gleaned from Forest Service publications found in my lookout stations, facts about the great property which you and I and other Americans own—our national forests.

We, the people, own 152 national forests, which cover 177,642,000 acres. This means that our national forest land almost equals in area the whole of France plus the State of Washington or Missouri. Yet we, the people, through State and municipal ownership as well as Federal, own less than a third of all the forest land in the United States. The balance is privately owned.

But lest these figures make us complacent and we continue to deplete what was once thought to be an inexhaustible resource, let us remember these Forest Service statements concerning all the forests of the country:

First, only about 100,000,000 of our original 850,000,000 acres of saw timber remain.

Second, "It is estimated that the drain on forests of the United States in 1944 amounted to nearly 16 billion cubic feet, and exceeded total growth by 50 percent. In timber of saw timber size, drain was almost twice the annual growth."

Third, "To meet the requirements of our people for forest products . . . growth should be nearly doubled."

For administrative purposes, the national forests are grouped in ten regions, with a regional forester in charge of each. Region 6, with headquarters in Portland, includes 19 national forests in Washington and Oregon.

Each national forest is administered by a forest supervisor and his assistants. For closer supervision, each forest is subdivided into ranger districts, with a forest ranger as administrator. Thus the Columbia National Forest, which is about the size of the State of Delaware and the eighth largest forest in Region 6, has five ranger districts.

Fire Prevention Paramount Duty

A district ranger has supervision over timber sales in his district; over grazing and other uses of the forest; over building and maintenance of roads, trails, bridges, telephone lines, recreation camps; and over the protection of his part of the forest from fire.

The most important of these duties is the last one, for upon it depend all the others. Consider these figures:

"During 1935-1939 cooperative Federal, State, and private fire control was in effect on 260 million acres of State and private land. The area burned was held to 1 percent. One hundred and sixty-three million acres of private forest land were without protection, and fires burned over 17.8 percent of this area."

To assist the district rangers in their work of protection, nearly 6,000 forest guards are

employed each summer. Stationed in strategic places, they watch for smokes and report them to the district ranger or to his assistant known as the fire dispatcher.

When in the summer of 1943 I first became one of these forest guards, I entered upon a life entirely new to me. Before being taken to my station, I, along with other lookouts and with the fire-suppression crew (about 35 in all), received four days of intensive instruction at the ranger station of our district. Our instructors were the ranger, his local assistants, and officials from Columbia National Forest headquarters in Vancouver, Washington.

We learned how to meet the public as representatives of the Forest Service; how to operate a portable two-way radio; how to replace batteries and a burned-out fuse in a telephone; how to use and care for tools; how to read a compass; how to detect and locate smokes; how to read section maps; and how to use the firefinder, the lookout's chief tool.

In the women's class, made up equally of teachers and of local girls just out of high school, the last two items received most attention. We were to be the lookouts, and lookouts must locate fires quickly on the firefinder map. We were taken into the forest and taught how to extinguish small fires, should one break out near our station (Plate VIII).

Boys Help Clear Trails

The fire-suppression crew, made up of 16- and 17-year-old boys and their adult leaders, most of whom had been clearing trails for several days before we women arrived, received much of the instruction we were given. In addition, they had half days of perspiring field work, learning the most effective method of fire fighting—the "one lick" method (p. 94).

I received individual instruction in reading and reporting the weather, for I was to operate a weather station as well as two lookouts about one-third of a mile apart.

These days of training, though long and fatiguing, were intensely interesting. Even though I have already forgotten the difference between a mattock and a Pulaski (page 95), I learned some things of permanent value.

As long as I teach, I want to remember one incident: Our instructor had been explaining a mathematical problem connected with the orienting of the firefinder, and had ended with the familiar words: "Are there any questions?" After a short silence I frankly admitted, "I don't understand it well enough to ask an intelligent question."

Sighs of relief from the girls on the bench behind assured me that I spoke for them also, and made me again aware that youth is often unwilling to admit ignorance in the presence of others.

It was inspiring, in the general assemblies, to feel the enthusiasm which the men of the Forest Service have for their work, to realize the professional pride which they take in being members of a national organization dedicated to the principle of "the most productive use for the permanent good of the whole people," "the greatest good of the greatest number of people in the long run."

Alone on Flattop Mountain

After these four days of Fire School, the district ranger and two boys accompanied me to my summer home on Flattop Mountain. They helped me unpack my car, split a pile of wood for me, showed me how to pump and light a gasoline lantern, put new batteries in the flashlight and in the three telephones (one in my living quarters and one beside each firefinder), and oriented both my firefinders.

By pointing out and naming some of the peaks and other conspicuous landmarks, the ranger started me upon my first major task—getting acquainted with the vast area I looked out upon.

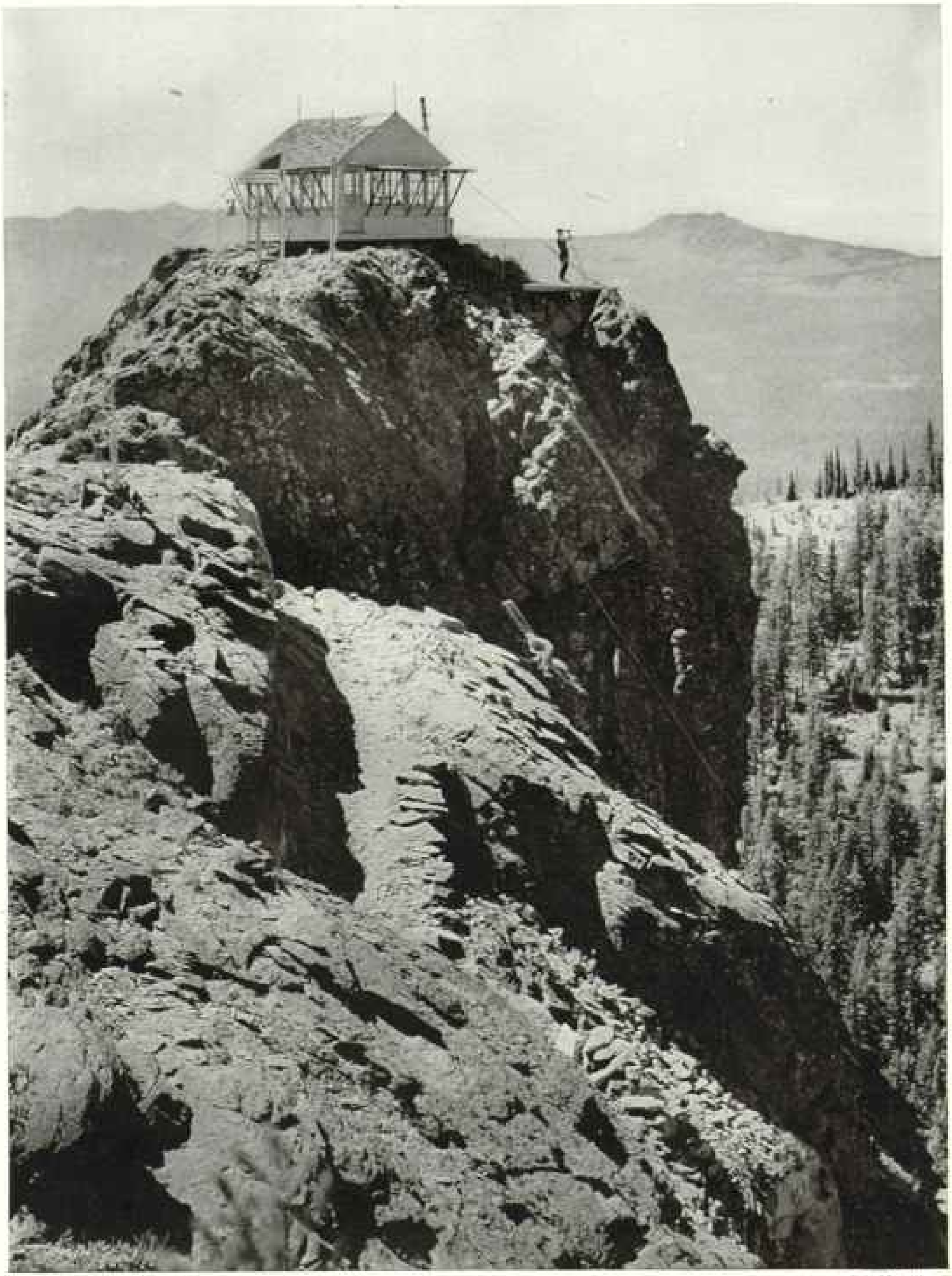
I include these details here because some people, even this summer when they knew that I was to be eight miles from a road, have assumed that I found my own way to my station and started this strange life in a strange world without any assistance.

At Flattop Lookout (4,400 feet altitude) I lived in solitude amid scenic beauty for ten weeks, leaving my retreat but once for part of one foggy day.

In 1944 I spent thirteen weeks in the same district, deeper in the forest and higher in the mountains. This summer my enthusiasm for photography and my spirit of adventure brought me to new territory, the rocky chaos above timberline.

Each lookout station had been placed on a site carefully selected because it surveys a valuable area or one with special fire hazards. For instance, my station the first summer overlooked the logging operations and the mill sites of several lumber mills; the second summer it overlooked a burnt-over area, which contained much ignition material for lightning fires, and also hundreds of square miles of virgin timber.

I do not mean that I was solely responsible for this vast and valuable territory. In my district were eleven occupied lookouts. Eight of them, as well as four in other districts of the Columbia National Forest, I could see from my station. They were between five and twenty miles away.



Ray M. Fillmore

Strong Cables Anchor Sleeping Beauty Lookout to Its Precarious Perch

On the ledge below the cabin, a guard trains binoculars on a suspicious smoke. Volunteers from outdoor clubs manned this station in the Columbia National Forest during their vacations. The author, on duty at a near-by post with her own radio, telephoned summaries of news broadcasts to her neighbors.

Ray M. Fillson

Student Guards Learn to Operate a Firefinder

On its surface is a circular map of the area, with the lookout station in the center. The rim is calibrated in degrees of the azimuth circle. Spotting smoke, the guard revolves the ring and adjusts the sights until the base of the smoke appears in the cross hairs of the front sight (at elbow). A tape spanning the map measures distances. Fire data are telephoned to the dispatcher a few minutes after spotting.

The person on duty in a lookout station is considered "the eye of the entire fire-fighting organization" of his area. He is expected to discover a fire as soon as possible after it originates, to locate it accurately and quickly, to record the data concerning it, and to report these data by telephone to the office of the ranger station.

The lookout, therefore, is directed to have his area under general observation all the daylight hours during possibly dangerous fire weather. By so doing he can detect a fire when it is small.

He is also directed to give his area a "check look" every twenty or thirty minutes; by a check look is meant an intensive scrutiny of the observed area, one small sector at a time. Usually the schedules for check looks on adjacent stations are so arranged that a given sector is under scrutiny most of the daylight hours. When a lookout detects a smoke, he locates it by means of a firefinder.

How Fires Are Located

This instrument has a circular map of a given area screwed to a steel frame. The whole equipment rides on a pair, or two pairs, of tracks fastened to a rigid stand tall enough to clear the windows enclosing the station.

The steel rim around the map is engraved to show the 360 degrees of the circle—the azimuth circle. On a movable steel ring between the map and the azimuth circle are screwed, opposite each other, perpendicular pieces known as the front sight and the rear sight. The front sight is equipped with a vertical hair and two horizontal hairs, to be used in determining the horizontal angle and the vertical angle of a given spot.

Across the map, between the front sight and the rear sight, runs a measuring tape, by which the lookout determines distances. At the center of my map is my particular lookout station.

The map shows the topography and names the principal landmarks (peaks, rivers, creeks, Forest Service stations) in a radius of twenty miles from my station. It is also a section map, and therefore shows the townships, ranges, and sections of the area covered.

When, therefore, I see a smoke, I revolve the sight-bearing ring and I adjust the front sight until, as I look through the peephole of the rear sight, the point of intersection of two hairs in the front sight appears to cut through the center of the base of the smoke.

Now I am ready to read the horizontal angle on the azimuth circle and the vertical angle on the vertical scale of the rear sight. I locate the spot on the map, record these data and others on a blank prepared for the purpose, and reach for the telephone. All this is supposed to be done within three to five minutes after the fire has been spotted!

My report to the fire dispatcher includes the following data: location by local landmarks (for example, the junction of Agnes Creek and Trapper Creek); the azimuth, or horizontal, angle; the vertical angle; the distance in miles; the township, range, section, and subdivision; the direction from which the smoke is drifting; the volume, color, and character of the smoke; the approximate size of the base of the smoke; the time the smoke was first sighted.

The dispatcher copies the data and, whenever possible, telephones another lookout or two in the area for azimuth readings on the smoke. This is to obtain a two- or three-point intersection on the location of the fire and will save time, for an error of one degree in the reading may result in several hours' delay in reaching a fire.

The dispatcher plots the readings on his map and decides upon the best course of action. If it is a small fire, he may send one or two men who are already nearest it. The lookout is alert to receive a mirror flash if the men need more help and to report to the dispatcher on the progress of the fire and the fire fighting. If the fire becomes large, the dispatcher calls together as many men as he needs or can find (page 92).

Besides the men employed by the Forest Service for fighting fires (and for making improvements when there are no fires), other men in the community are called upon. Workers in lumber mills in the area, as well as loggers and stockmen in the forest, may be subject to fire calls as a part of contracts with the Forest Service.

All of us are acquainted, through the daily press and the radio, with the heroic fire fighting done by the C.C.C. boys some years ago and by the soldiers and sailors in more recent summers, in the big fires which made the headlines.

The lookout also is expected to wash his windows after every rain or fog and at regular intervals during dry weather. This was no small task at Flattop, where I had fourteen windows in my living quarters and two glass-enclosed rooms, probably 6 by 6 feet and 10 by 10 feet, for the firefinders. But one cannot see smoke through streaked or rain-spotted windows.

The lookout is directed to keep his house, tool shed, and adjacent grounds tidy. We women have not been expected to do some of the tasks usually done by men lookouts, such as painting and repairing the stations, or working on trails on foggy days, but at least one woman unaccustomed to hammer, saw, and pliers has found it fun to discover what she can do when necessity arises.

And of course housekeeping takes some time, even for one person, when it includes splitting kindling, cooking on a wood stove, baking bread, and doing the laundry with tub and washboard.

One learns to be economical with water carried up from a spring. With the same water I have, in turn, shampooed my hair, washed my clothes, scrubbed the woodwork and mopped the floor. Then I have watered the nearest lilies or settled the dust near the cabin.

Lookout De Luxe on Flattop

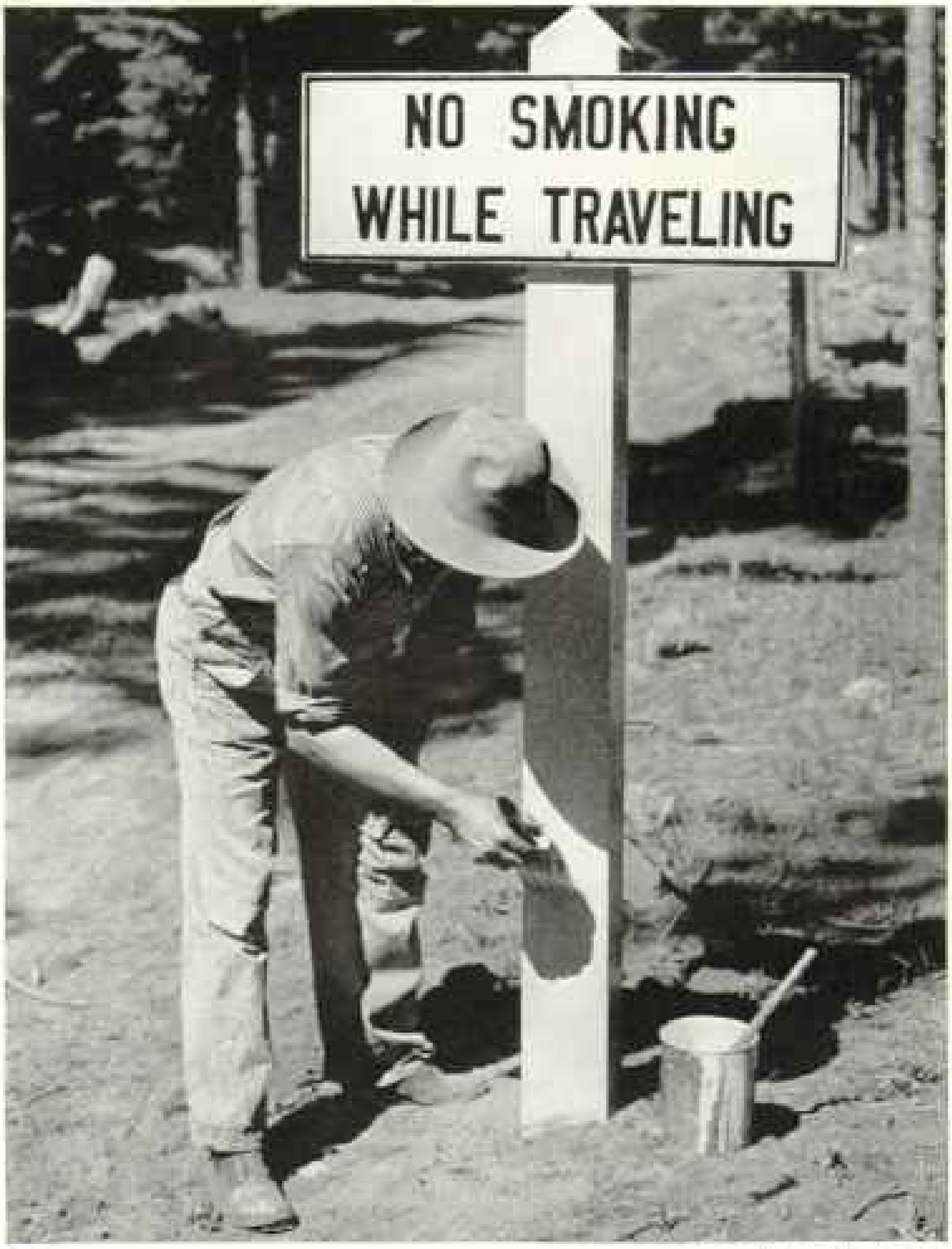
Lookout stations—that is, the buildings themselves—differ somewhat with the location and with the period of architecture, if one can use so elaborate a term for them. The first one I lived in is a lookout de luxe, more spacious than any other known to experienced foresters of my acquaintance. It has two screened-in porches, a small bedroom, a spacious "room," in the pioneer sense, with windows on three sides.

From the bedroom a steep, narrow stairway leads through a small attic to the tower enclosing the firefinder. The room is equipped with a good wood stove, built-in cupboards, folding chairs, two large tables, and a desk with drawer space not fully appreciated until this summer. (Cartons on a shelf under the table are my present drawer space, holding anything from bread to sheets.) Both stove and metal bed are grounded for lightning protection.

My second lookout in the Columbia National Forest and my present one in the Chelan National Forest are more nearly typical stations. Each consists of a single window-enclosed room. This one measures 11½ by 11½ feet.

A ladder starting from about the middle of the room leads to the tower and the firefinder. Each room is furnished with bunk or army cot, a table, a built-in cupboard topped with a worktable, and a stove.

Here, far above the tree line, I burn kerosene; there I burned wood. Cooking equipment is good and, when kept up to the standard Forest Service list, is complete. The white china dishes are substantial—twice the



U. S. Forest Service, Official

Man Causes 9 of Every 10 Fires in Western Forests

Here a worker touches up a sign in the Columbia National Forest. In areas where fire hazard is high, smoking is prohibited. Elsewhere, officials designate safe places that have been cleared of inflammable material. Three of every four man-made fires are due to carelessness, the other to incendiarism (page 96).

thickness and weight of my breakfast pottery at home. Floors are bare; windows, of course, must remain curtainless. In these one-room stations there is no wall space, not even for hanging one's clothes.

The first two summers a good little cellar in the side of a hill, equipped with shelves and a ventilating system, kept butter firm always and vegetables fresh surprisingly long. This year my "frigidaire," on warm days, is a metal container forced into the snow between two rocks.

Previously I have disposed of my garbage by burning what I could and then putting the rest in a pit dug for the purpose and fitted with a lid. Here, where I can neither burn nor bury, garbage disposal is more primitive. When I have emptied a can, I step to the door and toss it three or four feet. For a few seconds it knocks against the rocks which I cannot see, and then it reappears, a moving speck on the snowfield below.

It still goes against the grain to dispose of refuse in that way, even though I am sure that no human being will ever see that tin can again and even though I can think of no better method of disposal.

Standard among the newer types of lookout stations is the single room, 14 feet square, with the firefinder in the center. In some areas most of the stations have tall towers, 50 feet high or more. Sometimes living quarters are on the ground and only the firefinder is in the tower; sometimes both are in the tower, and the lookout stays there day and night.

The unique station of my acquaintance is in a State forest near my first location. Living quarters are in a small cottage on the ground, and the firefinder is in the top of a tall tree. There a local girl, first as high school senior and then as college student, has been forest guard for three summers.

Old Glory Flies High

A typical day's schedule varies somewhat with the station. The first summer I telephoned the ranger station every morning at six, made a check look at that guard station, walked across the mountain through a grove of trees and a flower-dotted meadow for a check look at the east-point station, raised the flag, returned to the other station, and put up the flag there (Plates I and IV).

No, I did not sing "The Star-Spangled

Banner." "America the Beautiful" seemed more appropriate to my location. It was my "theme song" all summer, and I sang it many, many times as I walked across the mountain. Months later I learned that it had been inspired by the view from Pikes Peak.

Flags up, I made a fire, prepared a hearty breakfast, and did the routine housework, including preparations for a hasty lunch. On hot, dry mornings I interrupted these activities by unscheduled check looks at both stations. At nine o'clock I went again to the east-point station to read and report the weather, as I did also at one and at five in the afternoon.

By telephone I reported to the ranger station the visibility, the percentage of humidity, the weight of the fuel moisture stick, the direction and velocity of the wind. A more detailed report at five o'clock, including the kinds and movements of clouds at different altitudes, became part of the data for the weather forecast telephoned back to the ranger station from Seattle each evening.

As a war-secrecy measure, both the evening forecast and my five-o'clock report were made in code. These five-o'clock reports were used also to determine the burning index for the following day in our district. At each of the three daily readings I made a detailed record and mailed it every ten days to the U. S. Weather Bureau in Seattle.

"Reading Between Looks"

Throughout the day I continued with the check looks at both stations, usually reading between looks, giving most of my attention to the side of the mountain where the fire hazards—the logging operations—were.

During August, when there were huckleberry pickers on one side and logging operations on the other, a few days of "fire weather" caused me to walk six or eight miles a day back and forth across the mountain. An estimated four miles was normal—and pleasant.

The last check look was made at early bedtime. Another telephone call had been made at four o'clock. This one and the early-morning one are made for two purposes: to see that the telephone is in order and to make sure that all is well with the lookout.

If he is not heard from at his scheduled hour, the office tries to call him. If repeated calls are unanswered, someone is sent up to investigate.

This was a typical sunshiny day of my first summer, but it is not a typical lookout's day. Most lookouts have but one station, either on a promontory or on a tower. Their days are much less active—sometimes boringly inactive.

Most schedules include also a certain time for getting water from the spring, usually between six and seven-thirty in the morning, so that the lookout will not be away from the station for any length of time after the dew is gone.

Last summer (1944) I went for water between six and seven in the morning, a seven-minute journey down to the spring and, after I became acclimated, a twenty-minute journey up, through the flower-dotted woods and clearing below the cabin. The water I carried in gallon canteens hanging from each shoulder.

Youthful Lookouts Become Lonely

Life on a lookout has, of course, its drawbacks and hardships. To most high school and college boys, the chief hardship seems to be the isolation, the loneliness. The long, three- or four-cornered telephone conversations in the evening show youth's hunger for companionship.

To one middle-aged man the worst feature, especially on these high peaks, is the frequent fog. Shut in by fog as well as by hazardous rocks, one can become depressed as well as lonely. (Patrol by airplane, being experimented with this summer, may prove to be a partial and welcome substitute for the lookouts on these isolated peaks.)

Probably all of us weary of the wind. Many times I have been awakened by it and have been grateful for the eight heavy cables which keep the cabin in its place at the edge of the mountain. Young boys, I was told last summer, have telephoned during a heavy wind in the middle of the night, just to hear the reassuring voice of the motherly woman at the switchboard below.

Sometimes carrying water is almost back-breaking work. Some complain of the monotony of their menus. When the grocery store is 25 miles to 75 miles away and supplies are brought up once in three or five weeks, one is restricted mostly to packaged and canned foods.

None of these hardships has affected me much. My varied interests have kept me from being lonely, even though for one month of my first summer I saw just one person and then for only five minutes. On foggy days I have gone exploring or have picked huckleberries and made jam. When the curtain of fog was very thick and cold, I have sat beside my snapping wood fire and rejoiced in long days of reading and study.

For two summers my water for cleaning was brought up by truck or by pack mule, and I could easily keep myself supplied with fresh water for drinking and cooking. This

summer my water supply, a glacier, is but a few yards from the door. I melt the snow, strain the water through a cloth, and boil what I drink.

