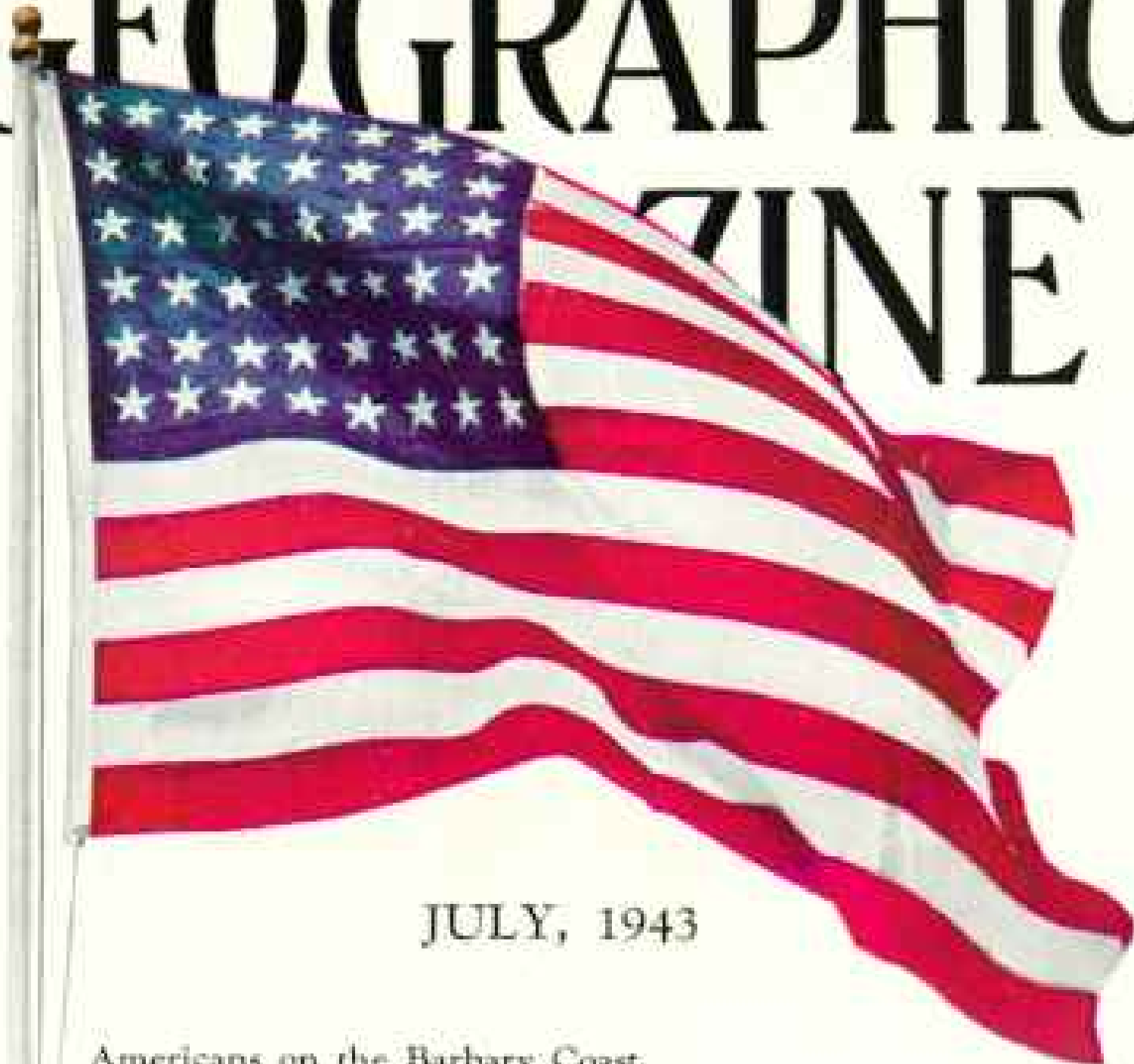


Buy U. S. War Savings Bonds and Stamps

VOLUME LXXXIV

NUMBER ONE

# THE NATIONAL GEOGRAPHIC MAGAZINE



JULY, 1943

Americans on the Barbary Coast  
With 13 Illustrations and Map

Willard Price

Casablanca Smiles  
10 Natural Color Photographs

Herbert P. MacNeal

Birds on the Home Front  
With 37 Illustrations, 30 in Full Color

Arthur A. Allen

American Wings Soar Around the World  
With 21 Illustrations

Donald H. Agnew  
and William A. Kinney

Aboard a Blimp Hunting U-Boats  
With 18 Illustrations

Mason Sutherland

The Heavens Above  
With 12 Star Charts, and 13 Drawings  
of the Constellations and Map