My chief hardship, even in the lookout de luxe, has been the lack of beauty and comfort and conveniences in living arrangements, coupled with the impossibility of keeping well groomed.

Not in my most uncomfortable moments, however, have I thought that bed springs or easy chair or bathtub should be carried up on the backs of men or of mules to convert the lookout into a Shangri La. The marvel is that lumber and window glass have been brought up. But I have often had to remind myself that I probably have more conveniences than my frontier grandmother had and that I am certainly more comfortable than some of my friends were on the islands of the Pacific.

Rivaling these discomforts this summer, and perhaps surpassing them as I look ahead, is the lack of opportunity here for healthful outdoor living, a necessity of my summers. Here in the center of far-reaching space, ten miles from anyone, there is not enough space inside the cabin, nor substantial footing outside, for even vigorous setting-up exercises.

In discussing the qualifications of a lookout—good eyesight, resourcefulness, ability to live alone, etc.—the Forest Service omits one important quality: a sense of humor. Mine came to my rescue every other day last summer when I crawled out the window to sweep the soot-clogged spark-arrester screen of the chimney.

Poised on a slanting roof, holding a long-handled broom, I often laughed at my witch-like appearance; I felt that if I had a peaked hat and a cat I could float across the edge of the cliff a few feet away and soon wash my soot-flecked face in Steamboat Lake, 1,000 feet below.

My sense of humor was dull my first day up here, when I killed the last mouse and cleaned the scattered meal from the cupboard. Yet I did manage a chuckle as I recalled that Mary Walker, a pioneer in Washington a century ago, had "wept at the thought of how comfortable my father's pigs are" back in New England.

The Joys of Rustic Life

Like Thoreau at Walden, I have found many joys in my rustic life—joys which, for two summers, have far outweighed these unavoidable inconveniences. Among them is the closeness of the elements.

My first morning on Steamboat Mountain last summer, I awoke to see Mount Adams bathed in rosy light. Would the sun come up from behind the north shoulder or the south shoulder of the mountain? Propping my head up, I watched it gradually come into view over the north slope. Less than eight hours before, wearied by a day of cleaning and unpacking, I had lain with my head at the other end of the same bunk and watched the sun go down in golden glory behind the peaks in the arc between Mount Rainier and Mount St. Helens (Plate II).

In late June in the central Cascades sunset glow and sunrise glow almost met. When I left in September, the sun was appearing far down the south slope of Mount Adams and was disappearing behind the south slope of St. Helens.

120° Heat on a Mountain Peak

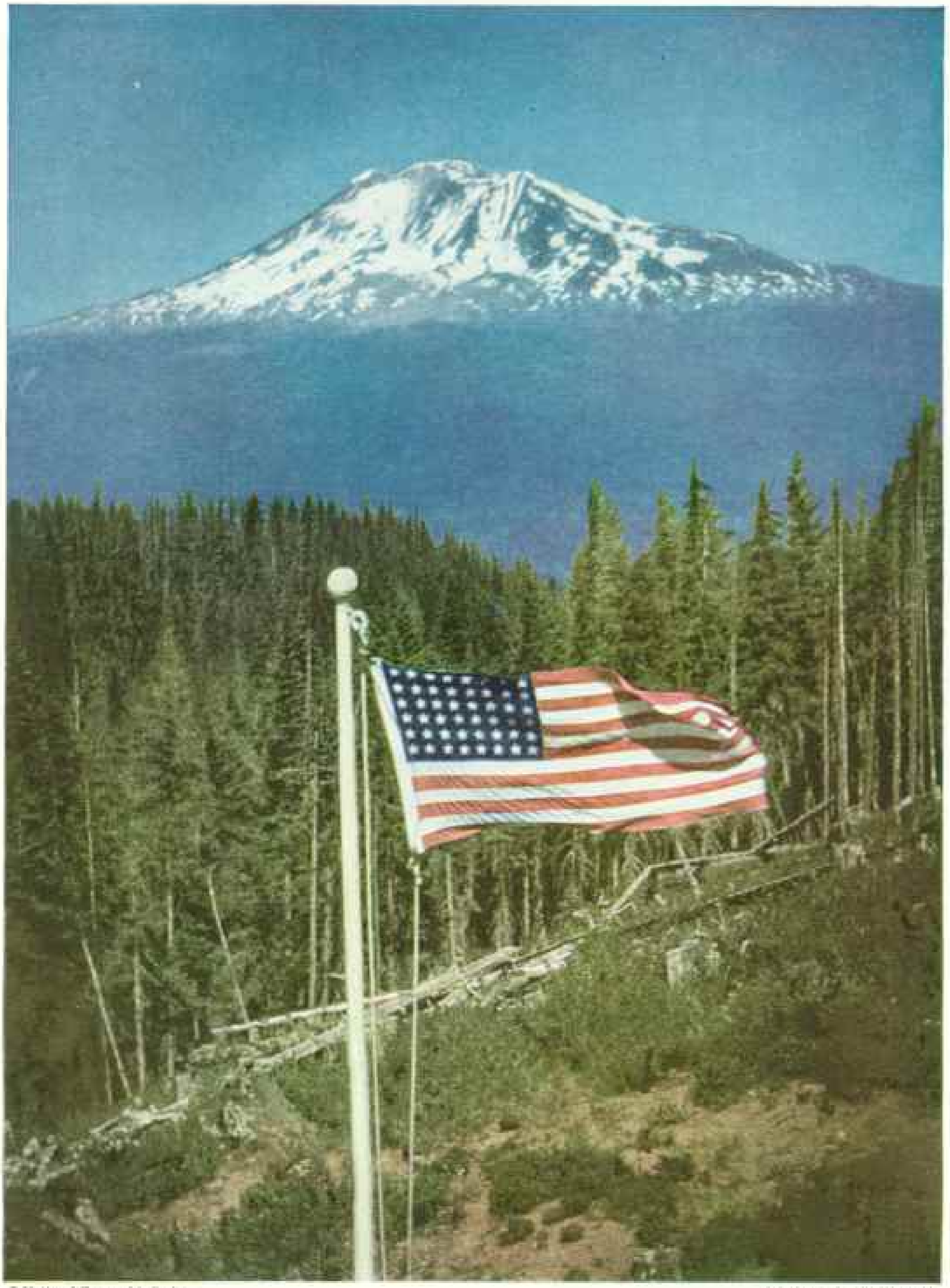
At seven o'clock that first morning, the thermometer, in the sun, registered 110°; when I moved it into the shade, the mercury dropped to 55°. Frequently in the late afternoon sun the mercury reached the top of the thermometer, past 120°, while I in the shade and in the breeze usually needed a light sweater. Shade temperatures ranged from 42 to 82 the first summer, and from 32 to 94 the second summer.

One Fourth of July I sat on a bench in warm sunshine and watched a cloud empty rain on Sleeping Beauty ridge, a few miles to the southeast, and another cloud empty snow on Mount Adams, twelve miles to the northeast.

Next morning when I returned from the spring, I found a fairyland of fog below me—white fog, billowing like the waves of the sea, the low mountain peaks and ridges jutting from it like islands, the snow-capped mountains glistening white against a brilliant blue sky. Sunset, sunrise, moonset and moonrise, radiant evening star and morning star, the Great Dipper and the Milky Way—all seemed very close, almost within reach.

There were other simple pleasures and some small adventures. Young people usually ask, "Didn't you have any big adventure? Tell us about your big adventure." Perhaps I am having a big adventure as I write.

For the fourth successive day I am enveloped in fog so thick that I can see but a few feet from the cabin. Though it is the middle of July, there are frost and ice outside; there have been sleet, howling winds, and flurries of snow. My battery radio, brought up for news and pleasure, is silent in the cold. For more than 48 hours my telephone has been dead, my only contact with the outside world being hourly radio communication with a high school boy on a



 Kodachrome by Ella E. Clark

Mount Adams, More than Two Miles High, Dominates Columbia National Forest

Embracing 1,263,000 acres in Washington's Cascade Range, Columbia is one of 152 national forests. Amid scenic grandeur like this, Miss Ella E. Clark, a college teacher, spent three summers alone as a lookout. Sometimes fog was so thick she could see but a few feet. Keeping Old Glory flying was one of her many duties.

Kodachrome by Ella E. Clark

Twenty Miles Away, Mount St. Helens Raises Its Snow-capped Head from a Creamy Sea of Cloud

This 9,671-foot peak, one of several visible from the author's station, challenges many climbers among the thousands who visit Columbia National Forest each year. During one month of her first summer as a lookout, Miss Clark saw but one other person and then for only five minutes. A near-by spring supplied her with water.

Kodachrome from Ella K. Clark

Duty at McGregor Mountain Lookout Proved to Be "No Life for a Lady"

Here a packer and other Forest Service employees escort Miss Clark (center) toward civilization after two weeks atop the 8,140-foot peak in Chelan National Forest. The station's surroundings looked "as if Paul Bunyan had angrily hurled rocks as far as he could in all directions" (Plates V, VI, and VIII).

Reduction by Ella E. Clark

Vistas of Majestic Beauty Surround the Four Glass Walls of Miss Clark's Mountain Cabin

In the distance, Mount Adams rises above 12,000 feet. Stations like this in the Columbia National Forest are equipped with a fire-finding instrument, telephone, and minimum essentials of living. Windows, often streaked by rain and fog, must be cleaned frequently to permit instant spotting of smoke.

Kodachrome by Ella E. Clark

High School Boys Back-pack Supplies up McGregor Mountain to the Lookout

These young summer employees approach the station where the author spent part of her third season as a lookout. From the post she could see more than a dozen peaks, ranging from 8,500 to 10,400 feet in altitude, and hear the roar of the Stehekin River rapids, more than a mile below.

Kodachrome by Elie R. Olmik

Boat Travelers on Washington's Lake Chelan Look Up at Towering Snow-clad Mountains

In summer this craft plies the 50-mile length of the lake between Chelan and Stehekin, carrying hikers, campers, supplies, and mail. The Government maintains 74 camps and picnic grounds in Chelan National Forest. First peak from center on right-hand ridge is McGregor Mountain (Plates III, V, and VIII).

Kodachrome by Ella E. Clark

This Doe Adopted the Author and Helped Relieve Her Solitude

Deer were frequent visitors, tempted by the salt brick Miss Clark put out for them, but this female blacktail took up residence under her lookout cabin. So plentiful is game, including elk and mountain goats, that 3,000 hunters visit the Columbia National Forest annually.

Over Snowfields in July, Pack Animals Carry a Summer's Supplies

To reach her third station, atop McGregor Mountain in Chelan National Forest, Miss Clark traveled on horseback up a trail which rises 6,000 feet in eight miles. Supplies were back-packed the last half-mile.

Kodachromes by Ella E. Clark

Before Taking Their Posts, Forest Guards Learn to Fight Fires

Part-time lookouts must undergo a four-day course which includes practice in extinguishing small blazes. Quick use of shovel and "Pulaski," a combined ax and hoe, often prevents woodland disasters.

lookout 20 miles away. Perhaps the trip up here across the snowfields and the rocks, to be described later, was an adventure in itself.

But the experiences I have enjoyed the most have not been adventures in the adolescent sense. In describing some of them, perhaps I can answer youth's question and also the frequent questions, "What did you do with your time besides looking and reading?" and "What is your recipe for 'taking it'?"

An amateur botanist has had the joy of discovery in the identification of a new flower; the pleasure of watching a curious plant, without leaves or greenery of any kind, grow until it could be identified as pine drops of the Indian pipe family; the pleasure of watching and wondering while lilies grew taller and taller, their buds forming and swelling—would they be tiger lilies or Washington lilies?

That rhododendronlike shrub which makes the dense undergrowth in the forest on the north slope of Steamboat Mountain—what kind of blossoms would its buds become and what shrub would it prove to be? Each summer I kept a list of the wild flowers seen, and each summer I had almost 100 varieties on the list. Those which remained unknowns I pressed and brought back to a botanist for identification.

Like a gardener, I had the fun of clearing away the fallen branches so that the glistening white petals and golden centers of queencups, in their bed at the edge of the forest, could be fully appreciated; of clearing out the dead brush and dead trees that marred the great display of Indian basket grass, perfectly landscaped with huckleberry bushes and surrounding firs and hemlocks.

These little self-appointed tasks lasted because, you remember, they were interrupted every twenty or thirty minutes by a study of the landscape. And to a lookout—at least to a contented lookout—the landscape is a constant source of joy.

"Deer Friends" Call

My deer friends, the first summer, were another source of pleasure. The very first evening, as I was watching the sunset glow over the Cascades and on my four great snow-capped peaks, I felt eyes upon me. Through the north windows a doe and a buck were watching me, all eyes and ears.

During my first night the doe bumped her way in and out of her basement apartment under the cabin (Plate VII). A week later, in the twilight, she brought her fawn down the lane through the woods. The next evenings they came at sunset, and soon the two browsed near the guard stations at all hours of the day, as did the buck and a second doe.

One noon when I went across to the weather station to make my report, all four deer were there. The buck slipped away, but the two does and the fawn stood only a few feet from me, alert and interested and perfectly still, while I went from station to anemometer to psychrometer to telephone.

Rooster Crow Baffles Deer

One morning the doe and fawn were near my windows when I turned on the radio for Sam Hays' newscast, which, as Pacific coast readers know, is always preceded by the crowing of a rooster. As I tuned in, the cock was in the act of crowing. The deer were startled and stood at attention facing me, their faces registering a most amusing series of expressions—surprise, wonder, amazement, puzzlement. The little fawn's expression made me laugh aloud.

They were quiet pets, with no barking or meowing or pawing. After weeks of silence, I once heard a strange cry somewhat like the squeak of a rodent caught in a trap. I went out expecting to rescue a chipmunk, but instead found the fawn looking for her mother and occasionally uttering that thin, sharp call.

The next time I heard that cry, Mother Deer was disciplining her young one and training her in independence. I had seen the doe go under the cabin (I never saw any of the other deer there), but the fawn was too busy browsing to notice. She called her mother, but the doe neither answered nor appeared.

The fawn repeated her call. Still no answer. Finally the little one turned away through the forest toward her hiding place among the alders on the south side of the mountain. I moved along in a parallel line with my camera, but the mother's instructions had been learned and I got no picture.

One "big fish that got away" still makes me lament. It was on a beautiful, crisp September morning when everything has that freshness peculiar to a morning after a rain. I had made the first weather report and was returning across the mountain.

As I came around a little grove of trees, I was surprised by three deer that had just emerged from the forest and were posed for the perfect picture. They were surprised, too. They stood in good light, the sun behind me, the forest behind them, the three does equidistant, each with head up and neck arched.

While they stared at me, I adjusted my camera. Just as I was ready to press the lever, I saw in the mirror the little fawn also staring at me. Fearing it would be hidden by the tall grass, I thoughtlessly took one step. Of

course the four bounded away into the forest on the other side of the meadow.

I regret that I cannot really share that picture, but it remains etched upon my memory as the perfect picture of deer: the forest background, the three does in the sunlight in the familiar alert posture, the fawn looking at me wistfully from the deep grass.

To the amateur photographer, life on a lookout in a beautiful setting is paradise. Deer do slip away into the shadows, but mountains and flowers remain; one has time to study the lighting and has opportunity to see the mountains and the sky in different moods and with different foreground.

Sometimes the whole interval between check looks has been spent in taking a single picture or merely in investigating the possibilities. Only one group of avalanche lilies on the north slope of Steamboat Mountain seemed ever to be in the sunlight, and then only for a short time at noon. The only accessible shrubs of white-flowered rhododendron glistened most in the late afternoon sun. Both were on slopes so steep that I could keep my balance only by hooking one leg around a small tree trunk, but the effort was fun and the results were worth the effort.

The brilliant pink or red penstemon on the rocks below had the richest coloring in the strong light of the early afternoon—directions for flower photography to the contrary. And the cloud effects over the mountains! Those people who have said, "After the first three days, the mountains must have looked alike," have never observed clouds, have never seen how they change the landscape, and what they add to pictures.

Mountains, Mountains Everywhere

But the greatest joy of all to one sensitive to scenic beauty is the magnificent panorama spread out before one at all times.

Imagine spending three months where you could enjoy with every meal four snow-capped peaks: St. Helens directly in front, Adams only a stone's throw to the right, Rainier between them but farther back, Hood far to the left. All can be seen from the dining table at Flattop Lookout, with but a slight turning of the head.

The setting sun touches the snowy crests with soft pink, and the long skyline above the ridge from Rainier to Hood, one hundred miles apart, is warm with burnished gold or pink and rose or more spectacular with tinted cloud formations.

From the other side of the mountain the view is less magnificent but not less pleasing. It is a study in green: dark green conifers down the slopes, in the valleys, and up to the timberline on Mount Adams, in so dense a forest that even with binoculars I could not see trail or camp or stream; lighter green of deciduous trees and shrubs along the creeks that join the White Salmon River; pale green meadows of the dairy farms in the valley; then a dark green ridge, another soft green valley, and finally the hazy bluffs of the Columbia River 20 miles away.

Seven miles from my nearest neighbor, 14 miles from the village, I never felt really isolated because the white farmhouses in the valley looked friendly and close.

Move across another valley ten miles to my second lookout station on Steamboat Mountain. Imagine washing dishes or kneading bread facing the White Salmon Glacier on Mount Adams or, with a half-turn of the head, seeing Mount Hood 55 miles away, and on very clear days having a glimpse of Mount Jefferson 100 miles away, peering over Mount Hood's shoulder, a white pyramid against the blue sky.

The City Price of a View

In the residential districts of Portland, I have been told, the view of one snow-capped peak adds from $500 to $1,000 to the value of a building site!

Adams, St. Helens, Hood, Rainier—each has its charms, but on my second lookout I was most impressed by Mount Rainier. Fifty miles to the north, across forested valleys and forested slopes, it stands glistening, a magnificent jewel perfectly set among smaller jewels.

The snow-capped mountains accent the quieter beauty of the rest of the landscape, which would be beautiful even without them—the miles and miles of tree-covered mountains and valleys, the little lakes down below, the jagged skyline made by Sunrise Peak, Jumbo, Hat Rock, Snagtooth, Craggy, Badger, and the other peaks, always different as the light changed and the clouds formed, shifted, and melted away.

Last summer I estimated that I could have detected smoke in 2,000 square miles of forest—an area twice the size of Luxembourg. Some people have been certain that the check looks would grow monotonous; but left alone with the trees for company, I acquired a sense of personal ownership, a strong desire to keep my possession green and beautiful. When I left the middle of September in a downpour of rain, I felt that it was *my* country that I was leaving safe until another season.

I saw the beauty of the silver firs and ponderosa pines near at hand and multiplied their beauty by thousands. "These beauteous

U. S. Forest Service, Official

Cloud Formations Like This Spell Trouble for the Forest Service

This thunderhead over Mount Adams, in the Columbia National Forest, preceded a series of lightning fires. At left, a woman lookout watches from her station atop a neighboring peak. Lightning starts about 90 percent of this region's forest blazes. Since the area is so sparsely populated, they often sweep over thousands of acres before they can be checked and controlled.

forms," the forest and the mountains, combine in a soul-stretching view, enjoyed over and over again during the summer and in retrospect during the winter months. For, like Wordsworth revisiting the Wye Valley—

> I have owed to them
> In hours of weariness, sensations sweet,
> Felt in the blood, and felt along the heart;
> And passing even into my purer mind
> With tranquil restoration.

I linger over this view from Steamboat Mountain, for it is my favorite of the panoramas displayed from my three lookouts.

The radio news in the summer of 1944 was exciting and heartening; on my map I followed our armies as they raced across western Europe, and I joyously re-broadcast the news by telephone to eager listeners at other Forest Service stations (once, to six at a time). Yet the destruction and the marching armies did not seem real; the realities were the serenity and the productivity, the dignity and the majesty of the natural world around me, in the diamond-shaped area pointed by four great peaks.

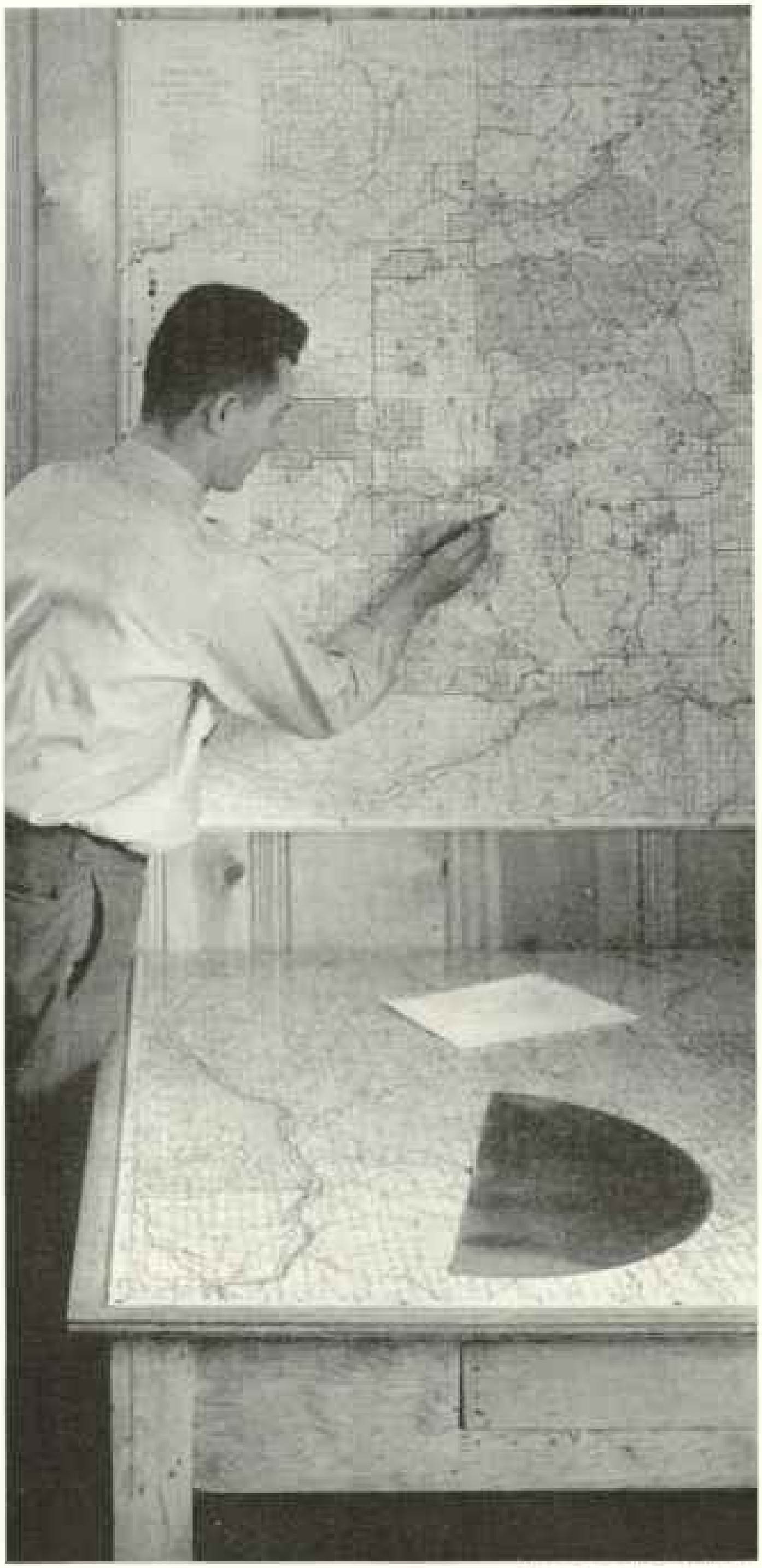
Alpine climbers among my readers may prefer my present view of the Cascades in northern Washington, especially if they do not contemplate spending two months upon this pin point of rock, with yawning abysses on three sides and a steep descent of boulders and loose rock on the other.

Climbing to McGregor Lookout

To reach my third lookout station, one must come by boat to the head of Lake Chelan (Plate VI), travel for eleven miles on a rocky Forest Service road along the Stehekin River, and then climb eight miles of trail, rising 6,000 feet.

The trail leads first through forest lush with thimbleberry and with bracken often horse-high, then through a wild chaos of rocks, tumbling streams, alpine firs and alpine larches, small meadows bright with heather, paintbrush, and blue lupine.

The trail has 187 switchbacks, I am told, and I am willing to accept the number. At times each new switchback brought a wider vista; a little more of that snow-capped ridge



U. S. Forest Service, Official

Pins on a Map Show Forest Fire Positions

By coordinating compass readings telephoned by lookouts from their remote stations, this Columbia National Forest dispatcher fixes the site of a new blaze. His next step is to order the nearest fire-fighting crew to the scene. Shadings on the map indicate the types of timber and help the dispatcher determine how many men and what kind of tools are needed. Wind and weather are also factors. The mountainous and heavily wooded area above is difficult of access.

became visible; the whole crest of another mountain appeared behind a crescent-shaped valley head. A few times on the fifth of July we dismounted and led our horses across the snowfields (Plate VIII). After three hours we were above the tree line, even above the dwarf conifers.

About one-half mile from McGregor Lookout, perched above us on a perpendicular wall of rock, the packer left me and my summer's supplies and took the horses back to High Bridge, from where next morning he would return with the kerosene for the summer's cooking and heating.

In the shelter of a boulder, shelter from both glaring sun and chill wind, I watched for nearly two hours while the trail crew brought a telephone wire down from the lookout. That is, I watched as often as I could endure the fascinating horror of seeing a Forest Service official and three youths bring or throw a copper wire from crag to crag, seeing them climb over sharp ridges and along ravines where a false step would be the last step.

Yet a husky high school boy whistled as he worked and laughed as he slid down the snowfield. In his hand he held a rock attached to the wire, the rock which he had flung from the last sharp ridge above the snowfield. Never again will I look casually at telephone lines in hazardous places.

A half-mile is a short distance except when it is turned on end. This last half-mile to the lookout required one hour of climbing and of stopping for breath in the rarefied air. Up we went across the snowfields and over the rocks, the leader and the boys carrying 40 to 60 pounds apiece in their back-packs and I feeling that my camera equipment and ski jacket were sufficient pack for me. I literally followed in the footsteps of the leader, and all of us kept our

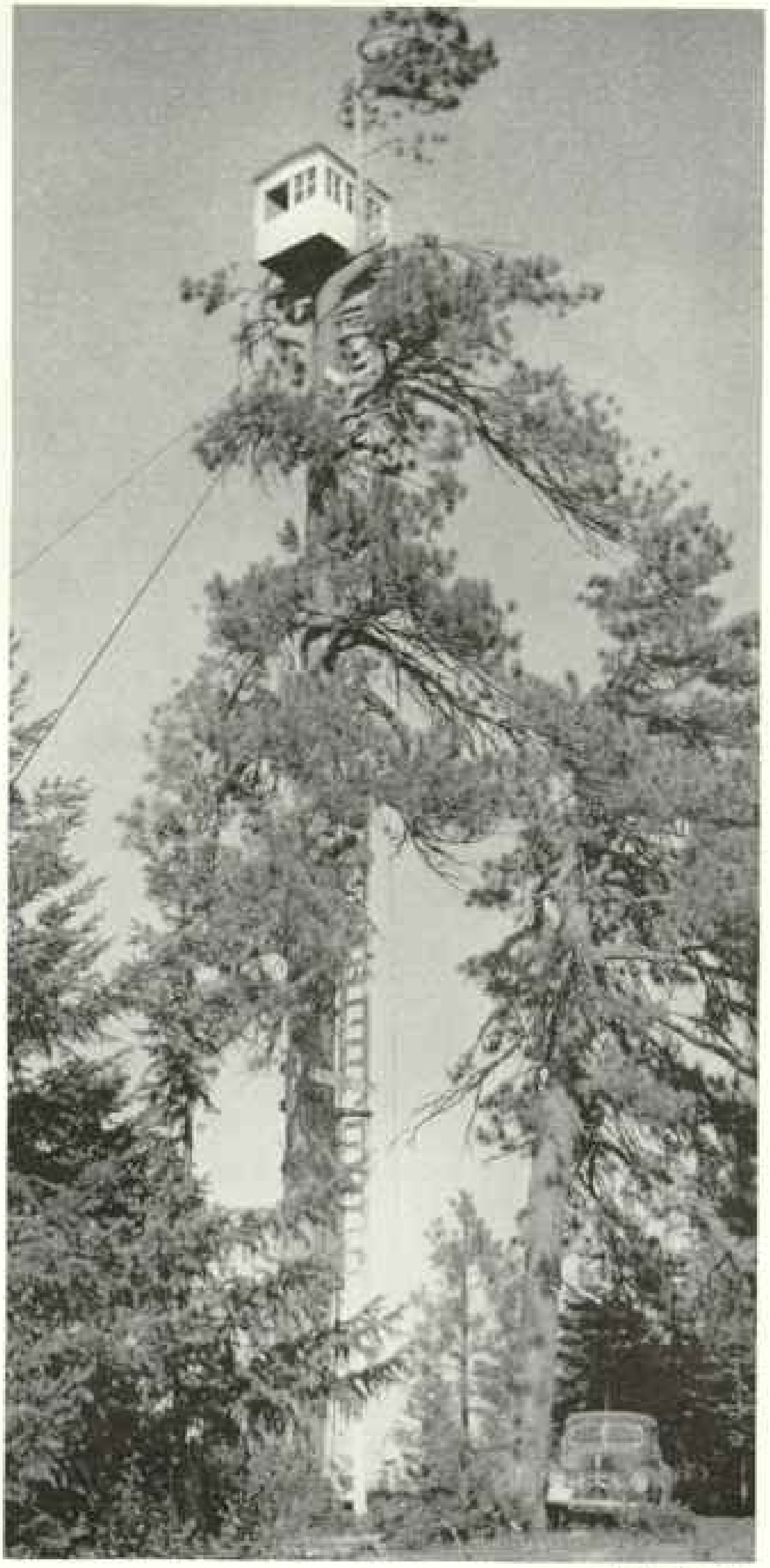
hands free to balance ourselves on the rocks wherever the trail was especially steep and narrow beside an abrupt drop (Plate V).

From the top of the mountain, 8,140 feet in altitude, the landscape first seemed a chaos of snowfields and sharp, ugly rocks near the station, a wild jumble of chimneys and points and sawtooth ridges against the sky, with forests on the lower slopes and in the valleys. It was as if Paul Bunyan had angrily hurled rocks as far as he could in all directions and then, repenting his anger, had planted trees at the base of the rocks and hoped, in vain, that they would spread to the top.

But gradually I began to bring some kind of order out of the chaos and to see something of grandeur in it. The Stehekin River is the unifying element in the picture, a diminutive river to give unity to so vast a scene. The blue-green water and occasional white flecks of its last eight miles are visible from the lookout tower as it meanders through the trees before flowing into Lake Chelan.

From here, more than a mile above it, the river looks quiet and slow, but I can hear its roar, and I know that those white flecks are the foam of its tumble over and around boulders. To the southeast, probably 15 miles of the upper part of Lake Chelan wind around its numerous wooded points, its water usually blue-green, sometimes touched with purple shadows, sometimes dotted with whitecaps, often turquoise blue without a ripple. In the opposite direction, the water of the Stehekin is hidden by near-by crags, but one can trace its valley up above the tree line and to the river's source in streams below Cascade Pass and Horseshoe Basin. On clear days one can see the snow-capped peaks above that basin.

Down the steep slopes which almost surround me come the



Keith C. Langfield

When the Wind Blows, the Station Does Rock!

State and Federal agencies cooperate in manning this lookout crowning a tall ponderosa pine. The tree stands in a Washington State forest along the eastern boundary of Columbia National Forest. The guard is employed by the State, trained by the U. S. Forest Service, and has telephone connections with both State and Federal fire dispatchers. Most tree lookouts consist merely of platforms; this one is unusual for being a cabin.

U. S. Forest Service, Official

Forest Fire Fighters Work at Close Quarters

Singed hair and eyebrows may be the lot of this man demonstrating a back-pack pump. By operating a sliding pump near the nozzle, he generates a strong stream of water. In recent years, specially trained "smoke jumpers" and equipment have been parachuted to battle woodland blazes in six western States. Where possible, spread of a fire is checked by the "one-lick" method, by which men in single file dig and successively widen a trench in the path of the blaze.

hundreds of streams which flow directly or indirectly into the Stehekin River. From here they look like mere trickles, but as I have hiked along that narrow silver ribbon which on my firefinder map is labeled Agnes Creek, I surmise that many a trickle, at this time of melting snows, tumbles and rushes and roars down its own deep and narrow canyon.

A tin can which I dropped from the bridge across the Agnes Gorge was several yards downstream almost as soon as it touched the water and was swallowed quickly by the white rapids. At normal level the water is 220 feet below the bridge, in a canyon which is about 90 feet wide. Agnes Gorge is picturesque and fascinating—a Grand Canyon in miniature.

Looking out from McGregor, the eye follows Agnes Creek for three winding miles beyond the gorge, seeing its water as silver flashes here and there among the trees. Above the forested valley head of one fork is Dome Peak, 8,860 feet in altitude, a long, snow-covered ridge flanked by sharp spurs and many glaciers. To the left, above the head of another fork, stands Glacier Peak, 25 miles away, the fourth highest mountain in Washington. Like its taller brothers—Rainier, Adams, and Baker—it is clothed in white.

A Landscape of Towering Peaks

A Forest Service list of the 25 highest peaks in the State of Washington shows that 14 of them, ranging from 8,590 to 9,500 feet in altitude, are in the Chelan National Forest. At least

Ray M. Wilson

Student Smoke-eaters Put Out Practice Fires

These fire fighters learn their trade at a school in the Umatilla National Forest, Oregon. They wield the Pulaski, a combination ax and hoe designed by Edward Pulaski, hero of the disastrous Idaho blaze of 1910 (Plate VIII). By constant research and use of new methods, Federal and State agencies strive to reduce the 200,000 fires which annually burn over about 31,000,000 acres of forest land in the United States.

seven of them are seen from this lookout. My own count on my firefinder map tells me that within a radius of 20 miles from McGregor are at least 62 peaks above 7,000 feet in altitude.

I say "at least" because an old-timer in the forest and in the Service tells me that this area has never been mapped in detail.

I have climbed or ridden horseback in the Lake Louise country of the Canadian Rockies, in Glacier National Park, up to 7,500 feet on Mount Rainier, along the Cascade Crest Trail in the Mount Adams country, in the Olympics of western Washington, in the Wallowas of eastern Oregon, and in Yosemite, and I have driven through the Swiss Alps. But I have never seen such rugged country as this.

Ages ago, glaciers cut and carved the great plateau which was the original Cascade Range, and the rivers and creeks which travel down the gorges made by the great ice streams have continued to cut and carve for many centuries. It is easy to believe the statement of the late Henry Gannett, formerly chief geographer for the U. S. Geological Survey and President of the National Geographic Society from 1910 to 1914: "Of the many ice-cut gorges of the [Cascade] Range, that of Lake Chelan and its tributaries is probably the finest."

Ravaged Slopes Record Fire Tragedies

I should be unfaithful to my trust if I left the impression that looking out from a lookout brings one into contact with only beauty and grandeur.

Facing me, above Agnes Creek on the right, is a slope bare and denuded except where Nature has tried to heal the ravages of fire. On my way to Agnes Gorge I passed through part of that graveyard of the forest, and I was grieved by the charred remains of what was once a beautiful and valuable piece of virgin timber.

Across the creek is a burn which tells an even sadder story. A fire fighter, returning from extinguishing a small lightning fire, failed to heed the rules of the forest, lighted a cigarette, threw down a burning match, and started one of the biggest fires in this area.

I recall those burned-over acres which spoiled part of my view during my second summer—ugly scars, wasted timber, now highly inflammable material for lightning fires which could destroy the young trees there and quickly spread to mature trees. Almost every forest one enters bears these pathetic, silent, ghostlike, black or gray evidences of what man has done to Nature. For man is responsible for most of these graveyards.

"Nine out of every ten fires are man-made. Smoking, camping, debris-burning, logging operations, incendiarism, and lightning are among the chief causes of forest fires. In a recent five-year period 7.6 percent of all fires recorded were caused by lightning, and the remaining 92.4 percent were man-caused.

"One-half of all fires in the national forests are started by careless campers who build their campfires too large or leave them without being sure that all the sparks are out."

During the five-year period ending in 1944, studies were made of the fires in all protected forests. State and private lands were included in this study, as well as national forests. Of a total of some 418,000 fires, 9.3 percent were started by lightning; 15.5 percent by debris-burning; 23.2 percent by smokers; 26.5 percent by incendiarists. In other words, so far as number of fires is concerned, smokers and incendiarists were about equally criminal!

Have we considered what these destructive fires mean to the public? They destroy scenic beauty and the playgrounds of the millions of Americans who visit our forests annually. They destroy forested watersheds which minimize floods and soil erosion and which protect the water supply of hundreds of cities, of power plants, and of irrigated farms (half the farms of 11 western States are irrigated).

They burn the forage of thousands of domestic animals, the homes of wild creatures, and hundreds of animals themselves. They destroy the source of a multitude of products, from golf tees and ball bats to 95 percent of our furniture and 80 percent of our houses, and the source of an increasing number of chemically made products as widely different as cattle feed, rayon, photographic film, and plastics.

This last list will gradually become longer, for scientists are challenged by the fact that at present from 50 to 70 percent of a tree is wasted in the woods and in the mills.

Forests Help Our Daily Living

Directly or indirectly, forests contribute to every aspect of our everyday living. They furnish us with shelter, water, food, clothing, fuel, electric power, newsprint, entertainment, and esthetic enjoyment.

As I write, a terrifying and devastating fire is roaring through nearly 267,000 acres of forest in western Oregon. In the same area, in 1933, a fire in some of the best timber in the State destroyed as much as had been cut in the whole United States in 1932! The estimated financial loss to industry and to the public was $350,000,000.

We are steadily reducing virgin forests, and "second-growth forests are being cut and burned almost as fast as they grow." We allow 75 to 80 million acres of timber-growing land to lie idle as a result of cutting and burning. At the rate we were proceeding in 1941, it would take us an estimated 22 years to complete the replanting needed in our national forests alone. Many owners of lands in need of planting are not replanting at all. All programs of reforestation were seriously retarded by the war, at the same time that cutting had to be increased greatly.

Three summers have not made me an authority on forestry. I have merely observed, listened, and read in thoughtful solitude twelve pamphlets published by the Forest Service of the Department of Agriculture.

I have become aware of an urgent domestic problem. To one who has spent 25 weeks looking out upon the green beauty of three forested areas and upon denuded spots which should be green, it seems clear that we need a Nation-wide program for our forests, for both the publicly owned and the privately owned—a long-range program of forest protection, restoration, and development.

We need to prevent 92 percent of our forest fires. We need more, not fewer, forests as luxuriant and beautiful as the wooded slopes and valleys, like dark green waves of a dark green sea, which lie between Steamboat Lookout and Mount Rainier.

Farewell to Bikini

By Carl Markwith*

With Illustrations from Photographs by the Author

ABOUT the middle of February, 1946, modern civilization suddenly overtook the natives of Bikini Atoll in the Ralik Chain of the Marshall Islands.†

These brown people had progressed to using kerosene lanterns and a few imported steel hand tools, introduced by missionaries. Thanks to the Japs and our own armed forces, they were familiar with many kinds of airplanes, but ships were something that passed far at sea, if at all.

A few could read and write their simple language, and Juda, the local chief, could speak and understand a little English. The outside world they knew little about, and cared less.

Then the U. S. Navy decided that Bikini was the place to test the atomic bomb, and almost overnight the natives found themselves in the Atomic Age.‡

The first inkling the Bikinians had of this was the arrival of Commodore Ben H. Wyatt and his staff to gain their consent to the test and to arrange for their evacuation to safety on another island in the Marshall group. After much discussion, Juda arose and spoke for his people. He signified that they would be happy to cooperate.

The arrival of the Navy Hydrographic Office survey ships *Sumner* and *Bowditch* in Bikini lagoon a few days later inaugurated what is now known as Operation Crossroads. Their crews of scientists, naturalists, and engineers began surveys of the lagoon, catalogued and classified animal and vegetable life, and started clearing a channel to the beach for landing and evacuation craft.

Pioneers Sail for New Home

LST 1108 arrived and took about twenty of the native men to Rongerik, their future home, about 125 miles to the east. This group was paid by the Navy to help a detachment of Seabees under Lt. Comdr. Harold W. Grieve, of Commodore Wyatt's staff, erect temporary tent housing and provide a water supply for the main body which was to follow.

None of this had much effect upon the islanders remaining on Bikini until the arrival, on March 2, of a Navy photographic team from Washington, D. C., under the direction of Comdr. Frederick A. Spencer. I had the good fortune to be one of the motion-picture sound men in that crew.

Bikini, as I first saw it from the air, was something to remember. I'd been seeing South Sea islands as they looked after both we and the Japs had had our innings—hot, dirty heaps of coral overrun with military installations, roaring with gasoline engines, reeking of Diesel oil, and almost completely treeless.

Bikini Island was a long, narrow crescent of gleaming sand, well grown with palms and other vegetation and framing one side of a lagoon of incredibly blue and green water. As our PBM taxied across the lagoon to its mooring, a small outrigger canoe dashed past toward the beach, where sailing outriggers were drawn up and boys played in the water.

When I commented that the setting might have come out of Nordhoff and Hall's stories about the South Seas, one of the sailors in the whaleboat alongside said, "Naw, you mean the National Geographic."

Whaleboat Transfers Supplies

We and almost 3,000 pounds of gear were finally transferred by whaleboat to the deck of the *Sumner*, which was to be our base of operations for a week. The rest of that day was spent in getting settled in quarters and checking over the mass of equipment necessary for making sound motion pictures. Officers and crew of the already overcrowded *Sumner* gladly made room for us.

Early the next morning, Sunday, March 3, some of the crew gave us our first taste of what they called "duckin'." With their assistance, we loaded ourselves and the inevitable boxes and cases into one of those wonderful seagoing trucks known as a DUKW, or Duck, which was bobbing at the foot of the quarter-deck sea ladder. The coxswain—or should I say driver—cast off and literally set us on the beach (pages 98, 100).

* The author, now on leave from the National Geographic Society, is a Photographer's Mate, 3d class, U. S. N. R. He visited Bikini and Rongerik as a member of a Navy photographic team.

† See Map of the Pacific Ocean with 73 Island Insets, supplement to National Geographic Magazine, December, 1936.

‡ See "Our New Military Wards, the Marshalls," by W. Robert Moore, National Geographic Magazine, September, 1943, especially map on page 329; "Hidden Key to the Pacific," by Willard Price, June, 1942; "American Pathfinders in the Pacific," by William H. Nicholas, May, 1946; and "Your Navy as Peace Insurance," by Fleet Admiral Chester W. Nimitz, June, 1946.

Photographers from U. S. S. *Sumner* Go "Ducking" in Bikini's Lagoon

An amphibious DUKW, now known around the world as a "Duck," carries them shoreward from the Navy hydrographic survey ship in background. The *Sumner's* scientists and engineers did advance mapping and supervised clearing of coral from landing points and anchorages before the arrival in the lagoon of Joint Army-Navy Task Force One for the atomic bomb tests.

Only one of us got damp. He was so incautious as to sit down over the vent from an automatic bilge pump. The laugh that went up when that pump started to work gave us all a good start for the day.

As the Duck climbed up the beach, Chief Juda and the town crier met us with a cheery good morning and rode with us the length of the village to the site of the final open-air church service. Most of the other villagers were there ahead of us and sat around watching while we went through the organized confusion that always precedes the making of a sound motion-picture sequence.

There was the usual discussion over camera and light angles, the concealment of microphones, the placement of "stars" and "extras," with much peering through a viewfinder and a great deal of shouting and running about.

Finally the Duck was jockeyed into place (that sailor driver could back a tank into the average garage with room to spare), the sound camera mounted on the bow, "mike" lines buried in the coral, the minister instructed to screen the one mike from the camera with his body, and the second mike suspended in a palm tree. We were ready to "roll 'em."

Palms "Scream" into "Mike"

The setting was idyllic, with a native hut of palm and pandanus leaves against the green lagoon in the background and the natives sitting on palm-fiber mats at the feet of their minister in the shade of the whispering palms.

Did I say *whispering* palms? To the human ear it may sound like a whisper, but to the recorder's "mike" it is a shout. Davis, wearing the earphones, instantly renamed them "screaming palms," and so they remained until we left.

The islanders had carried on a desultory conversation among themselves, paying only

slight attention to us. When actual shooting began, they followed instructions from Commander Spencer and Chief Photographer's Mate Woodward, relayed through our interpreter, to the best of their ability. All were interested and helpful—for two takes.

When it was decided to do it all a third time, there were some smiles and discussion, but when we started the "just once more" routine and followed that with close-ups, they decided we *were* crazy and began to wander off, muttering.

If the poor minister didn't already know his service by rote, he did when we finished (pages 103, 104).

After noon chow aboard the *Sumner*, Lincoln, the assistant cameraman, and I cornered the crew's interpreter, James Milne, a native of Tarawa in the Gilbert Islands, and hopefully tried to learn the local language.

In a half hour Jimmy had given us the alphabet, with instructions for pronouncing each letter, and a glossary of words that would be most helpful in placing the natives for cameras and mikes.

We had been met with a smiling hello from almost every native on the island and decided to return the favor in Marshallese; so, upon returning to the beach, I tried out my "Yok-we-yuk" on the first elder I met, carefully pronouncing each syllable. He laughed heartily and came back with a lot of other words and something that sounded like "Yokyuk."

I tried again and soon had a crowd, all trying to help. We finally compromised on "Hello" and I made a strategic withdrawal to await further instructions. Lincoln fared little better.

An hour with Jimmy that night enabled us to make ourselves understood without too much amusement when we tried again the next morning.

The islanders exhibited keen delight in our efforts to learn their language. They laughed a good deal at our blundering, but tried to help. A request to *Jouj em ji jet* ("please sit here")—got a much quicker response than if relayed through Jimmy. *Kommol* (thank you) from one of us for some small service never failed to win a smile and a *Kin jouj* (literally "we please" or "you're welcome") in return.

Hungry? Prospect the Cooking Pit

As the moving-picture crew progressed through the various phases of native life, we gained a fair insight into the lives and personalities of the Bikinians. They are a friendly brown people, small in stature but beautifully formed, and apparently very healthy. They loaf and sleep during the midday heat, but are active enough in the early morning and after 3 p.m.

Food from the sea and reefs, the palms, pandanus (screw pine), and other plants, is prepared on a series of community fires built in pits just above the beach. The fire is allowed to burn down to coals, and then the food, wrapped in leaves, is buried in the coals, covered with ashes, and left to cook and keep warm until late the next day. Anyone feeling hungry just digs around in the heap until he finds what he wants.

Like most small boys, those of Bikini always seem to be hungry—at least they were always either eating or prospecting the cooking pits.

Thirsty? Drink Coconut Milk

Water for drinking and washing is caught on large sheet-iron-covered racks arranged to drain into covered concrete storage tanks (page 109). However, there are plenty of green coconuts to be had for the picking, and most prefer to satisfy their thirst with the milk from these.

The fruit of the pandanus, when chewed, yields a mildly acid juice which also is a good thirst quencher. The dense brush that crowds in from the windward beach provides taro root and edible fruits and berries.

Sprouted coconuts contain a ball of what looks like wet cotton and is called *yw*. This is eaten raw and has a rich nutty flavor. When cut off right at its juncture with the outer shell, the shoot from the same nut yields a soft nutty core about twice the diameter of a pencil and several inches long. This also is eaten raw and is considered the greatest delicacy to be found in the islands.

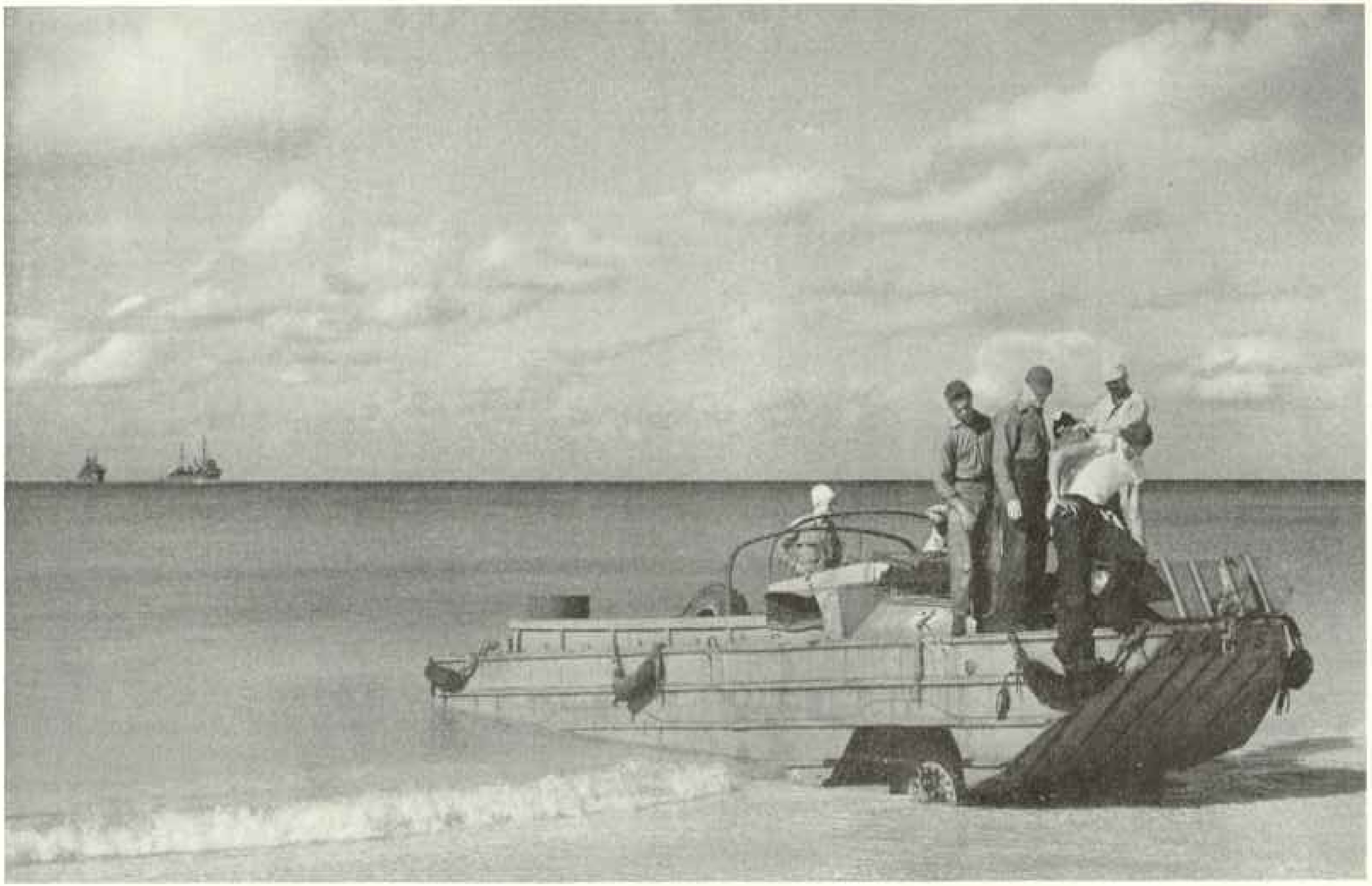
Fishing is done with spears and also with small handmade seines much like the modern gill net. Fish are surrounded and drummed into the meshes, or the net is run out in a crescent from shore, and then both ends are pulled in together, bringing the fish along.