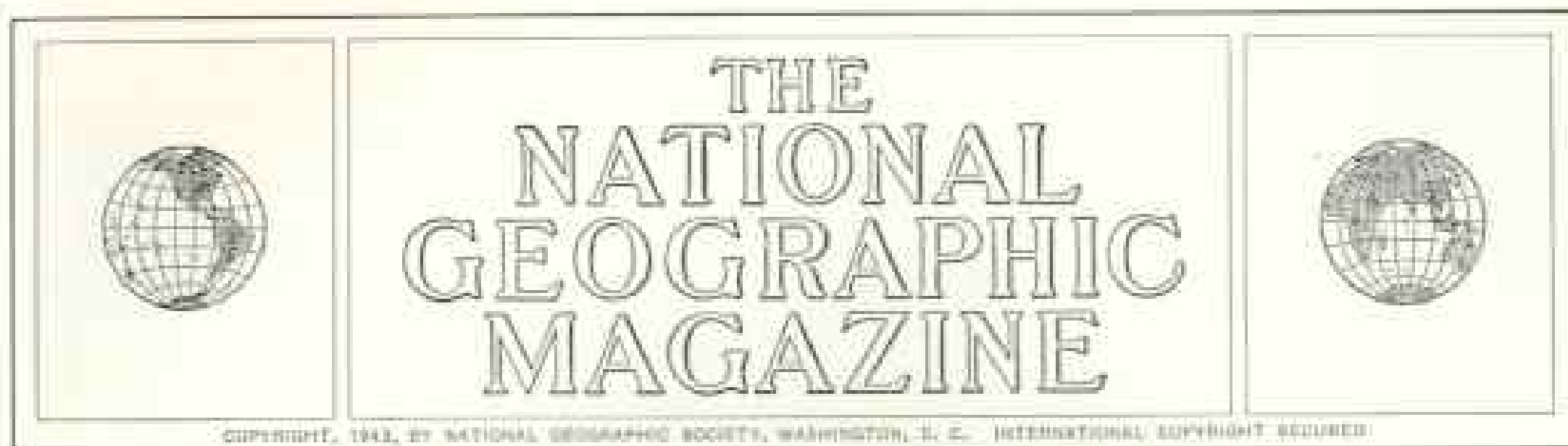
Donald H. Menzel

NATIONAL GEOGRAPHIC SOCIETY  
WASHINGTON, D.C.

\$4.00 A YEAR

50c THE COPY

24 Pages of Illustrations in Color



## Americans on the Barbary Coast

BY WILLARD PRICE

**H**UNDREDS of thousands of American boys now are getting acquainted with North Africa. The United Nations' invasion of Morocco and Algeria on the morning of November 8, 1942, introduced them to a strange and fascinating world.\*

This had been a land apart. England had become almost a second home to many Americans, and Europe was well known. But the beaten travel paths stopped at the shore of the Mediterranean. Shanghai, more than 12,000 miles by sea from New York, has long been better known to the United States than Casablanca, less than 4,000 miles distant.

Tribes in the interior of Morocco still regard the camera as an instrument of the devil to seize and imprison men's souls. Nonbelievers may walk into a temple in Peiping or Calcutta, but not into a mosque in Marrakech or Tunis.

### Sights to Write Home About

The American boys did not go to North Africa to see the sights. But the large American army of occupation assigned to the vast territory that has fallen under Allied protection has had many months of golden opportunity to see things worth writing home about.

It will add to our own interest in their experiences to make an imaginary tour of this world that time forgot and American soldiers and sailors are rediscovering.

Let us start with Morocco, on the left shoulder of Africa. It lies below the Strait of Gibraltar, once called the Pillars of Hercules by those who believed that here the world ended and that Atlas stood holding up the heavens upon his shoulders.

Greek sailors had seen him do it—or at least they had seen a mountain range lost

in the clouds. Imagination turned it into the giant Atlas, and the name Atlas has ever since been attached to it.

Early Greek and Roman visitors found sunbathers with a deep tan and called the land Mauretania, from the Greek *mauros*, black. It was a misnomer, for the inhabitants, insofar as they were black at all, were really a blackened white. They were Berbers, a naturally white-skinned race.

The American newcomer is surprised to find the skin of the "native" where the sun does not beat upon it whiter, often, than his own.

Many of the Berbers have blue eyes and blond hair. They do not seem to belong in Africa; yet they have been there so long that no one knows where they came from. At any rate, the American and Britisher soon feel a sense of kinship with them in spite of their strange language and costume.