Some fish are eaten raw. All are killed as soon as caught by severing the spinal cord just back of the head.

The fisherman simply bites in with his teeth and hangs on until the fish stops wiggling. Some of the younger boys are quick enough to catch with their hands the fish trapped in the tide pools.

Because they are a circumspect people, the islanders had a high time laughing and pointing when any of us went swimming, with or without our trunks.

Island etiquette reserves the lagoon beach



Navy Photographers "Invade" Bikini by Duck to Film Final Scenes on an Island Which May Be Blasted from the Earth

Here the amphibian makes slow time overcoming a coral ridge just at the surf line. More impatient members of the party, including the author who made this picture, got wet to the waist jumping into the surf and wading ashore. Those who remained soon landed high and dry.

Carrying the Message to Bikini! U. S. Navy Officers Tell of the Proposed Transfer of the Islanders to a New Home

Here the historic scene is reenacted for the benefit of Navy sound cameramen. Commodore Wyatt is seated on the palm bole, left foreground. When the proposal was made, Chief Juda responded that the Bikinians were very proud to be a part of the undertaking, and would move elsewhere (page 97)

Island Boys Mastered the Game of Darts in Short Order

After a few days of practice, they were able to give pointers to Chief Bos'n's Mate Dillon, of the *Sumner*. The board and darts are part of the recreation equipment landed on Bikini for U. S. Navy personnel assigned to the bomb tests.

with its clean sand bottom for the women, and requires the men to use the sea beach behind the barrier reef. This outer lagoon is almost completely covered by coral outcroppings of all sizes and degrees of sharpness, making it a very dangerous place for the uninitiated white man.

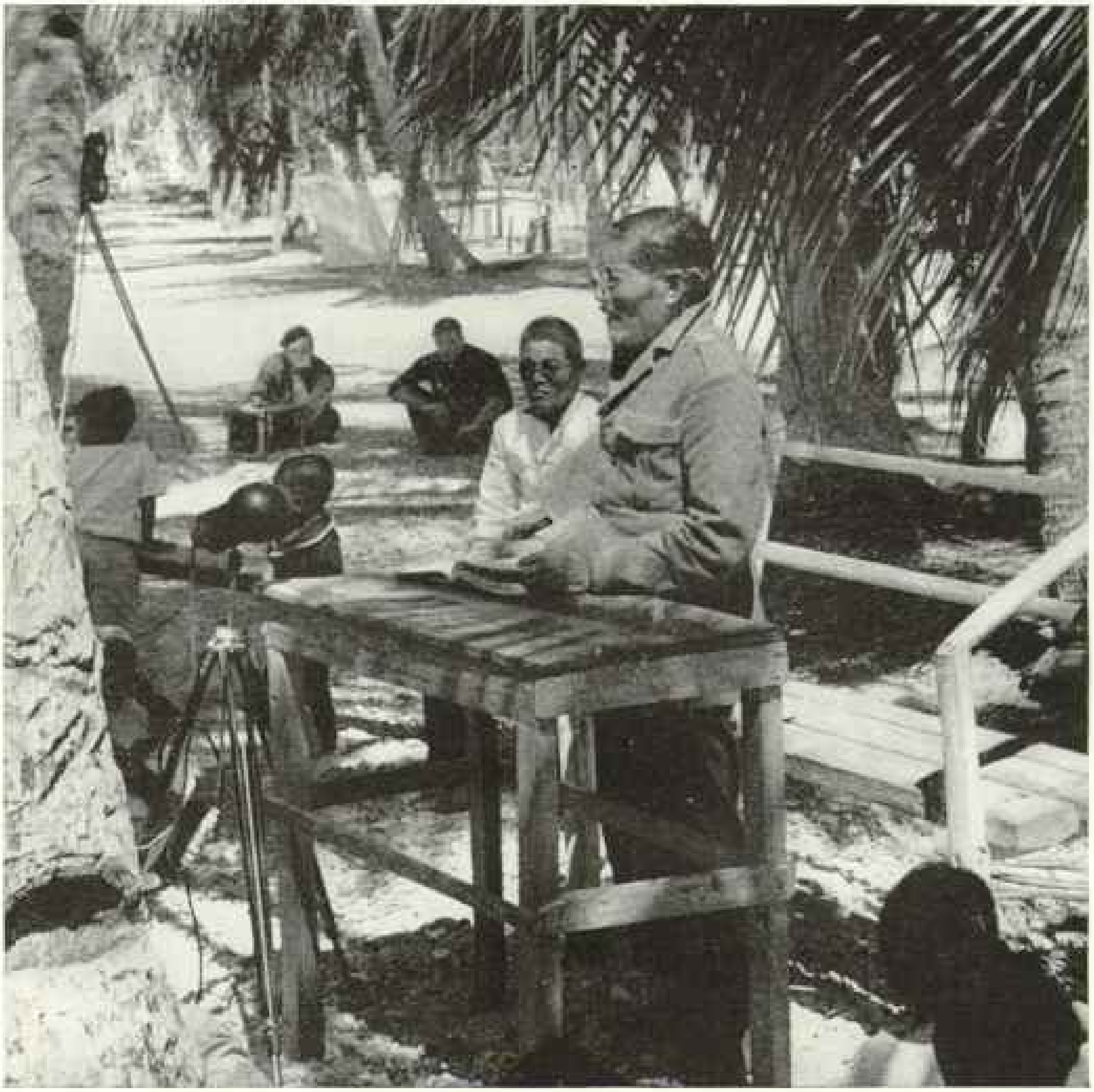
The well-developed native sense of humor led to much merriment for all hands. Chief Bos'n's Mate Dillon, of the *Sumner*, had a full set of store teeth, and when he took them out in front of a group of small fry he nearly created a riot.

Some left in a hurry, but most howled with laughter and then demanded an encore from every white man around. They were much disappointed to find that most of us could not comply.

Chief Photographer's Mate Woodward is a very excitable man. When things don't go to his liking, he is apt to explode into picturesque profanity.

Both the language difference and the speed with which we had to work contributed to frequent misunderstandings.

At such times Woody's words tumbled over one another in an almost continuous stream, adding to the confusion and delighting the natives with whom he was working. After one of these outbursts, Jimmy confided to



Jibaj, Bikini's Minister, Reads from His Marshallese Prayer Book

Sound motion-picture equipment records the church service. The congregation is seated on palm fronds before the reading table. Jibaj wears a cast-off military coat and his prized gold-rimmed spectacles, which he keeps in place on his broad nose by a piece of white cord tied around the back of his head.

some of us that the islanders had asked him if he spoke English.

A Monocle Creates a Sensation

Jibaj, the minister, wore gold-rimmed spectacles, and some of the younger men wore Navy-issue sun goggles; so those of us who wore glasses came in for no special attention. Woody was different. He had a monocle which he used only for close-up work. The first time he screwed it into his right eye to check a lens setting he created a furor. The islanders pointed, whispered, and giggled, and then followed him around to study this phenomenon.

Less than an hour later I saw a couple of the devilish little boys imitating, with pieces of tin, Woody's method of adjusting the monocle. Fortunately, Woody has as good a sense of humor as the rest of us and laughed heartily.

The island form of government is, apparently, an ideal arrangement. Juda is chief and arbiter, not king. He is assisted by some of the older men and the minister, who is much respected. The chief is selected by the others for his ability as a leader and holds his post only so long as the majority is satisfied with the results.

Through the chief, the Bikinians are responsible to the king of the Ralik Chain of

In Bikini Cemetery Islanders Gather for a Farewell Ceremony Before Departing for Rongerik Atoll

Their minister, standing, repeats a simple Congregational service, committing to the care of God the bodies they must leave behind. Navy sound cameramen recorded the touching scene on film. Many of the villagers, camera-conscious by this time, insisted on facing the photographer instead of the minister.

John V. Lincoln

Islanders Turn the Tables on the Author, Inviting Him into the Family Circle for a Photograph

One girl primps, others deliberately pose. The hut is a combination of imported Jap-sawed lumber, island palm poles, and thatching. Much of the side thatching has been removed for transport to Rongerik.

The Belle of Bikini Forgets Coquetry to Play Darts

She made eyes at U. S. sailors and giggled and blushed when they spoke to her. Here she joins island boys in a game of marksmanship. Island youngsters developed surprising accuracy in tossing the feathered darts (page 102).

the Marshalls. Family seat of this chieftain, who holds his post by right of inheritance, is on Ailinglapalap Atoll, which was held by a small Japanese garrison during the war.

In the event of the Bikini chief's death, he may be succeeded by his son or another member of his family, but only with the consent of the rest of the population. Apparently, instead of formal elections, everyone just agrees and that is that. Simple, just, and efficient.

Home building is a rather simple affair, too. The builder just picks a spot to his liking that does not interfere with any previous choice and sets a few palm posts in the sand. To these he notches and ties beams for the floor and carries the framework for walls and roof up to the desired height.

Meanwhile, the women of the family have been cutting and drying palm and pandanus leaves and plaiting them into matting for the walls and the flooring, which is of small round poles.

The rather steeply pitched roof is thatched with dried palm fronds, which do a good job of keeping out the weather.

Openings for door and windows are framed of small palm poles and hung with more of the beautifully woven matting, arranged so it can be rolled up and fastened out of the way. Some of the wall panels are made from single palm fronds, plaited to do the same job as a modern Venetian blind, letting in light and air and keeping out sun and Peeping Toms.

At several points around the village, usually close to the large concrete water tanks, were small tentlike structures of closely woven matting, which were not anchored down. Jimmy explained that these were the cooking houses, dragged over the open fire by the cooks in the event of a cloudburst.

Back in the brush at the edge of the ravine that ran the length of the island were little thatch enclosures used for sanitary purposes. Most of these were unroofed. Almost in the center of the village and right beside the main "street" was a rather dilapidated hut which Jimmy told us was the local house of ill fame.

Islanders Clever with Their Hands

We found the Bikinians to be very clever with their hands in the use of palm and pandanus fiber for building, ornamentation, fishing gear, and other purposes.

Palm-fiber cordage is made both by braid-

ing and by rolling and comes in many sizes. Both palm and pandanus leaves are used for weaving and plaiting. Juices extracted from berries and roots are used for dyes, which are soft and blend well with each other.

Woven Bracelets at $1 Each

Among the decorative articles made by the natives are bracelets, woven of palm, pandanus, or both, and varying in width from half an inch to three times that. As many as four colors were woven into some versions, and the geometrical patterns were well designed and executed. We were fortunate enough to buy some of these at the Military Government price of $1 each.

After watching the girls making these and learning that each one required about three days of continuous work, I wondered who was taking advantage of whom.

We were not able to obtain any of the woven cigarette cases that match the bracelets, because everyone was too busy preparing for the move to Rongerik to bother making them.

From Dyed Pandanus Fibers She Weaves a Cigarette Case

The fibers are tightly twisted, then woven into shape over a wooden form in precise geometric patterns. This work ceased soon after the author's arrival because of the rush to leave the island, and the cases became unobtainable.

The windward, or sea, beach abounded with shells of all shapes and sizes, which the men collected and the women polished and strung on palm cord to form necklaces. Some of these necklaces were of rare beauty, but they seemed to be made only for trade goods, as I seldom saw them worn with any but everyday clothes.

Here Clothes Are No Problem

Clothing seems relatively unimportant to the Bikinians in their day-to-day living. The women usually wear the long, shapeless cotton-print gown introduced by the missionaries, adorned with native jewelry and such odd things as GI jackknives and discarded GI identification tags.

The men sport a strange array of garments ranging from blue-serge trousers and white waiters' coats to tattered dungarees and battered sun helmets. The younger children wear no more than mother demands, usually nothing at all. Shoes are highly prized—and are worn until they fall apart. However, they are not necessary, as no one seems to mind the sharp coral and burning sand. Actually, walking in the yielding stuff is easier barefoot than with shoes, if soles are not too tender to stand the gaff.

Perhaps the most highly developed native craft is construction of sailing outrigger canoes, ranging from 15 to 25 feet.

The hulls are built of two palm logs. The lower one is carefully tapered lengthwise to form the almost knifelike keel, and is dug out to a thickness of about one inch. The ends of this log are formed to match the tapered ends of the upper log, which is much longer and larger, hollowed completely through the center, and fitted to match the recess in the lower one.

The joint between the two sections is carefully fitted and the sections then fastened together with finely twisted palm-fiber cords passed through holes drilled near the seam.

An ingenious toggle arrangement on the inside of the hull permits tightening these cords whenever necessary. The seams are calked with a cottony fiber obtained by beating dried pandanus leaves, and the swelling action of the water makes a nearly watertight joint.

Some bailing is always necessary, perhaps because the boats are hauled out on the beach in the blazing sun when not in use. One or two of the hulls we saw had been constructed with planking for the upper section, and we saw an occasional nail used to reinforce the cordage or to repair a break.

The outrigger booms, float, and decking are all carefully mortised together and secured with the palm-cord lashing. Standing and running rigging is of palm fiber in an assortment of sizes, but the sails we saw were of canvas. When furled, the sails are protected by a waterproof cover of pandanus matting.

Boats That Sail from Either End

These craft are so designed that they will sail equally well from either end. The mast is stepped in a sort of universal joint. Adjustable stays are used to control its angle to the beam and its rake aft.

The throat of the lateen-rigged sail is attached to that end of the hull which is most convenient in relation to wind and course to be made good. Instead of turning the canoe through the wind, the islander simply unhooks the sail, transfers it to the other end of the canoe, and refastens it. In less than a minute the craft is headed in the opposite direction.

This reversing operation is complicated and requires the finest kind of teamwork. It begins with a great deal of shouting between the helmsman and crew and some hasty scampering about. When everything is ready, a single command is given and the yards are loosened, walked around the mast, and refastened in the new position. The mast is set at a new angle and the boat is off on her new course.

After watching this performance, we found it easy to understand why fat men are unpopular as crewmen aboard these canoes, which have a maximum beam of about 18 inches.

Outrigger Outraces Whaleboat

Commander Spencer wanted some close-up footage of an outrigger in action; so part of the camera crew set out in a whaleboat and the rest photographed the launching from the beach. Almost as soon as they hoisted sail, the native crew discovered that they could overtake and pass the motor whaler at will. They were delighted and began to show off at a great rate, grazing coral heads and the whaler's stern and in every way proving themselves good sailors.

The performance continued until they became careless and had to be fished out after capsizing. Before the canoe had been entirely bailed out, the sail went up again and there was a race with the powerboat for the beach. The outrigger won easily.

The island school had been housed in the government building which, with the church, had been dismantled and taken to Rongerik. As a result, school was suspended until after the move, and the brown youngsters were really enjoying the unexpected holiday. The minister and some of the other older men supervised the study of reading, writing, and arithmetic.

I saw several printed prayer and hymn books at church services and there were books in several of the homes.

Arithmetic must have taken a thorough hold, for all knew how to count and the value of American money. If the brown children are as apt at their three R's as at picking up English words and phrases from the Navy crews working on the islands, they must be a delight to teach.

Each night during our stay aboard, sound motion pictures were shown on the afterdeck of the *Sumner*, and the captain nearly always saw to it that some of the natives were present. I tried to interpret the expressions on their faces as they sat there in the dark, completely engrossed. What must they have thought about a Roy Rogers western, a Hollywood bedroom farce, or Mickey Mouse in technicolor.

When I questioned Jimmy about this, he shrugged and asked, "How can I explain it to them?" I still wonder if they were able to connect the antics of the camera and sound crews in daylight with the enormous shadows and booming sound they witnessed at night.

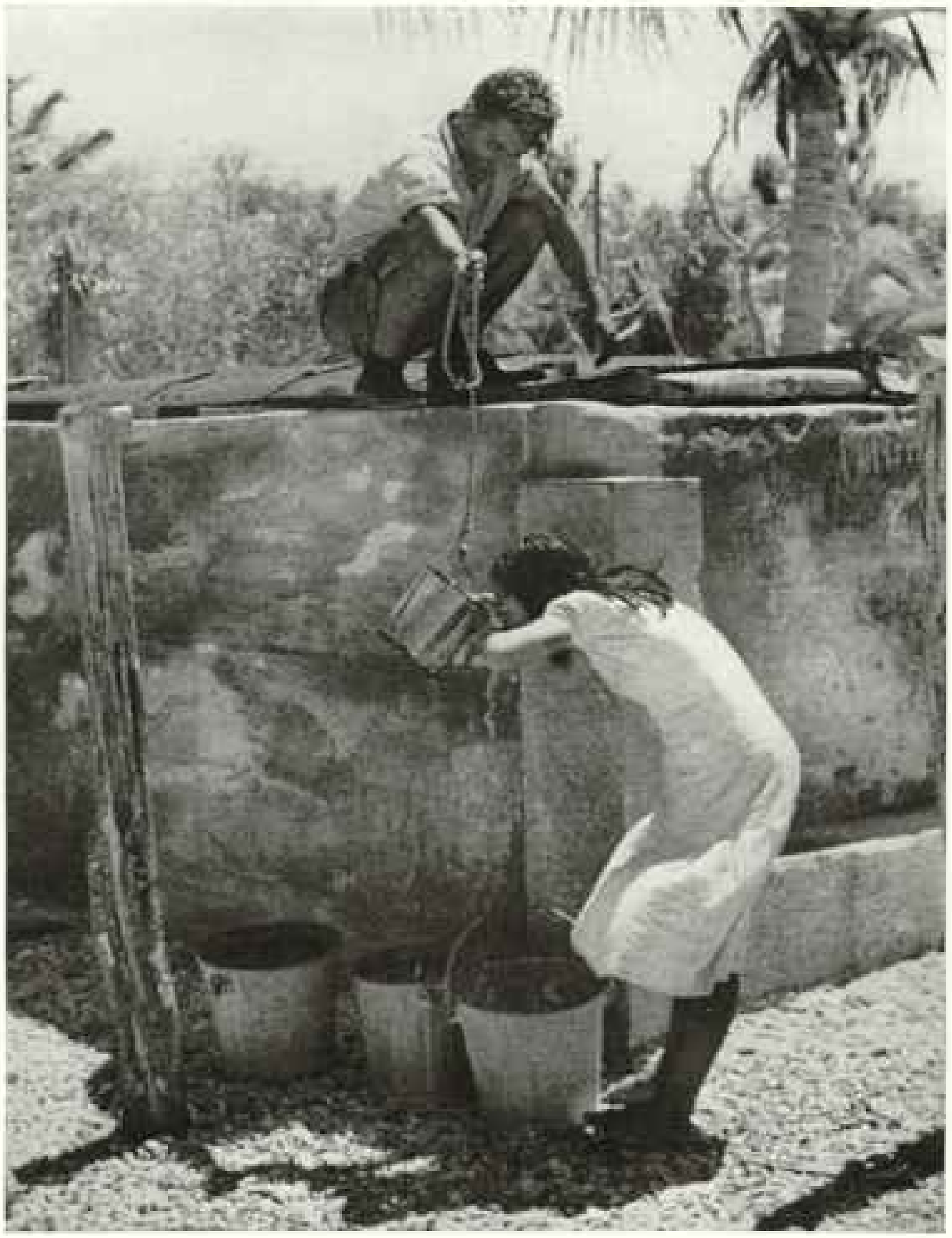
One reaction to the white man's doings that

we all observed was their complete awe when LST 1108 returned from Rongerik and pushed her blunt bow up on the beach. Despite their visits to the *Sumner* and the fact that 1108 had been there before, they just couldn't bridge the gap between the 25-foot outriggers and this enormous "canoe" with her bow towering above them.

Jimmy proudly boasted that he'd seen even larger ships, but they took the wind right out of him by refusing to believe.

Not to be outdone, young Lincoln explained that New York skyscrapers were as high as three LSTs laid endtoend. Even Jimmy couldn't accept that one, and there was much laughter and fun about Lincoln's "long talk."

Despite their awe, none of the natives had any fear of the ship, and as soon as her tank ramp was down they swarmed aboard to look around. In fact, the children would soon have overrun the ship if there had been no guards to stop them.



Bikini's "Old Oaken Bucket" Is Made of Tin

But rain water from the concrete cistern still tastes good. Cisterns on the island are covered with sheet-iron racks which collect the rain and channel it into the tanks. This water serves for drinking and washing.

One by one, other ships had been joining the *Sumner* in the lagoon, and their officers came ashore to watch the fun, each with a camera of some description.

Islanders Become Movie Actors

From a commercial newsreel team that had preceded us by a week, the islanders had learned the meaning of a camera. The young girls were especially susceptible and giggled and posed as soon as a lens was turned their way. However, by the third day of our stay, there were so many photographers around, all shooting at once, that the girls hardly knew whom to pose for. As soon as one of the professionals settled on an angle, several of the amateurs fell in around him, and after much discussion of exposure, film speed, etc., there was a fusillade of shutter clicks.

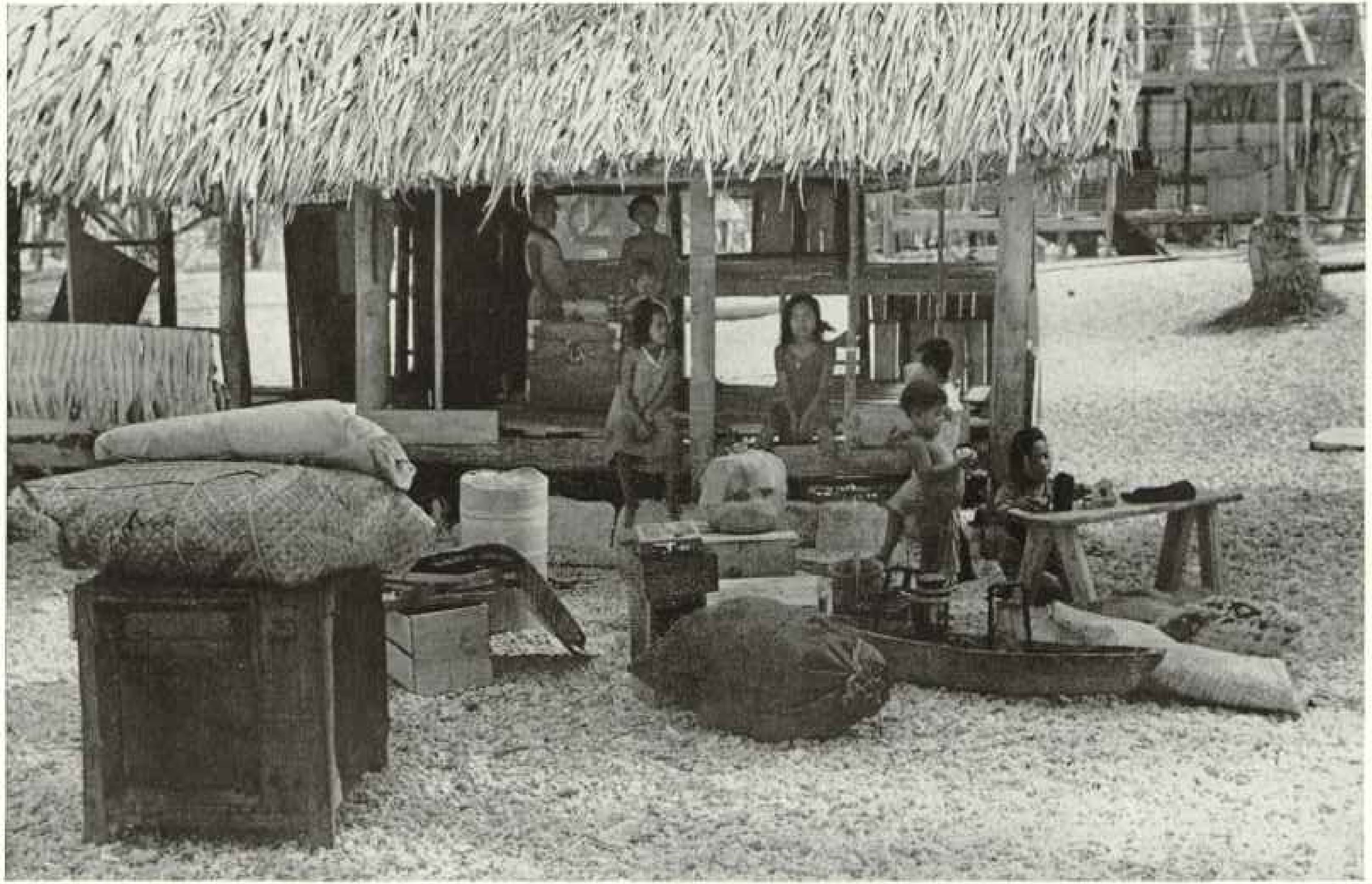
When it came time to film the final ceremony at the little cemetery above the beach, there was more than the usual amount of trouble in placing the cast. Everyone wanted to face the camera and be in the front row (page 104).

The villagers had assembled at the cemetery in response to the town crier's call on a conch shell. Jibaj, the minister, was wearing his prized gold-rimmed spectacles on the end of his somewhat flat nose and carrying his prayer book (page 103).

When I had made sure that the microphone, concealed in shrubbery in front of his station at the central grave, was operating

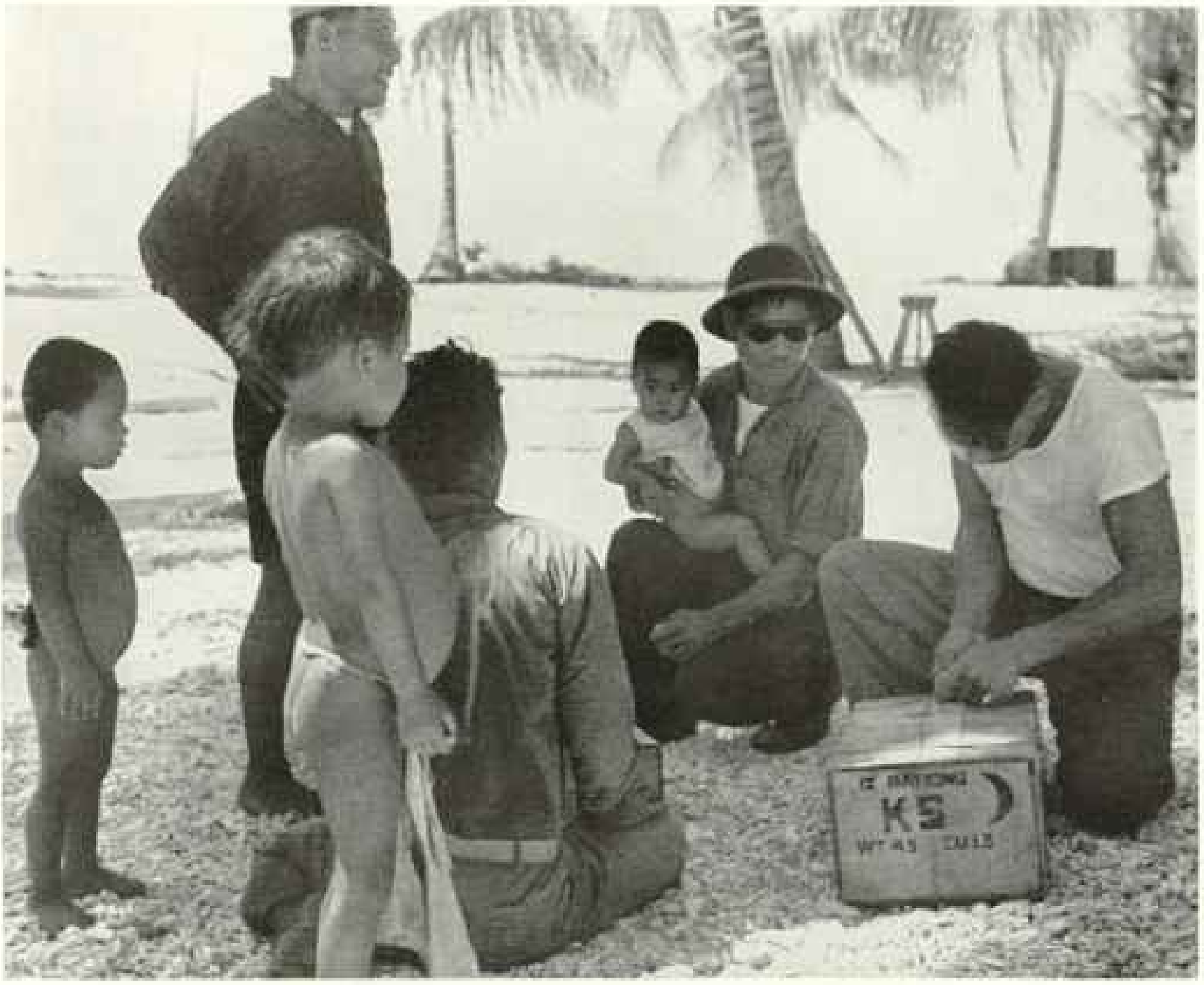
Household Goods Go Down to the Sea on Moving Day upon the Strong Heads of Bikini Women

Their husbands helped with advice and noisy supervision. Some bundles weighed more than 100 pounds. The woman in the lead carries her baby, too. Heavier equipment was transported to the waiting LST in the *Sumner's* Duck (page 113).



Waiting for the Moving Man—Belongings of a Bikini Family Are Ready to Go Overseas

Packing and moving, annoyance to elders everywhere, were an exciting adventure for the island children. Small boys were permitted for the first time to ride on the Duck, atop loads of equipment, en route to the LST. They had the time of their lives (page 113).



When He Opens That Box, His Audience Will Feast on K Rations

In their haste to sample something new, some of the villagers lost the keys for opening the small containers. The boys solved that difficulty by unpeeling the tin ribbons with their teeth! An unusual sight is the islander taking care of the baby. Such a job, and nearly all other work on the island, is delegated to women. Chief occupations among the men are fishing and loafing.

properly and had helped to get some of the others in position for the camera, I had an opportunity for a few shots with my own camera and a chance to observe the native finery.

Sashes and Flowers Being Worn

The women were wearing ankle-length gowns of some fine flower-print material. Most wore a sash around the waist, and some of the dresses had puffed shoulders, somewhat like the butterfly dresses of the Philippines.

Nearly every woman had a flower in her hair, and there were leis of all descriptions. Others wore numerous strands of the cheap glass trade beads which are so much less beautiful than the native jewelry worn with everyday clothes.

Jibaj and one of the other elders were the only men in dark clothes. Nearly all of the others were in spotless white and had flowers around their necks or a single blossom in their teeth. The children, completely clothed for the first time since the church service on the Sunday we arrived, were uncomfortably clean and showed it.

The cemetery had been cleaned of dead leaves and trash and the graves freshly decorated with flowers and fresh palm fronds. The Jap beer bottles which decorated the tops of some graves had been carefully polished and realigned.

Farewell to the Dead

When everyone had been placed to suit the cameramen, Jibaj took up his station and made a short address, led a responsive prayer, and gave a brief benediction, committing the departed to the care of God. It was very simple and very effective. The only jarring note was the necessity of doing the whole

thing twice for the benefit of the sound camera.

While helping to pick up mike cable after the ceremony, I noticed one of the younger men in an earnest conversation with Jimmy, which, from their gestures, seemed to involve me. Investigation disclosed that Laiboei wished Jimmy to ask me if I had enough film to spare for a shot of himself and family at the grave of his sister. We all moved down the shore to the grave where they grouped around the headstone and I made my shots (page 116).

In the usual rush there wasn't time to go into the reason for the request, but the expressions on the faces of that family were so sincere that I suddenly found there was an unusual amount of dust in the air.

Duck Serves as Moving Van

About noon of March 6 the natives began loading their possessions aboard the 1108. The *Sumner's* Duck went into the village and returned with a strange assortment of boxes, bags, and bundles from which protruded all sorts of household gear.

The top of each load was covered with at least a dozen naked and grinning brown boys, all having the time of their lives. Until now they had been kept off the Duck to prevent accidents.

The Duck was driven up the ramp into the tank deck and unloaded there. Each succeeding load brought more strange articles which had not been in evidence when we were working around the village.

Several loads of dried palm and pandanus leaves for home building on Rongerik were followed by a ton or so of palm matting and a whole load of corrugated sheet iron, salvaged from the rain-catching racks to be re-used for the same purpose.

Moving went on until almost dark without filling more than a small part of the cavernous tank deck or greatly reducing the piles on the beach.

On one return trip the Duck took ashore numerous cases of K rations, which were distributed to each family according to need.

These cases are put together to stand the roughest kind of handling and the rigors of tropical heat and rain and are almost impossible to open without either a crowbar or dynamite. The villagers had neither, but the outer cases stopped them for only a few moments (page 112).

The watertight cardboard and foil wrappings of the individual packages were more difficult, and their exertions over them were good material for the motion-picture cameras.

In the haste to open the packages, some of the keys for opening the cans inside were lost in the coral. This worried no one for longer than it took one of the boys to discover that he could peel the ribbon out of the cans with his teeth. They all tried it with more or less success, to the delight of the assembled cameramen.

They had seen the candy packages before and made short work of them and their contents, but the little cellophane packages of lemon powder were something else. Jimmy finally got the idea across by telling them that the powder would taste somewhat like lime juice when mixed with water. It was the best we could do, because Jimmy had never seen a lemon, either.

By dark the entire village was strewn with discarded K-ration wrappers of all kinds and a lot of unopened envelopes of the lemon powder. Apparently, they cared even less for it than most of us did.

During the day, we of the motion-picture crew had moved our gear from the *Sumner* and were to spend the next two days and nights aboard the LST 1108.

After the nightly session of cleaning and checking cameras and typing picture and sound dope sheets, we gathered on the bow ramp to watch the officers and the natives hunting hermit crabs on the beach. Officers wanted them for fish bait and the natives wanted them for food.

Early Thursday morning the rest of the islanders' belongings were brought aboard, and the crew of the LST hoisted the outrigger canoes over the side and made them secure on the main deck.

About 2 P. M. the last of the natives came aboard, and the crew started preparations for getting off the beach with the tide.

Battle of the Aerosol Bombs

When the tank ramp and bow doors had been closed and secured, the bos'n's mates started issuing aerosol bombs, those wonderful dispensers of sudden death to insects. The brown children learned to operate the bombs immediately and quickly developed a new use for them. Soon the enclosed deck was swarming with children, each with a bomb and trying to catch his companions from behind with the spray.

The air became cloudy with the vaporized poison, and if there was a fly or any other insect left alive, it wasn't their fault. The only pest we found on Bikini was a swarm of what looked like common houseflies, many of which had come aboard with the native gear.

A Deep-voiced Member of Bikini's "Amen Corner"

At church services, this villager gave the minister encouragement and approbation in resonant tones. His Sunday attire includes dark woolen trousers, a blue denim shirt, and a highly prized Navy mess attendant's jacket with safety pins substituting for buttons. He was especially proud of his sun glasses.

There were no flies on Rongerik, and the Navy hoped to prevent the transfer of breeding stock.

The captain of the 1108 had provided paint, and some of the outrigger owners spent the early afternoon painting the hulls of their boats. The rest of the villagers congregated on the main deck to watch and comment. Soon several groups were singing and gradually all joined in.

The ramp connecting the upper and lower tank decks had been lowered, and the younger generation had a lot of fun scrambling up and down this and over the rest of the fore part of the ship until we backed clear of the sand about 3 P. M.

As the ship turned to head out into the lagoon, the natives lined the port rail and began to sing a song of farewell. Until now, none of them had shown much emotion over leaving, but as the island dropped on the horizon their faces became very solemn, and some of the women sniffled when they thought no one could see.

Within an hour 1108 was wallowing in the open sea, on course for Rongerik. Until we had secured our gear against the motion of the boat and any possibility of water damage, we had little chance to see how the natives were taking their first voyage on a large craft.

Unique Motion of an LST

We were working in the forward section of the lower tank deck and had some difficulty getting accustomed to the inimitable motion of an LST. I looked aft just as the ship hit one particularly heavy sea and saw the whole structure bend in a series of waves as the swell passed under us. The others, Davis and Lincoln, had seen it, too, and we hastily finished lashing and went on deck—for air.

I was the only one who had any real difficulty with seasickness, and mine was such a light case that I soon was able to enjoy the pitching and rolling and observe the natives. Except for one about three months old, none of the children seemed to mind at all. Some really enjoyed it.

Most adults were too busy with food for the family and accommodations for the night to be worried for long, but several women and two of the men became very ill. Jimmy had expected some of the women to be upset, but was much surprised when the men were affected, because they were all such excellent sailors and had spent so much time in canoes in all kinds of sea conditions. The water was not rough, according to 1108's crew, but for me it was rough enough.

For chow, the mess cooks carried huge kettles of rice and stew down to the lower deck for the Bikinians. After supper we settled down on our side of the barrier and they on theirs to watch a moving picture.

Arrival at Rongerik

Everyone turned in early and got as much sleep as 1108 and the Pacific would permit. There were so many strange noises ringing through that echoing steel hull that I won-

Biggest Mystery of This Strange Device to Young Bikinians—It Rings a Bell!

Each time Hugh N. Duvis, production sound mixer of the photographic unit, typed close to the end of a line and the carriage warning tone sounded, these onlookers searched for the source of the sound. Cameras and microphones soon became commonplace to island youngsters, but the typewriter's loud clacking, its mysterious use which they couldn't comprehend, and above all, its bell, held their interest.

dered what the brown people thought about our mode of transportation as compared with their own.

Shortly after breakfast on March 8 a shout went up from the foredeck, and the natives all crowded the rails to get a look at an island off the bow. It was the first of many small islands and reefs we passed as we crossed the lagoon toward Rongerik Island itself.

There was much excited chatter as we headed in toward Rongerik's beach, but this soon gave way to disappointment when it was found that the tide was wrong for a landing and that we should have to wait until late in the afternoon.

I was fortunate enough to be able to go ashore with an advance working party and some of the officers and cameramen. Rongerik, I found, was not as large as Bikini but had a much wider beach, with deeper water and much heavier vegetation. The palms were not only more plentiful but yielded much larger nuts than those on Bikini. There were also plenty of pandanus trees and along the sea beach a profusion of hibiscus.

A quarter-mile away to the southwest and connected by a sand bar that could be waded across at low tide was another smaller island. This was a nesting ground for a multitude of sea birds, which at Bikini had been conspicuous by their absence.

A few yards inland from the beach were the first of the wood-framed, plywood-floored tents erected by the advance party of natives and Seabees. Much of the thick brush had been cleared away, but there was still an enormous amount of work to be done before the site would be as attractive as the one at Bikini.

Tent Ready for Every Family

Commander Grieve explained to Juda through his own interpreter that each family was to choose its own tent and that Juda was to mark the name of the owner beside the entrance with the red crayon provided. Soon each of the tents bore a name, such as Juda, Jonjen, or Laiboei.

Juda and Jibaj settled down on the floor of the chief's tent to associate each tent with the plots indicated on the chart provided by Commander Grieve. They were making little headway until Jimmy came along to help.

The rest of the islanders began to help the advance party, clearing away and burning

A Bikini Family Says Farewell at the Grave of a Loved One

Laiboei, left, helped the Navy photographers who filmed the village ceremonies in the cemetery (page 104). Upon its conclusion he asked the author to make this photograph of the burial place of his sister.

brush and mixing cement for the new water-storage cisterns.

About 5 P. M. the 1108 came in to the beach, and unloading began. Men, women, and children poured down the ship's ramp, loaded with everything they could carry, while the assembled photographers, myself included, rushed about trying for the best angles against the setting sun.

The Return to Kwajalein

There was no Duck to help this time, so all the heavy gear was left aboard until morning and only immediate necessities taken ashore. Even so, the beach was soon littered with the natives' gear, and they were moving about in the glare of the floodlights long after dark, trying to get settled for the night. Until nearly midnight there was a steady trickle of them back and forth between ship and beach.

During the evening, word was received that a plane would arrive at 10 o'clock the following morning to take the motion-picture crew back to Kwajalein. Commander Spencer was to proceed immediately from Kwajalein to Washington, taking with him all the film that had been exposed.

There was so much packing to be done in the short time remaining that I was unable to get ashore again until it was time to transfer our gear to an LCVP waiting on the beach to take us to the plane.

Jimmie, our interpreter, who was to leave with us, had spread the word that we were departing, and a sizable group of Bikinians—now Rongerikans—stopped their home building to see us off.

As good-byes were being called back and forth, I found myself wishing that I could say, as I had each time before, *Kim naj drol il ju*—"We shall return tomorrow." I refrained, because there would be no returning for me—nor perhaps for them. Civilization and the Atomic Age had come to Bikini, and they had been in the way.

Mystery Mammals of the Twilight

By Donald R. Griffin

Harvard University

BATS! The very word is enough to send our sisters, mothers, and grandmothers scurrying for cover, hands clutching their hair and hysterical screams resounding.

Centuries' accumulation of superstition, hair-raising stories of vampires, and a few glimpses of elusive shapes darting through the evening sky—these make up the average person's impression of a bat.

Little wonder, then, that when a bat actually flies into an open window the occupants of the room are thrown into a panic. The feminine reaction is one of terror and disgust, while the menfolk rush heroically to the defense and are soon belaboring the flitting visitor with sticks, brooms, and tennis rackets until he is killed or driven out.

Misconceptions Cause Needless Panic

Now, bats seen in the United States are actually harmless and beneficial animals, and practically all the widespread fears and superstitions which they arouse are groundless. A list of "nots" is included here in the hope that it may help correct some of these popular misconceptions which cause needless fear at the sight of a harmless little creature no larger than a mouse.

Bats are not birds. They are mammals, like ourselves. Bats have fur, their young are born alive and nursed at the breast, and they have well-developed teeth. All these important characteristics distinguish them from birds. Bats' wings are supported by the finger bones of the hand, greatly elongated, the wing membrane itself being skin stretched between these finger bones, forming an exaggerated webbed foot (page 118).

Bats do not carry bedbugs. Like all animals, including birds, they are apt to be parasitized at times. One of their parasites resembles the common bedbug. But all bat parasites prefer bats to any other animals. I have handled thousands of bats, hundreds of them parasitized, and never have any of the parasites transferred themselves to me.

North American bats are not known to carry any human diseases. Neither is their bite poisonous in any way. All bats will bite if they are injured or frightened, but most species found in the United States are too small to break the skin. Their bite is nothing more than a sharp pinch.

Bats do not get in women's hair. This very widespread belief is entirely groundless. Bats flying about in close quarters may alight temporarily on any part of one's body, but the animal which can wing its tortuous way through pitch-black caves and thick forests is far too clever to get itself tangled in anything as obvious as hair.

Bats are not blind. The old expression "blind as a bat" is misleading, for bats' eyes are entirely functional. However, bats rely primarily on a keen sense of hearing to guide their flight, and a bat with its ears stopped but its eyes free cannot avoid obstacles. By listening to the echoes of their own high cries, inaudible to human ears, they thread their way through the absolute darkness of caves. This remarkable method of perception takes the place of vision for the bat. The proof of this, brought out by recent experiments conducted by Dr. Robert Galambos and the author, provided one of the most interesting highlights of my years of study of the habits of bats (page 133).

No bat in the United States sucks blood —or bites or attacks anything larger than insects except in self-defense. The vampires which form the basis for so many stories, legends, and superstitions are found only in the Tropics. They bite sleeping animals or men and lap the blood which flows from the small wound.

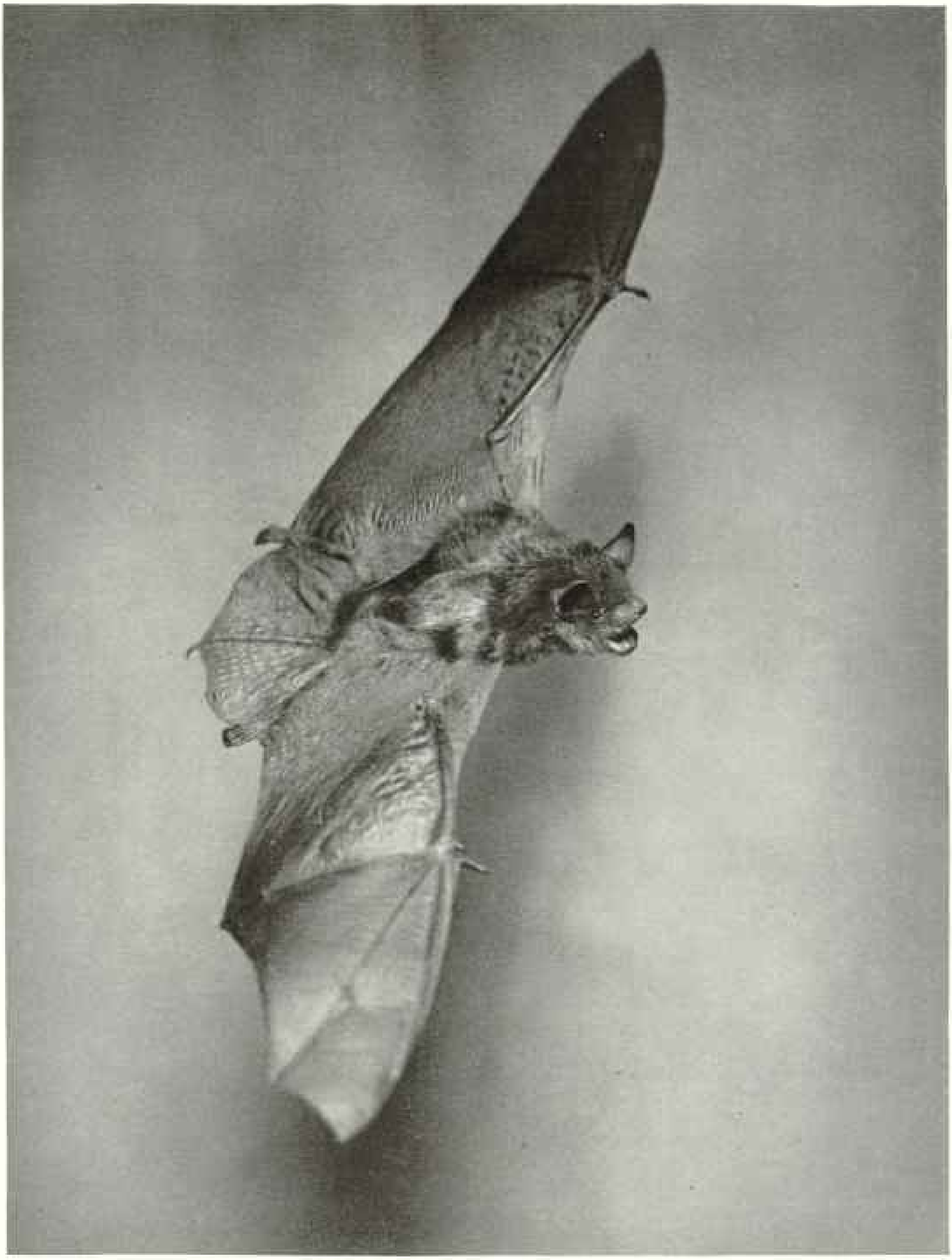
Camera Catches Bats in Flight

Bats are the only living vertebrates other than birds—and man with his flying machines —which possess the power of flight. Many animals, such as flying phalangers (marsupials), flying lemurs, and our common flying squirrels, can glide from an elevated point for as much as 100 to 200 feet, but they must always lose altitude and cannot long sustain themselves in the air as bats and birds can.

Through the remarkable high-speed photography techniques developed by Prof. Harold E. Edgerton at the Massachusetts Institute of Technology, we now can stop the flitting shadow which is a bat and show, in clear photographs, exactly how it uses its wings.

On learning that I was studying bats, Professor Edgerton asked me to bring some to his laboratory where he had evolved his methods of making photographs with flashes of light lasting only about 1/100,000 of a second.

When I first arrived, the camera and lights



H. E. Edgerton

Warned by Echoes of Its High-pitched Cries, a Bat Banks Sharply to Avoid a Wall

How close it has come without striking is shown by the shadow. With eyes covered, bats still fly unerringly, but cover ears or mouth and they cannot avoid a crack-up. This one was caught in full flight by Dr. Edgerton's high-speed camera, developed at Massachusetts Institute of Technology, which also made the photographs on pages 120 and 134. Projections like wing-mounted machine guns are claws corresponding to thumbs (page 127).

were set up at one end of a large room containing many tables covered with amplifiers, stroboscopes, and other electronic devices in various stages of construction, any one of which provided innumerable small crevices into which bats would be likely to crawl away.

"Make your bats fly in front of the camera," our host suggested. But with so many inviting retreats at hand, the bats had other ideas. One promptly lost itself in the maze of apparatus.

After several unsuccessful attempts in smaller rooms, Professor Edgerton devised an ingenious combination of a beam of light playing on a photoelectric cell which in turn activated a relay. When a flying bat interrupted the beam, the intense flash was set off and the film exposed.

Photocell, lights, bats, and the writer were all placed in a hood about two feet deep and five feet wide, so that the bats could be photographed as they flew about in this confined space. It was all very chummy.

Only after I and my bats were closed into this hood did I realize that the exposed electrodes three inches from my face carried 3,000 volts of electricity. We had no accidents, however, and even the bats avoided being electrocuted.

The resulting photographs, together with motion pictures taken at the same time, demonstrated exactly how bats fly and how their flight compares with that of birds. Bats make about 15 strokes of the wing per second, and their flying speed is approximately 10 miles per hour. The photographs on pages 118, 120, and 134 show some of the stages in the stroke.

Travels Traced by Banding

The bats which thus reluctantly performed for the high-speed camera had been collected in the course of a special study of the habits and life histories of New England bats—a study which has led me into innumerable dank caves, abandoned mines, and crannies where only a bat would feel at home (pages 121 and 124, 125).

During these investigations, extending over 14 years, more than 13,000 bats have been banded with aluminum bird bands to trace their migrations, and many experiments have been conducted to learn more about their mode of flight, their hibernation, and their powers of homing and orientation.

Most of the bats found in the United States belong to the family Vespertilionidae, which feeds exclusively on insects. For this reason those which live in the northern States find themselves without food in winter.

Our common bats have adopted two methods of meeting this problem—hibernation and migration.

"Cave bats," which include the kinds we see most often in the evening and find spending the daytime in the attics of our houses or in cracks in loose trim, pass the winter in a state of hibernation, usually in caves. They are gregarious at all seasons. Several hundred may gather in a single attic, and thousands may flock into the same cave to hibernate.*

During hibernation I have frequently seen bats hanging from the rock in compact clusters, sometimes several hundred on one or two square feet, all packed as closely together as they can possibly squeeze (pages 122 and 125). These cave bats include the many species of the genus *Myotis*, the little brown bats; the pipistrelles (*Pipistrellus subflavus* and related species); and the big brown bat, *Eptesicus f. fuscus*.

Contrasted to these colonial cave bats are the much less abundant "tree bats" (the red bat, *Lasiurus borealis*; the hoary bat, *Lasiurus cinereus*; and the silver-haired bat, *Lasionycteris noctivagans*). These species are often seen flying about in the evening, but they do not congregate in large colonies, seldom if ever enter buildings, and apparently spend the day singly or in small groups in trees. For winter food they migrate south, just as so many birds do.

Mysteries of Migration

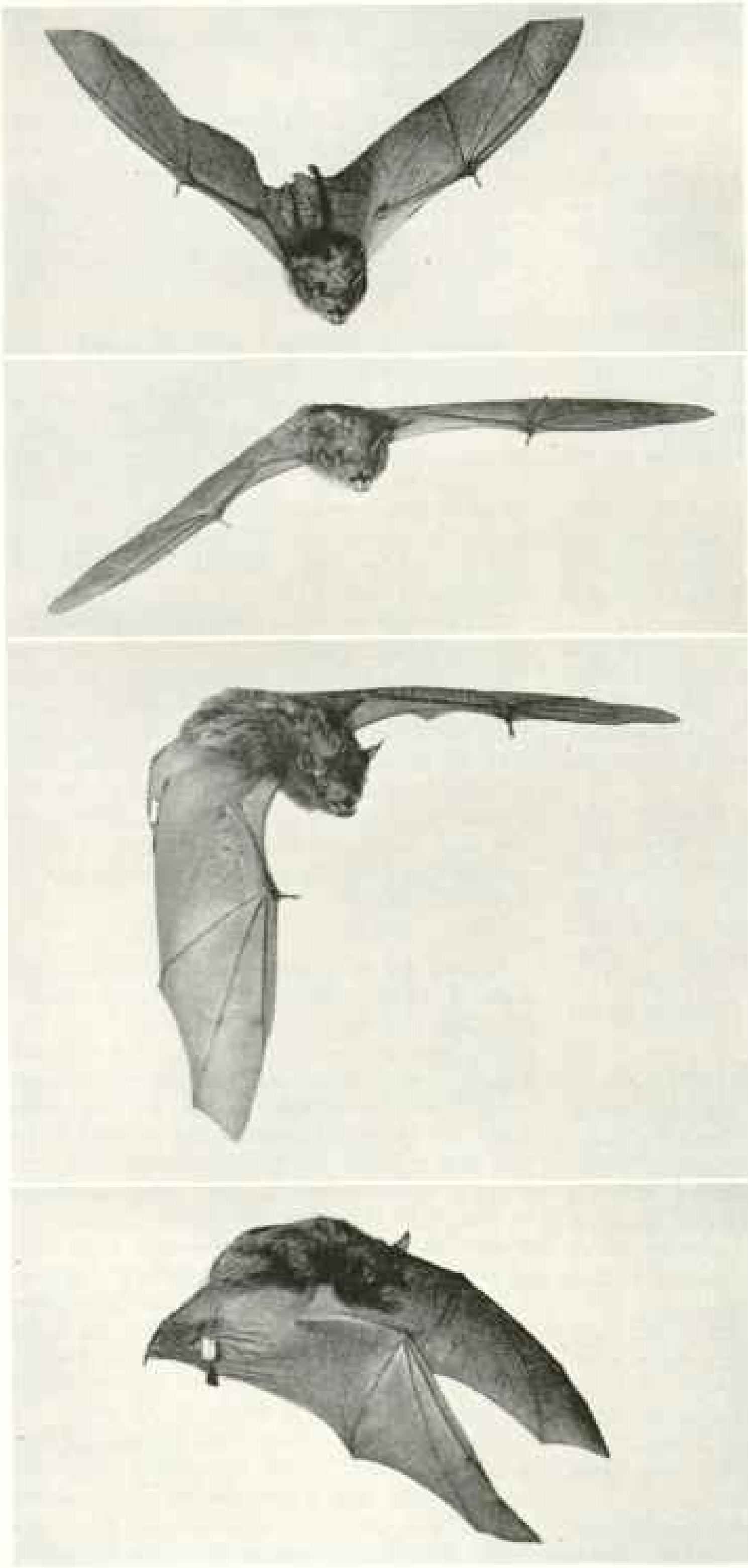
One of the most fascinating mysteries about bats is their migration. Everyone knows that most birds migrate, although there has never been any completely satisfying explanation of how they find their way or what stimulates them to start.† Bats, on the other hand, are generally supposed to be weak flyers and hence incapable of long migrations.

As a matter of fact, when bats are flying in a straight line they can make a respectable speed which compares favorably with that of small songbirds. The fluttering flight of a bat as seen hunting in the early evening gives an erroneous impression that its flight is weak and faltering. The bat is usually chasing insects and thus must fly erratically to follow the agile dodging of its prey.

The idea that some bats might migrate south originated when naturalists first discovered that the three species listed above

* See "Bats of the Carlsbad Cavern," by Vernon Bailey, NATIONAL GEOGRAPHIC MAGAZINE, September, 1925.

† See "Our Greatest Travelers," by Frederick C. Lincoln, in *The Book of Birds*, published by the National Geographic Society.



H. K. Edgerton

Bat Flight as Revealed by the High-speed Camera; Bats Make About 15 Such Strokes Each Second

as tree bats were never found hibernating in caves. Since bats must do something to survive the winter in climates as cold as the northern United States where all insect life perishes or becomes dormant, and since they apparently did not hibernate, it seemed reasonable that they might migrate south as birds do.

Further evidence appeared when it was found that large numbers of these tree bats appeared in late August and September at exposed points along the Atlantic coast. Such places as Mount Desert Rock, Maine (30 miles from the mainland), and the barren tip of Cape Cod, Massachusetts, where bats were not seen at other seasons, suddenly became populated with red and hoary bats in late summer and early autumn.

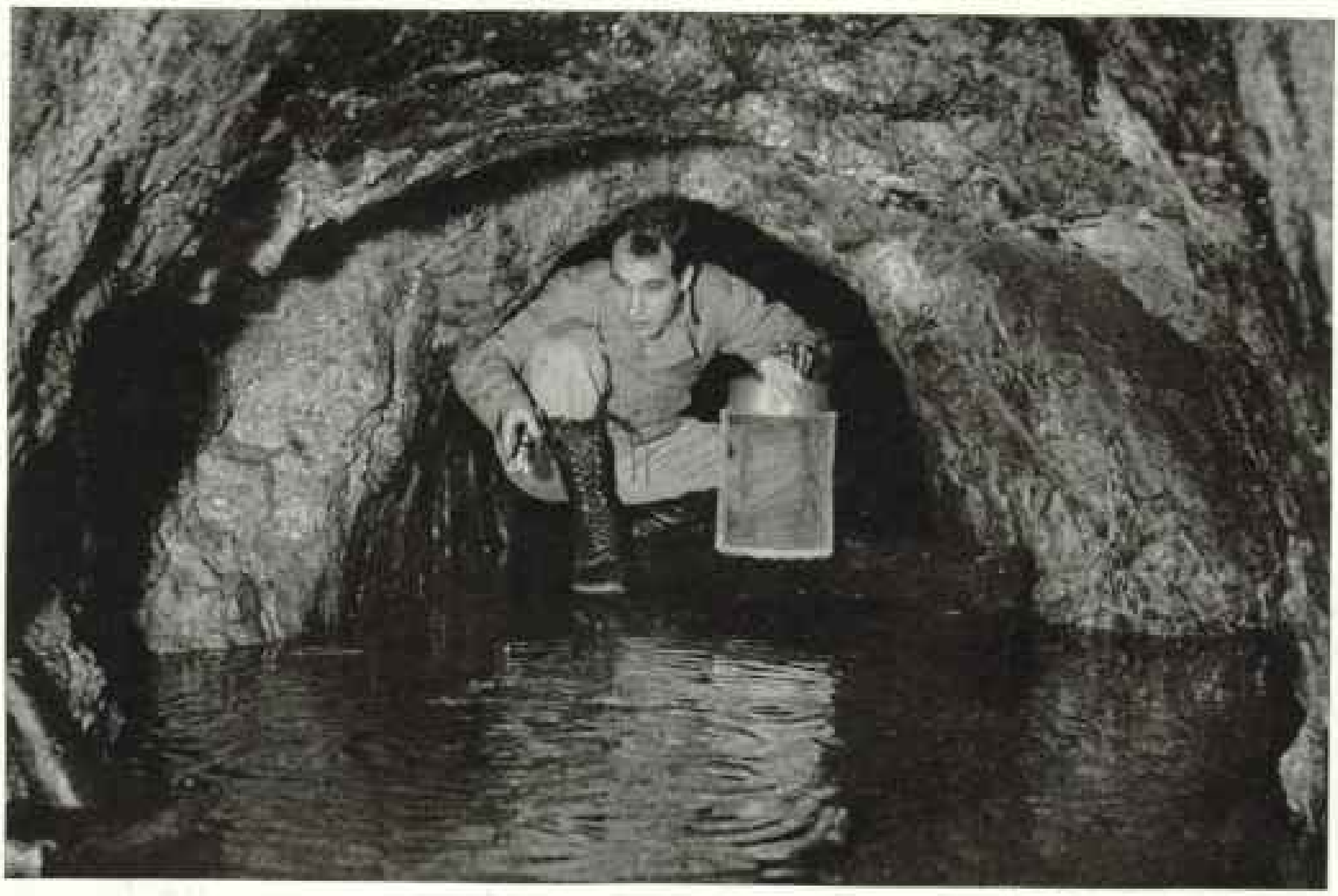
These were evidently small flocks of migrants, and there are several records of similar flocks of red bats alighting on ships as far as 200 miles off the coast at this season.

It has never been possible to confirm this migration of the tree bats by banding them in the North and later recapturing them in the South, as has been done with so many birds. The chief reason is that, since the tree bats do not congregate in numbers in caves or buildings, no way has yet been found to secure enough of them alive to do any worth-while banding.

Dr. M. Eisentraut in Germany has banded several thousand bats and recaptured many of them later. These "returns" indicate what might be expected if large-scale banding studies of American tree bats were made.

Thus Equipped, Bat Banders Pursue Their Quarry Beneath New England Hills

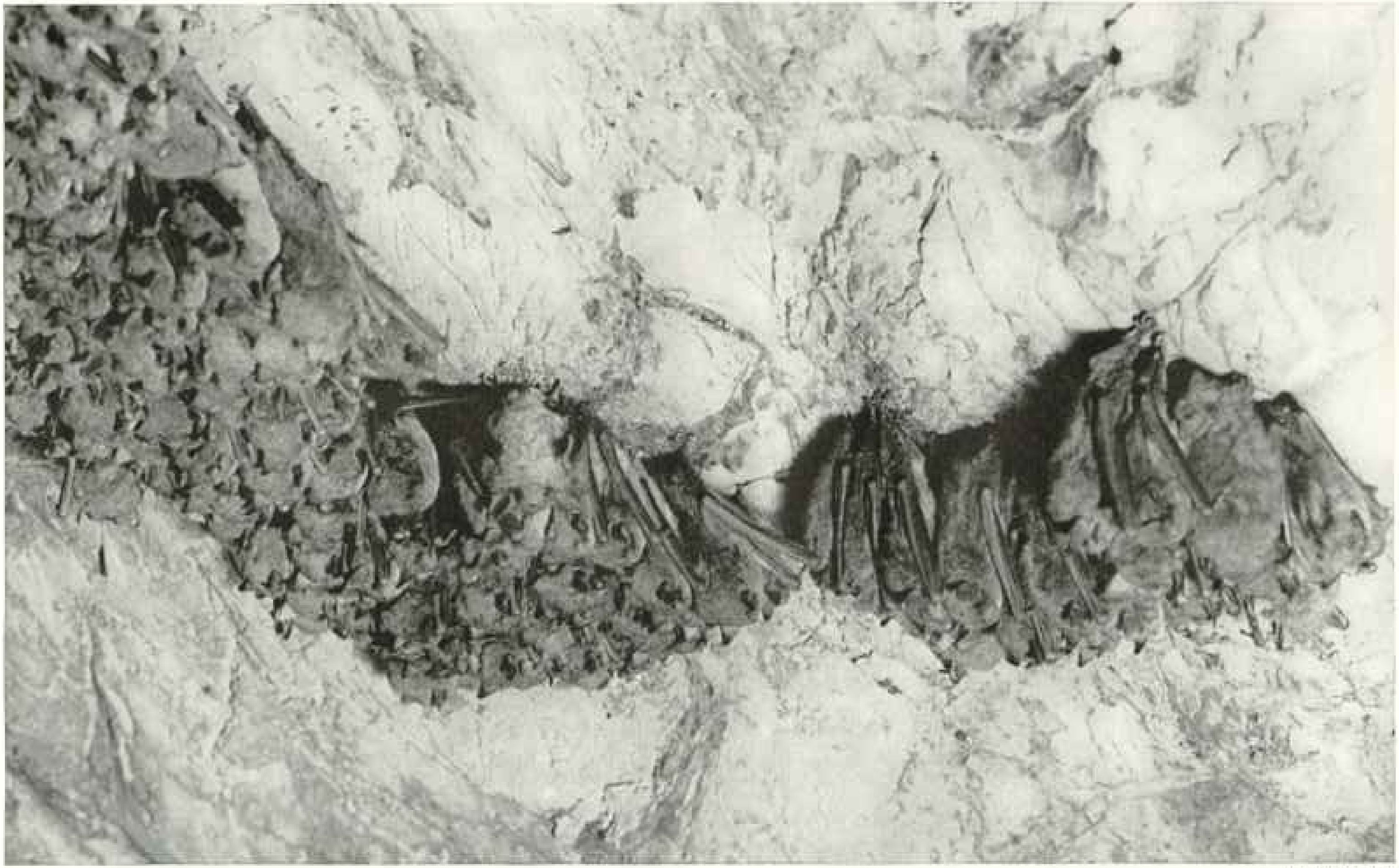
The author (left) and two Harvard graduate students have just emerged from an old mine near Pepperell, Massachusetts. Equipment includes wire containers for carrying bats, large forceps for extracting them from crevices, a net with extension handle, spade, fork, cap lights, and back pack. Soaked shoes are drying.



Staff Photographer Robert F. Sisson

His Quest Leads Through Dank Depths Where Only a Bat Could Feel at Home

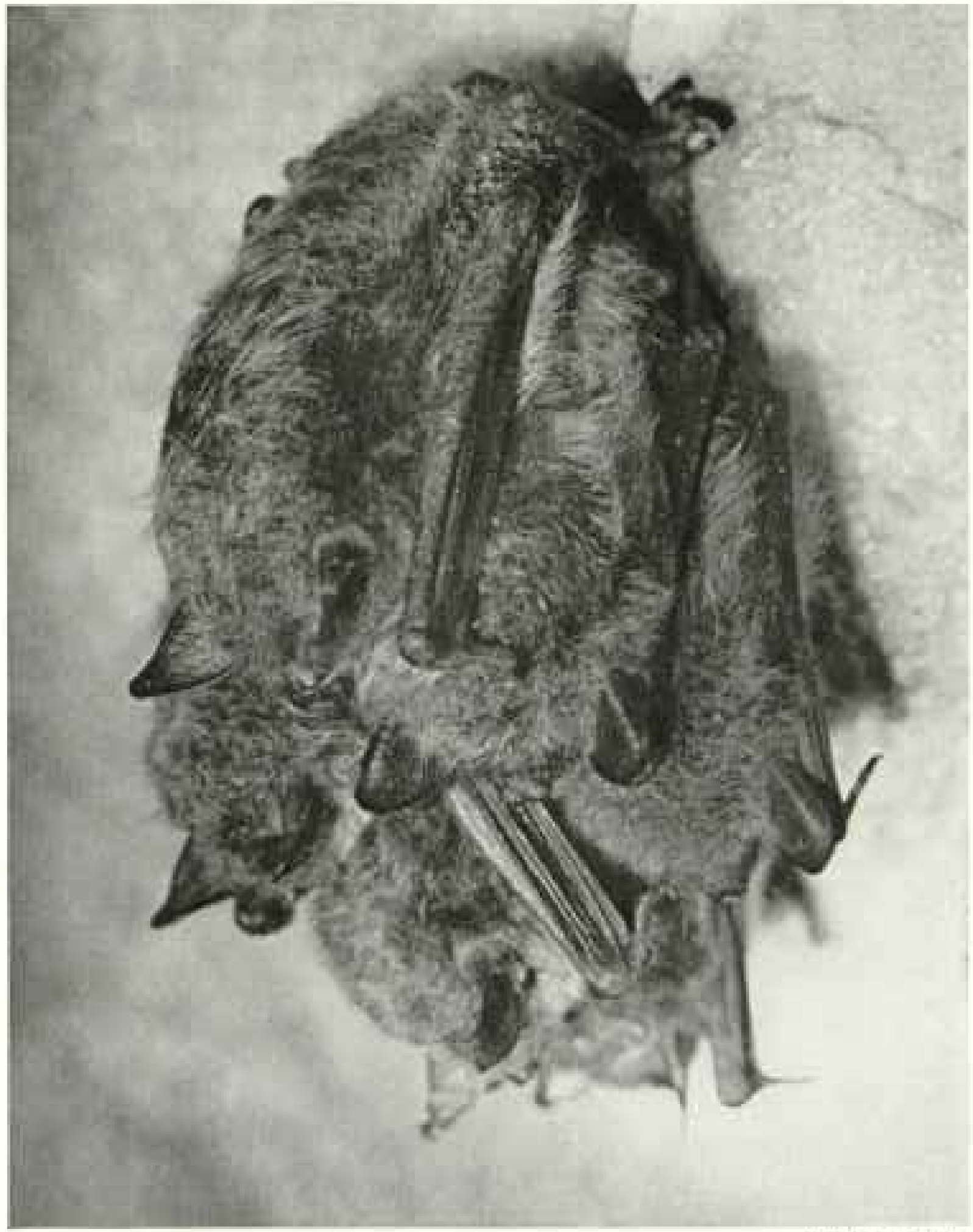
In a flooded tunnel of the abandoned mine a Harvard graduate student hunts bats for banding (p. 119). In one cave the author and companions narrowly escaped being trapped underground by rising waters (p. 126).



Donald R. Griffin

Cold as Death, More than 100 Hibernating Bats Hang from This Small Area in the Roof of a Limestone Cave

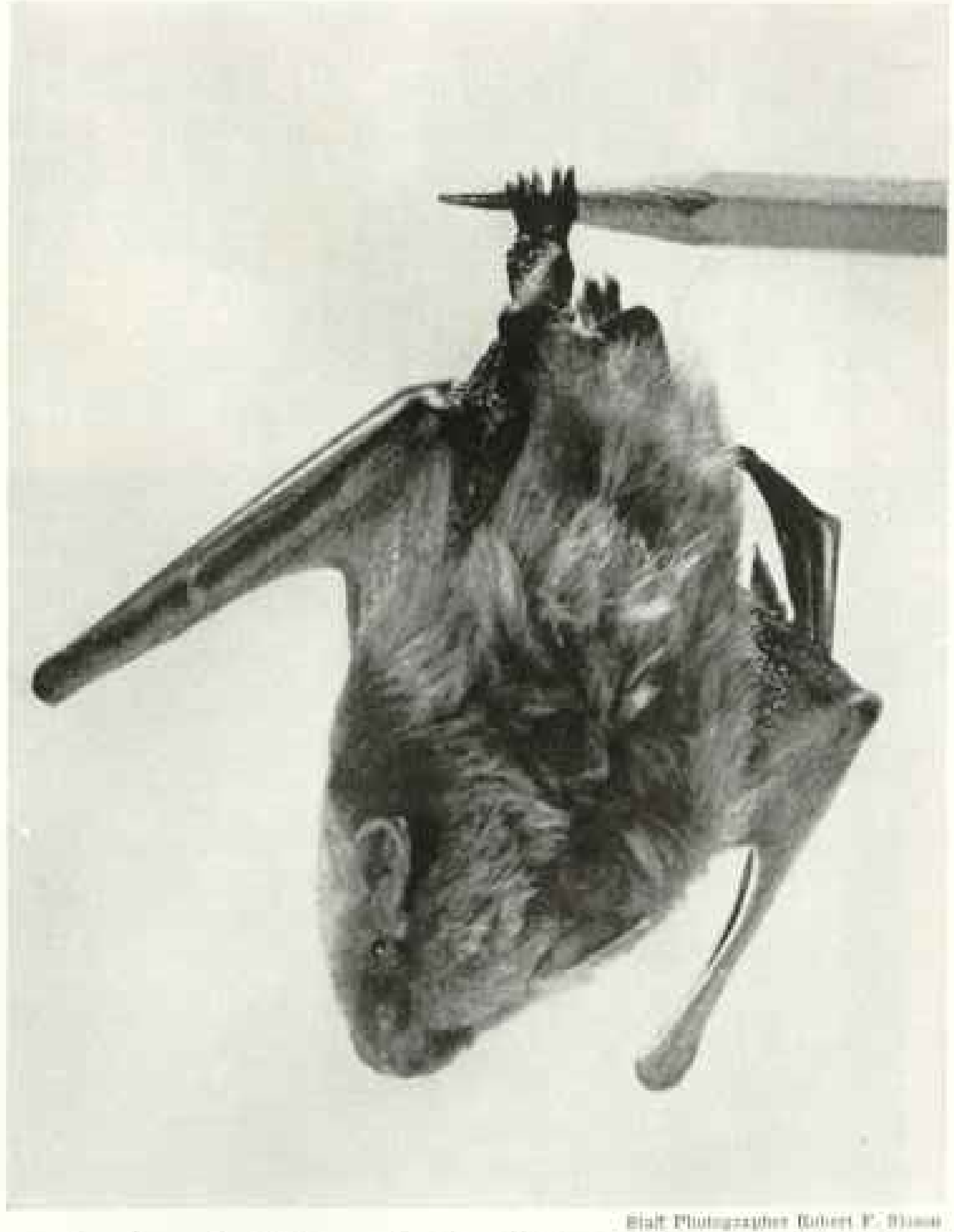
All are torpid; the whole cluster can be plucked from the rock like a sheet of moss. During handing the bats awaken somewhat, but upon release they fly sleepily about the cave, hang themselves up again, head downward, and resume their hibernation. Metabolism, heart rate, breathing, and body temperature drop so low that only the experienced can tell a hibernating bat from a dead one (page 127).



Donald R. Griffin

Close as Bananas in a Bunch Huddle Hibernating Bats

With claws clamped in crevices in the rock of the cave, six bats cling snugly together to retain some of their heat. Bats must oxidize their fat slowly in winter to keep alive, since cold weather cuts off their one source of food—insects. In the five or six months' hibernation they lose a third of their body weight. Protruding from this mass of brown fur are the sleepers' ears and folded wings.



Staff Photographer Robert F. Sisson

Awakened, a Hibernating Bat Tries to Sleep on a Pencil

Hind feet are adapted solely for hanging, head down, from rocks or trees. Once the strongly curved claws are well fixed in minute cracks, the bat can relapse into a profound torpor without danger of falling. Even if it is killed by freezing, the claws remain attached. This one had been hibernating in a Harvard laboratory. The whole foot can rotate 180°, like a man's hand.

Donald R. Griffin

High in a Gloomy Mine a Bat Is Bagged for Banding

Sound asleep for the winter in an old iron mine near Roxbury, Connecticut, he was safe from all intrusion except for the long arm of science. The bat bander's cap light spotted him, and the long-handled sectional net brought him down, still dead to the world.

One of his bats (of a species called the noctule, *Nyctalus noctula*) was recaptured nearly 500 miles from where it was banded, and several others were retaken after having traveled more than 100 miles.

It does not seem unlikely that our own red bat and hoary bat might also perform migrations of equal or greater length. These species are reported to appear in Bermuda in the autumn and to disappear again at other seasons. If so, they must make a sustained flight of more than 600 miles over the open ocean.

The cave bats which hibernate in such large numbers in our caves are also thought to migrate, although probably to a less extent. This at first glance seems an unnecessary assumption, since caves are found in the northern States and the cave bats have only to retire there and hibernate when cold weather deprives them of their insect food.

Many large areas, however, have no limestone rock and hence no natural caves. Eastern New England is one of these areas, for all the limestone is concentrated in a belt in Vermont, western Massachusetts, and western Connecticut.

In New Hampshire, eastern Massachusetts, and Maine I have found no natural caves containing more than a few bats. Yet there are large numbers of bats in the caveless areas in summer, including the numerous large breeding colonies of *Myotis l. lucifugus*, the common little brown bat.

What do these bats do in winter? They cannot remain in buildings, for they

Staff Photographer Robert F. Sisson

Into Such Small Black Holes in Hillsides Bats Fly Unerringly "by Ear"

Truly remarkable are the creature's powers of avoiding obstacles that beset his path in gloomy woods and pitch-black caves. So skillful is his flight, indeed, that some have credited him with a sixth sense, while the hard-headed practical scientists have only recently discovered that his powers are based upon echolocation, a mode of perception operating on the same principles which underlie some of the most complex devices yet produced by man (page 133). Here Dr. Griffin, emerging from an old mine near Pepperell, Massachusetts (page 121), hands a colleague a wire container of bats.

would be far too cold in midwinter, and these breeding colonies which were so full of bats in July are deserted by the end of September. The logical deduction is that they migrate to the nearest caves for the winter and return again the next summer.

Banding the Elusive Bat in Its Lair

It was my interest in this problem of bat migrations that led me to begin banding cave bats in both summer colonies and caves in New England about 14 years ago. By handling thousands of bats at all seasons, we found it possible to recapture some at a distance from the place where they were originally taken and thus to establish the direction and extent of migration.

Most of this work was done in spare time and on week ends snatched from the busy college life of a group of Harvard students. More than thirty men have participated in one or more of the trips to bat caves, but the outstanding ones, known among themselves as "master bat banders," are T. L. Perry, H. B. Hitchcock, Garrett Eddy, F. L. Osgood, G. E. Folk, Robert B. Holden, David McAllester, and Douglas Robinson.

Special equipment, most of it built for the purpose, is loaded into whatever cars are available, and the expedition is off for the hills (page 121). We had to spend much time in searching for caves, and many disappointments were our lot when some "enormous cavern" we had been told about turned out to be a measly porcupine hole barely ten feet long and two feet high.

All bat banding in caves must be done in winter and despite whatever weather New England's fickle winds may blow.

Snowshoes and skis have been needed often,

Rain and floods have delayed and impeded us, but never prevented the week end's quota of caves from being visited.

So zealous did one of my assistants become that on one occasion he remained at his post in an old mine plucking bats from the wall even after rocks began falling from the roof of the tunnel behind him, threatening to cut off his only retreat. Rotting timbers made these abandoned mines especially hazardous.

All caves are not the high-vaulted caverns open to the public in Kentucky and Virginia, with their level walks, spacious passages, and electric lights. The typical New England cave has an entrance barely large enough to squeeze into. Exploring such caves often means a long crawl on one's belly through water and mud to reach the higher rooms where the prized clusters of bats are found.

Once I asked one of my fellow bat hunters to explore a certain side passage through which he could barely squeeze. As his feet disappeared I heard a muffled remark. A porcupine was in the passage ahead of him! Immediately the bat hunter reappeared, much faster than he had vanished. He was remembering a story we had heard about a man who climbed a tree after a porcupine, whereupon the animal backed down the tree trunk at him, lashing its quill-armed tail as it came. This one was less belligerent, however, and in these caves we encountered no wild animals except bats and porcupines.

Sometimes the passages are vertical and ropes must be used. One cave was at the base of a cliff and over its entrance tumbled a good-sized waterfall through which we had to climb.

Nearly Trapped by Rising Water

An adventure befell us when we visited a cave in Thacher State Park in eastern New York. Out of the low entrance flowed an innocent-appearing brooklet. On our way in we could crawl in comparative dryness along the edge of this brook, although the roof was only two feet high in places. But it was raining hard that day and the stream suddenly began to rise while we were inside.

We came out just in time, it proved, for the stream rose rapidly a few minutes later. Had we stayed inside a little longer, the water would have reached the roof and cut off our retreat. Then we would have had to sit inside and wait, patiently I hope, for the ground water of that whole mountain to drain off through the cave until the stream could fall again.

The technique of large-scale bat banding had to be developed in the course of this work. Although more than two million birds had been marked with aluminum bands issued by the United States Bureau of Biological Survey, only a few dozen bats had ever been marked in any way.

Banding the bats on the hind leg with aluminum bird bands of the smallest size proved satisfactory. Permission was obtained from the Bureau to use surplus bird bands which carry on the outside a serial number and are marked on the inside "Notify Biol. Surv. Wash. D. C."

This is a postal address, and anyone finding a bird or bat with a band on it should remove the band and send it to the Bureau, with complete information on when and where it was found. In this way the finder may contribute materially to the study of bird or bat migrations. In 1940 the name of the Bureau of Biological Survey was changed to the U. S. Fish and Wildlife Service.

The bands themselves are only $\frac{3}{16}$ of an inch long and weigh less than $\frac{1}{100}$ of an ounce. They do not seem to inconvenience the bats at all (page 128).

500 Bats Banded in an Hour

Banding becomes rapid after practice, and on one expedition four men banded at the rate of 500 bats per hour, at the same time identifying and recording every bat.

Sometimes the banding is done underground by the light of flashlights and lanterns. This greatly increases the difficulty and discomfort, since cave rocks are cold and damp to sit on for hours, and drops of icy water have a way of oozing from the roof and suddenly dropping down the back of one's neck. In fair weather the bats are taken outside to be banded and are then released inside the cave.

Being awakened and banded does not seem to do bats any harm, and after flying around for a few minutes they hang up again and relapse into the torpor of hibernation.

It seems likely, however, that they are not continuously dormant throughout the whole winter. On successive visits to the same cave we usually found the bats in different parts of the passages, even when they were not disturbed on the previous visit. Probably they wake up from time to time and fly about a bit, perhaps occasionally venturing out of the cave to see whether spring has come yet, and then hang themselves up again for another long sleep (pages 122, 123).

The hibernation of cave bats and other animals is a curious state which is still in many respects a mystery to biologists. Apparently the animal simply goes to sleep for several

Staff Photographer Robert F. Sisson

Yawning Mouth and Sharp Teeth Make the Bat an Insect's Nightmare

This furry ogre is flying death to moths, mosquitoes, and other insect enemies of man. Bats found in the United States bite humans only in self-defense, and most of them are too small to break the skin. The author's thumb indicates the size of this species, known as the big brown bat. Though it has an 11-inch wingspread, it weighs but half an ounce. Note the small eyes, functional but not keen-sighted, and the large ears which warn the bat of obstacles by receiving the echoes of its supersonic cries (page 133). Hooks on the wings, corresponding to the thumbs of a hand, aid the bat in getting a foot grip on rocks, trees, or rafters.

months. Actually the torpor of hibernation is much more profound than ordinary sleep. The heart rate slows to a point where it cannot be detected. Breathing almost ceases. The blood moves sluggishly. The body temperature falls almost to that of the surroundings.

Hibernating Bats Appear Dead

Bats hibernating in a cave where the air temperature is 33° F. may have a body temperature of 33.5° F. They feel cold to handle, and they are stiff and unresponsive. It requires close observation to distinguish a hibernating bat from a dead one.

In spite of the low level to which the metabolic processes have fallen, a hibernating bat will awaken in a few minutes if handled or even disturbed by lights and talking. Once awake, the bat is lively and active as ever. His temperature, circulation, and respiration have returned to normal.

It is obvious that if the animal is too active during the winter, or if his metabolic rate of using stored fat is too high, he will exhaust these reserves before warm weather has returned and before he can get any insect food. This is what happens if the temperature of the hibernation quarters is too high. It results in death from starvation, for the metabolic rate of an animal in hibernation depends on the temperature of his surroundings; he will burn more fat at a higher temperature, just as any chemical reaction is speeded up by a rise in temperature.

For this reason hibernating animals seek a place where the temperature is low and constant. Woodchucks and chipmunks retire to deep burrows, and bats winter in caves, be-

Staff Photographer Robert F. Sisson

Tiny Aluminum Bands on 13,000 Bats Tell the Story of Their Travels

Many have been traced from western New England caves to summer colonies on Cape Cod, and vice versa. The author used bird bands weighing less than 1/100 of an ounce. Affixed in a moment, they stay on for life. Recoveries show that some of the bats have lived at least 11½ years. They also reveal a strong homing instinct. Bats carried from their native roost have returned from as far as 150 miles (page 132).

cause an inclosed space below ground remains at a low and nearly constant temperature.

Another important requirement also usually satisfied by caves and burrows is that the temperature should not go below freezing. Apparently no mammal can survive freezing when it is hibernating and its body temperature is at the mercy of the surrounding air temperature.

The dangers of subfreezing temperatures were graphically demonstrated at a cave near East Dorset, Vermont. Three or four hundred bats may be found here in November or December, but by midwinter the cave's large entrance has allowed it to become too cold for the bats.

Whenever I visited this cave in February or March, large ice stalactites had been formed, and many bats were hanging dead from the icy roof. Others were completely entombed by huge icicles. Most of the bats, however, awakened and left before being killed by the cold. In subsequent winters I caught several banded ones at other caves in Vermont, Massachusetts, New York, and Connecticut.

Flying from cave to cave in winter seems to be a rare occurrence, but we obtained three returns of banded bats which had flown 55 to 125 miles from one cave to another during a single winter.

Bats have been observed to mate in both spring and fall, and even in the caves throughout the winter. The theory has been advanced that after fall matings the sperm remain alive in the uterus of the female all through the long months of hibernation and resume activity in the spring when the female awakens, and that actual fertilization of the egg occurs then. Recent experiments have shown that this can happen in female bats kept in captivity.

Young Born in "Maternity Wards"

When warm weather finally returns at the end of a long and dreary winter, the bats gradually begin to leave the caves. It seems likely that in March and April a few venture out on warm nights and then return to resume their hibernation. But by the middle of May or the first of June at the latest we found the caves entirely deserted, with not a single bat to be found.

Apparently the females leave the caves earlier in the spring than the males. In a mine

Bluff Photographer Robert F. Hissey

With Wings Folded, a Collegiate Bat Gets Its Meals the Easy Way

In the Biological Laboratories at Harvard University, one of the author's protégés eats a meal worm held in a pair of forceps. Bats in captivity are fed by hand and watered by a medicine dropper, since they do not readily learn to eat or drink from a dish. Awkward and painfully slow, a bat afoot bears little resemblance to the phantom flyer seen at twilight catching insects on the wing.

near Chester, Massachusetts, for example, we caught a large number of bats on May 1, and 98 percent of them were males.

At this time the female cave bats congregate in large breeding colonies in old buildings or hollow trees. No males are found in these colonies; the German naturalists call them "maternity wards."

Such bat colonies in buildings often come to the attention of the human occupants, usually to the displeasure of both parties.

In a typical colony, a hundred or more female bats will squeeze themselves into some small crack in the trim of a frame building and gain access to empty spaces inside the trim on the roof ends or in spaces between the roof boards and rafters. Here they are practically inaccessible and safe from interference.

In these retreats the young are born about the middle of June. No nest of any kind is made, the mother bats apparently being satisfied with the cavities provided by Nature or man.

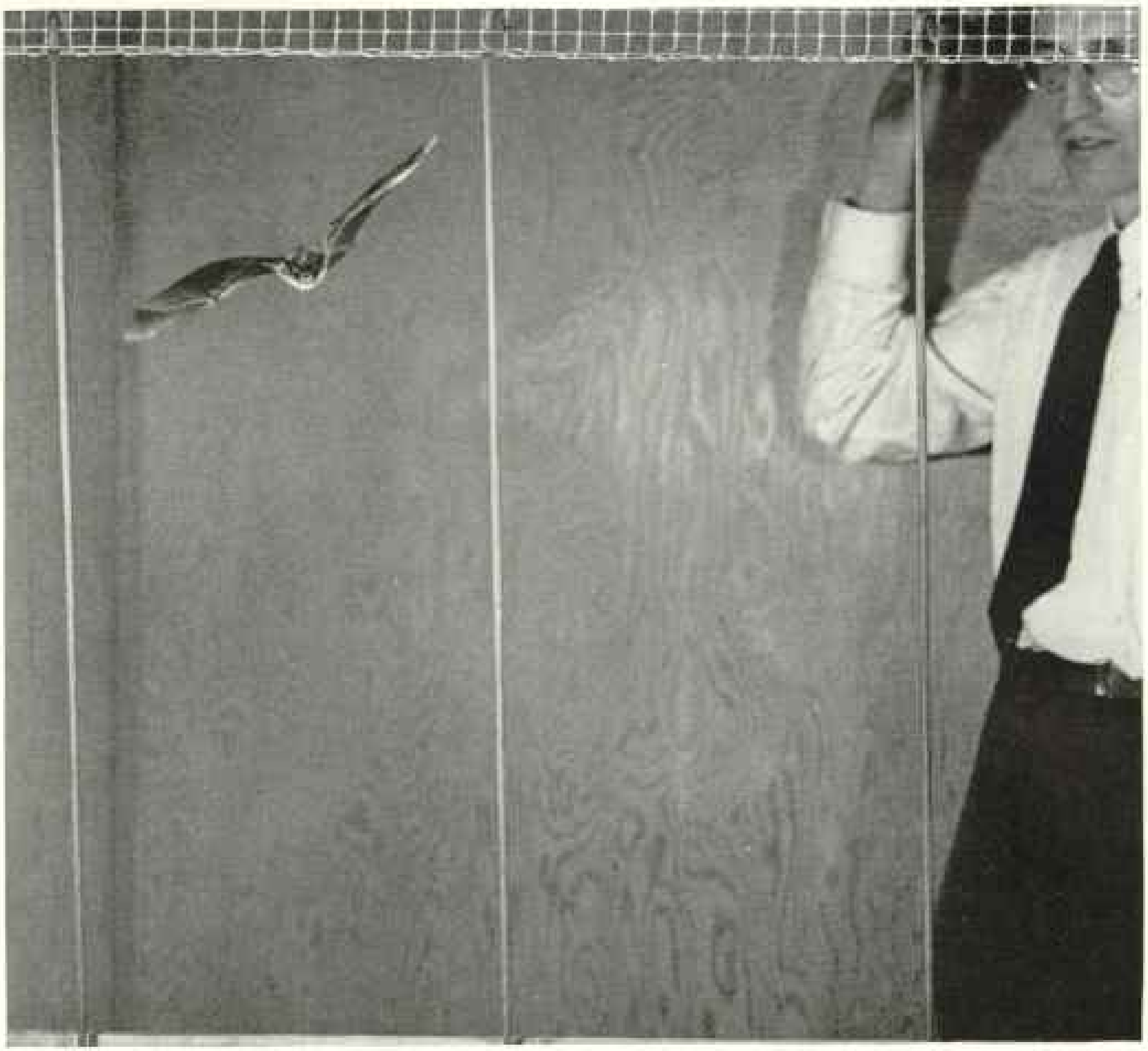
The newborn bats are relatively large, weighing about one-quarter to one-fifth as much as the mother. Their claws are fully developed and they attach themselves firmly to the mother's fur and also to her nipple.

A mother bat often leaves her baby inside the roost when she does her evening hunting, but she sometimes carries it along as she flies. There is one case on record of a mother red bat carrying four young whose total weight exceeded her own and catching food for them at the same time.

Such a large number of young is exceptional, however, and most of our bats have only one young each year. This is a reflection of what a safe life they lead and how successful they are in the zoological sense of the word.

Bats seem to have few effective enemies. Owls and even hawks take a few, and sometimes a cat or other predatory mammal will catch them as they emerge from a summer colony in a building. Snakes may get some in the same way. But, on the whole, bats live a life which must be remarkably free from violent death. In the caves they roost so high that no animal which cannot fly can reach them (aside from bat banders), and their roosts in buildings are also inaccessible to predators, except possibly snakes.

This helps to account for their high life



Staff Photographer Robert F. Sisson

Banking, a Bat of 11-inch Wingspread Clears a 10-inch Opening

An instant after release from Dr. Griffin's grasp, it shoots squarely between two of the rubber uprights barring the front of the test booth at the Harvard University Biological Laboratories (opposite page). Other pictures showed that sometimes, instead of banking, the bat merely pulled in its wings a trifle. In similar experiments with vertical 16-gauge wires spaced 12 inches apart, blindfolded bats flying at full speed echo-located the wires when a foot or two away and brushed them only once in six to ten passages (page 133).

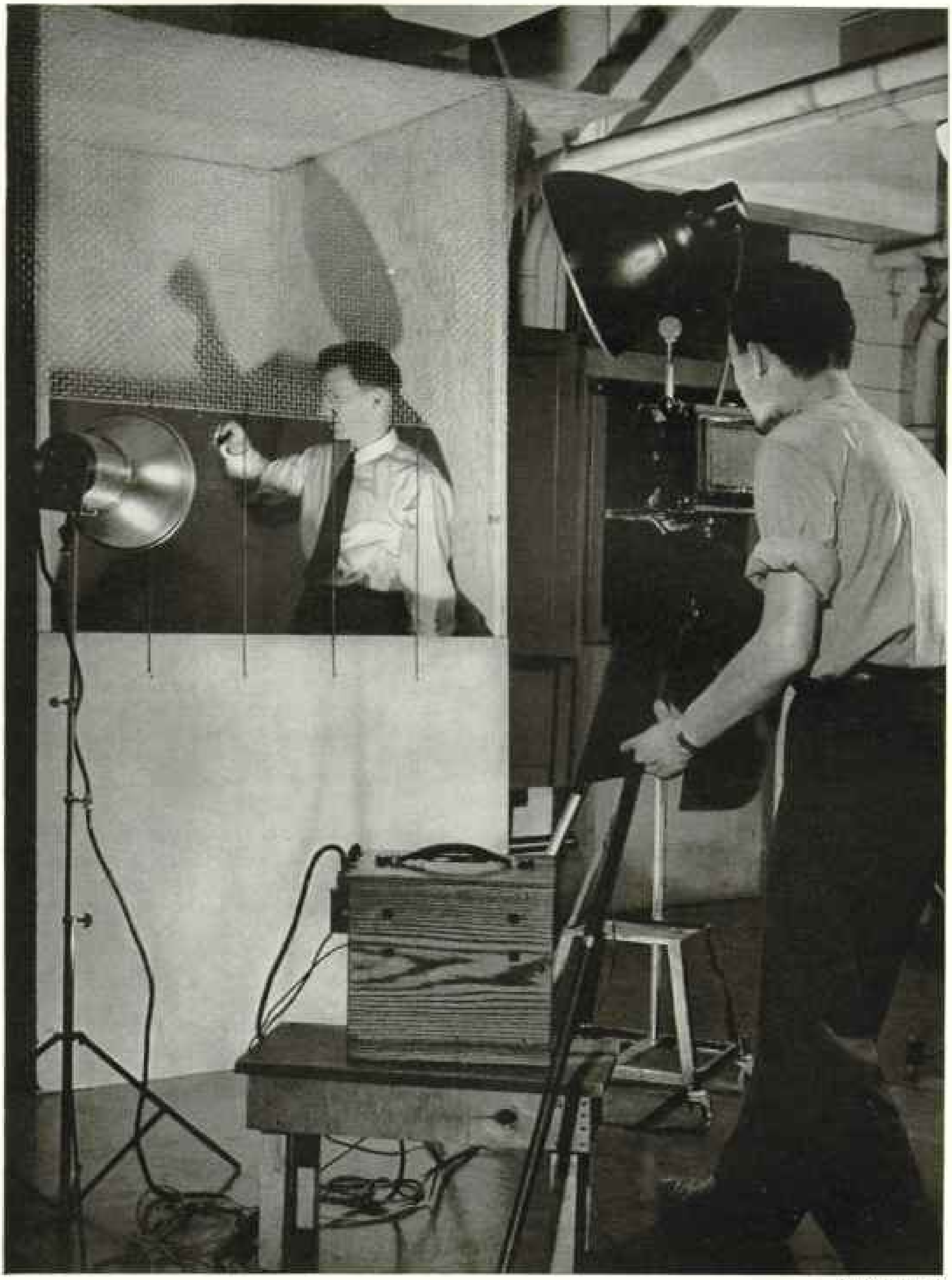
expectancy. Most mammals as small as bats live only a year or two, and five years is a very exceptional age span for the laboratory white rat, but some of the bats which I banded in the winter of 1934-35 were retaken alive and apparently in good health in January, 1946. Since they could not have been born later than June or July, 1934, these bats lived to be at least 11½ years old.

In about one month after birth the young have grown almost to adult size and are able to fly. After the latter part of July the females and their young leave the breeding colonies in buildings, and apparently at this season the cave bats spend the day in small groups in trees, rock crevices, or similar inconspicuous places. Less is known about their habits at this time because they are difficult to find.

Banded Bats Traced 170 Miles

A few of the bats which I banded at summer colonies were later retaken when we visited caves, and some were traced in the same way from caves to summer colonies. For instance, four bats banded at Mashpee, Massachusetts, on Cape Cod, were retaken the following winter in the cave near East Dorset, Vermont. Another bat banded on Cape Cod in the summer was caught at Roxbury, Connecticut, hibernating in an abandoned iron mine.

These bats have thus been traced some 150 to 170 miles from their summer roosts in



Wilfred Wentzel

To Test the Bat's Powers of Echolocation, the Author and Photographer Built This Booth

Inside, Dr. Griffin is about to release the bat while National Geographic Staff Photographer Robert F. Sisson, armed with Dr. H. E. Edgerton's high-speed lights and camera, prepares to "shoot" it on the wing as it banks to fly between the strips of rubber tubing stretched vertically across the opening (opposite page).

buildings to their winter quarters in caves. The returns substantiate the theory previously advanced that even the cave bats may migrate several hundred miles from the caves where they hibernate to their summer homes in trees and buildings (page 124).

Returns so far indicate that the bats in question had a summer range to the north and east of their winter quarters. This is what one might have inferred from the fact that large caveless areas lie to the north and east of the limestone belt of western New England.

Strong Homing Instinct Shown

A study of the banded bats recaptured shows clearly that they have a strong preference for their "home" cave. About 30 to 40 percent of the bats banded at a given cave are retaken there the following winter. When it is considered that some bats die each year and are replaced by young, and that not all the bats in a cave can ever be captured, this percentage indicates that the majority each winter return to the same cave to hibernate.

In central Vermont, where there are three good bat caves, several hundred banded bats were retaken in subsequent winters at the same cave where they were banded. We found only four or five which had voluntarily moved to another cave.

As a further check, several groups of bats were carried from one cave to another. Later the same winter many of these were retaken at the cave to which they had been transferred; evidently they did not move out during the cold weather. But the next winter several of these bats had returned as much as 150 miles to their home cave to hibernate.

Only one of 250 bats transferred from one cave to another remained in the cave it was taken to. One bat which was carried 150 miles was retaken the next winter at a third cave in a direct line on the way back to the cave it came from; evidently it had stopped at this intermediate cave on its way home.

At their summer colonies the cave bats are much more difficult to capture, and it is never possible to catch all of those roosting in a building. For this reason the percentage of returns is much lower.

Still, the bats show a marked tendency to return successive summers to the same roost, and very few of them move voluntarily from one colony to another even though it be only two or three miles distant. When bats are artificially transported from one roost to another, many are later retaken at the building where they originated. In fact, the percentage is actually higher than when bats are released right at the building where they are caught.

The distance from which transported bats have returned ranges up to 150 miles. Evidently they find their way back with great ease.

One summer Mr. Dean F. Bumpus, Biological Technician at the Woods Hole Oceanographic Institution, carried some bats to sea for me on the research vessel *Atlantis*. Twenty-four were released 12 miles from the nearest island and 35 miles from their home roost. Six of these, or 25 percent, were later retaken at the building where they were banded.

The fact that bats have such a well-developed homing instinct is interesting in itself and is good indirect evidence that they may be migratory, for a strong homing instinct usually accompanies the ability to perform long migrations.

An interesting problem is raised by the small size of the entrances to most of the caves where bats congregate for the winter. As can be seen on page 125, the actual hole which the bat must find may not be more than two or three feet in diameter, and yet these bats, flying at night, can return to such a cave or mine from summer colonies as much as 170 miles away, seeking out the obscure entrance beneath the trees of a wooded hillside.

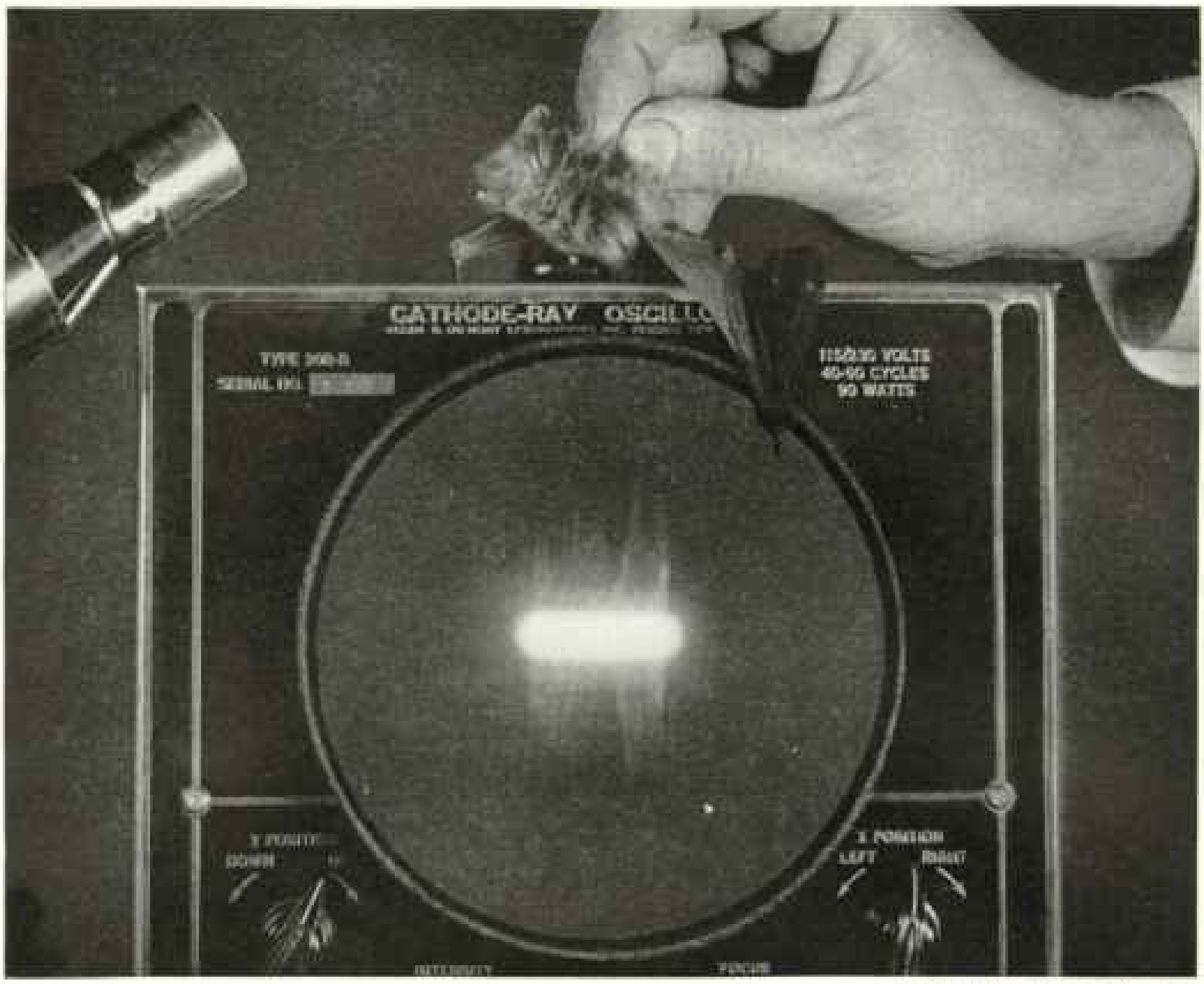
How they do this, particularly when they must orient themselves by hearing echoes rather than by vision, is one of the most puzzling problems which biologists have yet to solve.

How Bats "See with Their Ears"

Bats have a remarkable ability for avoiding obstacles, as is obviously necessary for an animal which flies such an erratic and rapid course through thick woods and the narrow tortuous passages of caves, often in total darkness.

Many experiments have been tried with captive bats to demonstrate their ability to avoid obstacles which they could not see. The Italian scientist Lazaro Spallanzani in the 18th century wrote that bats which had been blinded flew about a room, avoiding walls, furniture, and silk threads stretched in their path.

His friend Louis Jurine, a Swiss scientist, repeated these experiments and made the interesting additional discovery that bats lost their ability to avoid obstacles when their hearing was impaired. Spallanzani confirmed this observation before he died in 1799, but the celebrated anatomist Georges Cuvier and many of his followers expressed an incredulity which was phrased in the quip: "Since bats



Staff Photographer Robert F. Sisson

Photograph of a Bat's Voice! This Picture Proves that the Bat, Though Seemingly Silent, Is Actually Uttering High-pitched Cries

Too shrill for the human ear to hear, the cries of the bat held by the author are caught by the microphone at upper left, amplified, and reproduced graphically on a cathode-ray oscillograph in the Harvard University Biological Laboratories. The streaks above and below the central luminous spot are the visual representation of the creature's cries, which have a frequency of 50,000 cycles per second—some 30,000 above the maximum range audible to man. Such experiments by the author and Dr. Robert Galambos first proved that bats "see with their ears," guiding their flight by the echoes of their cries.

see with their ears, do they hear with their eyes?"

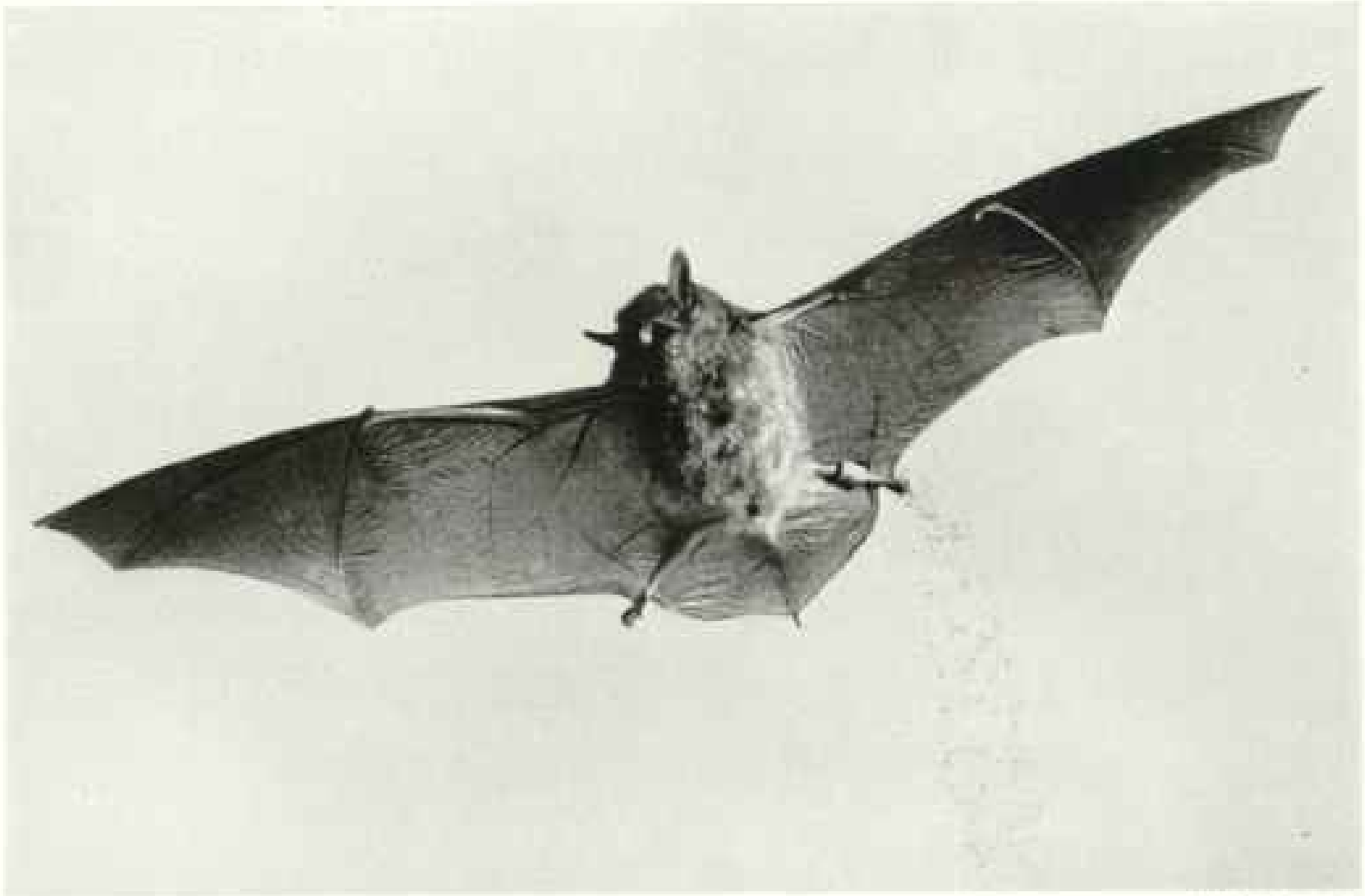
So convincing are a great man's words that Jurine's discovery was completely forgotten until the present century, when recent developments in physics placed at the disposal of Dr. Robert Galambos and the writer an electronic apparatus which detects supersonic sounds—sounds of higher pitch than the human ear can hear.

When a bat was held before this apparatus, we discovered that, though apparently silent, it was actually emitting loud supersonic cries which the apparatus could detect and even translate into sounds audible to the human ear. Our later experiments showed that the echoes of these cries enabled bats to detect obstacles in their flight and to dodge them in time to avoid collision (pages 130 and 131).

This process is the chief mode of perception available to bats, and in this way they obtain most of their information about their surroundings. The process is so distinct from other types of perception that I have called it "echolocation," or the location of objects by means of echoes.

Bats' Echolocation Resembles Radar

Bats are so proficient at echolocation that even when blindfolded they can fly between vertical 16-gauge wires spaced 12 inches apart, brushing the wires only once in six to ten passages. They do this while flying at full speed, "echolocating" the wires when a foot or two away and banking or pulling in their wings to pass between them.



H. E. Edgerton

A Bat's Furry Fuselage Rides on Wings of Membrane and Slender Bones

Bats fly by raising the wings partly folded and bringing them sharply down and forward, the rubbery membrane bulging between the bones like a sail between its spars. Unlike the airplane and some soaring birds, this little insect eater cannot fly with wings motionless but must flap continuously, some 15 strokes per second. In this photograph, made in midstroke at 1/100,000 of a second, the extended wings resemble the airfoil contours of some early airplanes and gliders. Webbing between the legs and tail provides rudder control.

The process of echolocation is not confined to bats. The traditional tapping of a blind man's cane (for instance, that of blind Pew in *Treasure Island*) is a form of echolocation. Many totally blind persons acquire an uncanny ability to move about without striking furniture, walls, or other obstacles. Most of them have no clear idea how they do this, but recent studies by three psychologists at Cornell University have shown that they lose the ability if their ears are stopped.

In foggy coastal waters, fishermen and steamboat captains can often detect the presence of cliffs or rocks by blowing a short blast with the ship's whistle and listening for echoes.

Another example is the sonic depth finder, or fathometer, which sends down sound waves through the water and measures its depth by timing the interval between each sound and its echo.*

But the most spectacular example of echolocation is the modern miracle of radar, which sends out radio waves and measures the distance and direction of aircraft or other objects by the echoes of these waves, reaching out even as far as the moon.

Because of the basic similarity between the bat's use of echolocation and the fundamental principles of radar, one occasionally hears the statement that "bats have radar." This is not strictly true, since the bats use sound waves and radar employs radio waves. More comparable is the Navy's "sonar," used for locating submarines, icebergs, or rocks.

So when next you see the fluttering shadow that is a bat erratically chasing insects through the summer twilight, remember that he is a harmless, interesting little beast and not the ferocious leather-winged dragon at which you were inclined to shudder. Like the more familiar and more generally appreciated songbirds, he is beneficial because he eats insects harmful to man.

Next fall the agile phantom which you watch against the sunset's glow may fly hundreds of miles to some distant cave whose passages he will thread by his skill at echolocation to find a quiet retreat in which to pass a restful winter's hibernation.

*See "Servicing Arctic Airbases," by Robert A. Bartlett, NATIONAL GEOGRAPHIC MAGAZINE, May, 1946.

Postwar Portrait of the United States

AS MILLIONS turn to travel and war-deferred vacations in the first full summer of peace, the 1,450,000 members of the National Geographic Society receive with this issue of their Magazine a map which will unfold 3,022,387 square miles of the most diversified and beautiful lands of the world—the United States of America.*

This postwar portrait of our Nation incorporates the latest census estimates and includes more geographical names than ever before appeared on a single NATIONAL GEOGRAPHIC map—10,750. Several newcomers owe their newborn importance to World War II, notably Oak Ridge, Tennessee, which was boomed by the atomic bomb from a population of 75 to 75,000.

Volumes of up-to-date information are compressed within the star-spangled borders of this detailed and decorative ten-color map, designed as a companion to the National Geographic Society's current World Map issued in December, 1943. Some of the information has not heretofore been generally available, because it results from recent aerial and land surveys.

The new map supplement to the NATIONAL GEOGRAPHIC MAGAZINE is the product of six months of careful compilation and draftsmanship in The Society's Cartographic Section. The scale is 1 to 5,000,000, or 78.91 miles to the inch, and the over-all size is 26½ by 41 inches. Extensive border lands of Canada and Mexico are included.

The projection chosen is the Albers Conical Equal-Area, ideal for showing a country such as the United States, which stretches some 2,700 miles from east to west.

The territory covered by the map extends from Vancouver Island to the Gaspé Peninsula, from Key West, Florida, to Monterrey, Mexico, and on to lonely Cabo San Lázaro, in Baja California.

A special large-scale inset shows the Greenwich, Connecticut, area, north of New York City, which was recommended as headquarters of the United Nations by its Permanent Site Committee. Another inset, on the same scale as the main map, includes the great summer-resort area of the Canadian Maritime Provinces east of Maine.

Nation Has 3,000,000 Miles of Roads

From Lubec, Maine, in the east, to Cape Alava, Washington, in the west, and from Penasse, Minnesota, in the north, to Key West, as the southernmost point, the continental United States is woven together by more than 3,000,000 miles of roads. The total length of surfaced roads alone would encircle the globe more than 56 times.

Clearly shown on your new map by a network of red lines is the vast and amazing system of national highways and the more important State roads. National highways are marked by the familiar shield.

Compilers in The Society's Cartographic Section worked directly with Federal and State highway authorities and many private touring clubs to delineate accurately the greatest highway system in the world. The same painstaking care was used in adjacent Canada and Mexico.

Map Shows 107 National Shrines

Spreading the full-color map before him, the travel-hungry member will find an abundance of objectives for journeys near or far.

On it are all of the national parks in which the Federal Government preserves our heritage of wild life and scenic wonders.

Except in urban areas, national monuments also are shown. Among them is the new Franklin D. Roosevelt National Historic Site, at Hyde Park, New York, dedicated in April by President Truman.

In the right-hand margin appears a key to location of the 107 national parks and monuments shown on the map. Territory under jurisdiction of the National Park Service would almost equal the area of Maine.

For power, irrigation, and flood control, large bodies of water have been created in recent years. Near one of them will doubtless be located the Army's Air Engineering Development Center, since specifications call for immense quantities of electric power and fresh water. There it is planned to attack problems involved in creating aircraft and robot missiles capable of exceeding the speed of sound.†

Many man-made lakes have incidentally developed into recreational areas. Among the newest of these is Fontana Reservoir, in North Carolina, which was opened to vacationists in May.

Some bear new names in commemoration of noted Americans. The waters formed by Grand Coulee Dam, in Washington, now are

* Members may obtain additional copies of the new map, "The United States of America" (and of all other maps published by The Society), by writing to the National Geographic Society, Washington 6, D. C. Prices, in United States and Possessions, 50¢ each, on paper; $1 on linen; Index, 25¢. Outside United States and Possessions, 75¢ on paper; $1.25 on linen; Index, 50¢. All remittances payable in U. S. funds. Postage prepaid.

† See "Air Power for Peace," by General of the Army H. H. Arnold, in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1946.

known as Franklin D. Roosevelt Lake, and Shoshone Reservoir in Wyoming was rechristened Buffalo Bill Reservoir this year in honor of the centennial of William F. Cody, hard-riding western scout and showman, born in Iowa in 1846.

Another new name on the map is Mount Eisenhower, formerly Castle Mountain, in Banff National Park, Alberta, Canada. The peak was renamed by our Canadian neighbors in honor of the achievements of our esteemed general in commanding the Allied Expeditionary Forces which drove to the heart of Germany.

War-important towns making their first appearance on a National Geographic Society map of the United States include the following in addition to the "atom city" at Oak Ridge, Tennessee: Richland, Washington, boomed from 700 to 15,000 by the Manhattan Project, which created the atomic bomb; Boca Raton, Florida, Army Air Forces Radar Training Center; Inyokern, California, Naval Ordnance Testing Station; and Bretton Woods, New Hampshire, international monetary and financial conference scene.

Transport Plane Airports Marked in Red

The air-minded traveler on business or pleasure will find on this map a convenient new feature. All airports with scheduled passenger service are clearly marked with a red symbol.

As a flight companion the map is of good scale for tracing progress across the country. So swift is the pace of present-day air transportation that the large-scale maps used for navigation are unsuitable for the ordinary passenger, since the plane runs off the sheet too quickly. Even on this map, of relatively small scale, a modern transcontinental plane covers about four inches every hour at cruising speed.

Readily apparent on the map, as in an aerial view, are the striking contrasts between the great city centers of population and the open spaces where swamp or desert handicaps human settlement.

Heavy concentrations of place names in certain parts of the map, particularly the industrial East, emphasize how uneven is the distribution of the Nation's inhabitants.

In South Dakota is the most sparsely settled county in the United States. Armstrong County, in the Cheyenne River Indian Reservation, had 42 inhabitants in 1940 and three years later its total civilian population had fallen to 9. Each inhabitant had an average of more than 57 square miles—enough elbow room to satisfy even a Daniel Boone.

At the other end of the scale are such hives of humanity as New York and Chicago. In Manhattan's New York County, for example, nearly 86,000 persons share each square mile.

The Nation's population center at last count was 10 miles south of Sullivan, in Sullivan County, Indiana. The geographical center is in Smith County, north-central Kansas.

The population of the United States, including armed forces overseas, increased by nearly 8,000,000 between April 1, 1940, and July 1, 1945, according to Census Bureau estimates, and now is over the 140,000,000 mark. Thus the increase is roughly comparable to the peak strength of our entire Army ground and air forces, which reached a total of 8,300,000.

Chiefly responsible for the sharp upswing was the wartime rise in the birth rate combined with a continued low death rate resulting from advances in medical science. The general death rate increased little despite our war casualties.

Meanwhile, the traditional westward trend in American population movement continued. Of the various regions of the country, only the Pacific-Rocky Mountain area showed a gain in civilian population in the face of the drain of manpower for the armed forces during the war years.

Most of this increase was in California, Washington, Oregon, and Arizona. California was the principal gainer, with a net rise of 1,600,000 through migration. For example, Richmond, California, Kaiser shipyard city, grew from 23,642 in 1940 to close to 100,000 in three years.

In the past few years more Americans have been on the move than ever before in history, and the movement still continues. A Census Bureau survey two months before victory in Europe showed that 7,670,000 civilians were then living in a State other than the one where they lived at the time of Pearl Harbor.

To these moving millions must now be added the legions of ex-servicemen pouring across the land as they return to their homes or travel with their families to new postwar fields of work. To all such migrating Americans, the new map will serve as a silent guide.

Despite the unprecedented number of names on the map, instant legibility is assured by use of The Society's patented type faces designed by Charles E. Riddiford, of its cartographic staff, including some recently created and used for the first time. Examples are the types used for New Salem, Illinois, where Abraham Lincoln began to read law, and the shipbuilding boom town of Richmond, California. All type for the names of rivers is of a newly designed style.

NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDING
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ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded fifty-eight years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 10, 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 A. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

The National Geographic Society–U. S. Navy Expedition camped on desert Canton Island in mid-Pacific and successfully photographed and observed the solar eclipse of 1937. The Society has taken part in many projects to increase knowledge of the sun.

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.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

Actual color photograph of 1947 Studebaker Commander Regal De Luxe 5-Passenger Coupe

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For a city boy — especially one who's had few privileges — the first cold plunge at summer camp is liable to be awkward. But it isn't long until he takes to this new world with its new ways like a duck to water!

Not least among the things he learns are *good eating habits.* For camp directors know that well-balanced meals are as important as sunshine and outdoor sports to a child's health.

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The Meissner 18th Century English is pictured above. Veneered in beautiful swirl mahogany, the hand rubbed cabinet has a top section bordered in satinwood with ebony cross line banding in the Hepplewhite tradition. Under the top is a hand carved flute and rosette design. Pulls are finished in antique brass tone.

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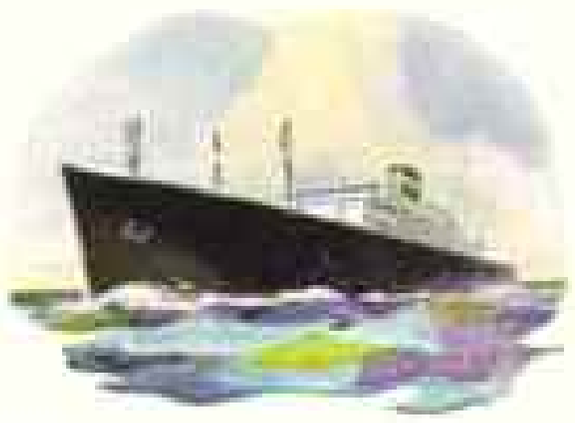

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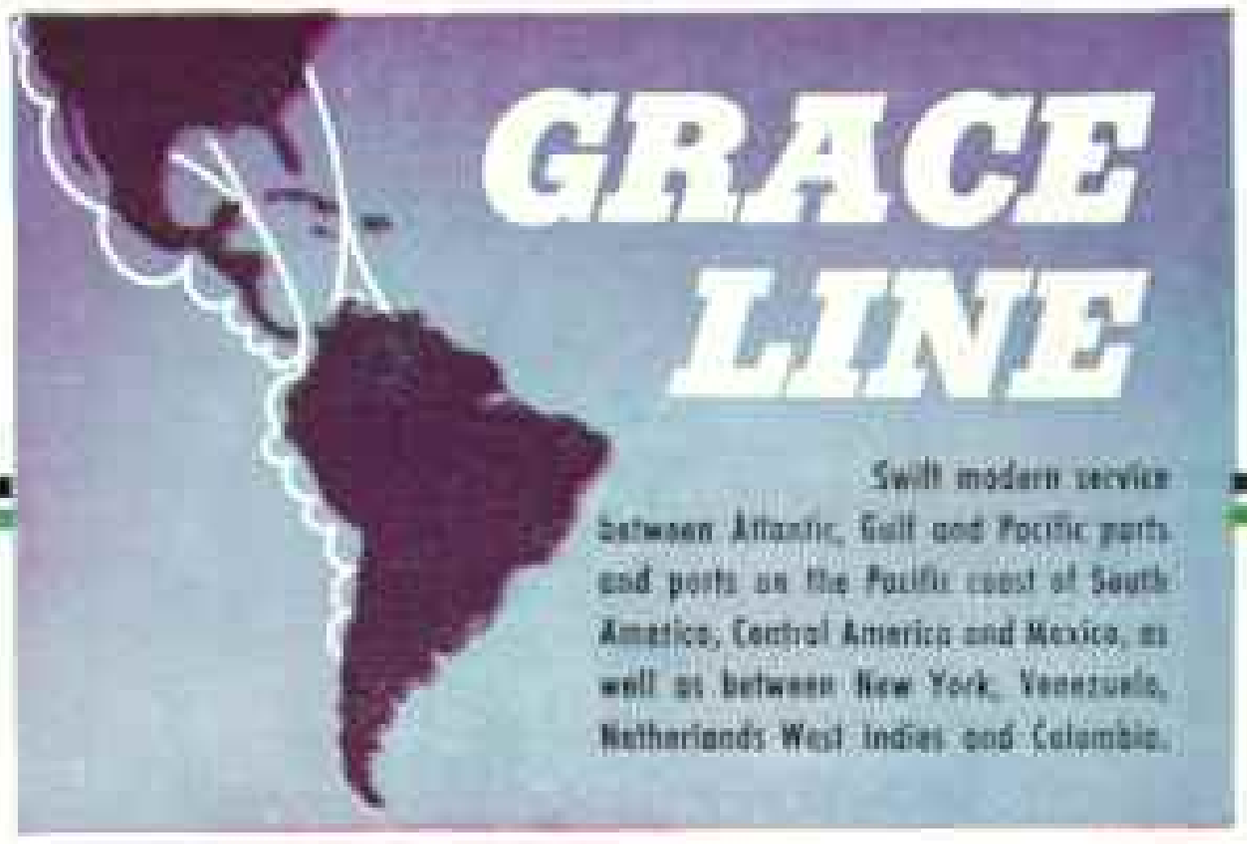

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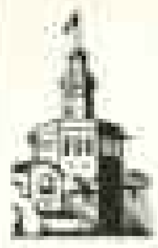

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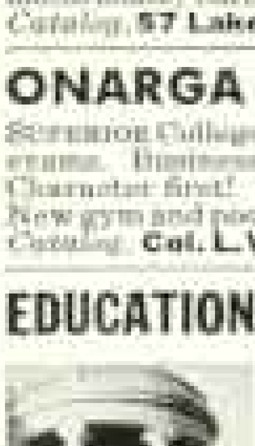

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