The Berbers are a sound, vigorous people, democratic by nature. Their villages are run by the villagers, and the voice of the poorest man is equal to that of the richest. The village officials are unpaid and are replaced promptly if they fail to serve the community.

### Berbers Recognize Women's Rights

The Berber has taken the Arab's religion, but with reservations.

He considers one wife enough. She has rights which Arab women envy. She may take part in the government of her village. She does not wear a veil except in cities,

\* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Eastward from Gibraltar," by Cyrus French Wicker, January, 1943; "Fez, Heart of Morocco," by Gordon Casserly, June, 1935; "Beyond the Grand Atlas," by V. C. Scott O'Connor, March, 1932; and "Across French and Spanish Morocco," by Harriet Chalmers Adams, March, 1925.



British Official Photograph

### French Girls at Liberated Gabès Hail the Eighth Army with Smiles, Flowers, and Tricolor Rosettes

Rommel's army, driven from the Mareth Line to the south, made little effort to hold this small port in southeast Tunisia. To General Montgomery's dusty desert veterans, its green oasis was a welcome sight. At Gabès they reached railhead. In caves near by dwell the Troglodytes.

where she is influenced by Arab custom. She is not imprisoned in a harem.

In the seventh century the Arabs made their first sweep through all North Africa, even into what is now Morocco. Since it appeared to be the end of the world, they called it *Maghreb el-Aksâ*, "the Extreme West-land."

The Arab intermarried with the Berber, and the result was the Moor. The term "Moor," however, came in time to be loosely applied not only to those of mixed blood but also to the many Berbers and the few Arabs who remained pure in bloodline.

The crossbred Moor combined some of the Berber stamina with Arab aggressiveness and set out to conquer Spain. He seized that country and held it for centuries, much to the benefit of Spain.

He kept alive civilization at a time when it had almost perished in the rest of Europe. The Moorish Empire and China carried the world over an abyss of barbarism. We owe them both an eternal debt.

The Moors preserved much of Greek learning, and added their own to it. Aristotle was studied in the Moslem universities when he

had been forgotten elsewhere. Philosophy, mathematics, and medicine were cultivated.

A delightful experience awaits those who dip into Moorish literature of this period. Agriculture was studied, and marvelous irrigation systems made Andalusia famous for its gardens. Moorish vessels ruled the Mediterranean and traded with all the known world. And the visitor to the Alhambra stands speechless before the glory of Moorish architecture and art.

But the Moors became self-satisfied. They were the best people and they knew it. Since they had reached the top, why keep on climbing? They became lazy. Black slaves did their work. Prosperity led to dissipation and decadence.

They were finally expelled from Spain in the year of the memorable voyage of Columbus, 1492. Europe had awakened and was pushing into the western unknown. The Moors retired into North Africa and, in resentment, began to prey upon Spanish shipping.

They were as talented in destruction as they had been in construction. They extended their operations to ships of all nations and their depredations went unchecked until Com-



Henri Goumar

### One Veil Hides a Mother's Age, the Second Masks Her Daughter's Beauty

The parent is muffled in the broad-stripe silk, her coquettish eyes made up with kohl. One daughter combines a black oriental veil with embroidered garments revealing European influence. Her sister, boldly exposing her face, clings to native dress. They live in Tunis, where many upper-class Modern women patronize French dressmakers.

modore Decatur of the United States Navy sailed into the harbor of Algiers. But more about that when we consider Algiers (p. 14).

#### Modern Morocco a Sleeping Beauty

Modern Morocco still has its universities, but they drone over the Koran. It still has its magnificent palaces, minarets, and gardens, but they are redolent of the past. Its people wear the costumes and practice the customs of a bygone age.

"I have just been reading a book written in the 14th century describing Moroccan customs," a Frenchman told me in Fez. "The customs it describes have not changed. The book might be republished with this year's imprint and it would still be up to date!"

The Americans who sloshed ashore from their landing boats on the beaches on each side of Casablanca stepped back 600 years (Plates I to VIII). Casablanca itself is a modern French town, the only one in Morocco. But a few miles up or down the coast the old Morocco is little altered.

Strafing French planes, flying low to machine-gun the beaches, did not prevent the curious and eager native population from

swarming out to see the Americans. They refused to believe that these "invaders" were enemies.

Of course their wonder was not as great as ours. They had seen foreigners before, but the lads from New York, Keokuk, and Los Angeles looked upon a scene that must have reminded them vaguely of Bible Land pictures they had seen as children in their Sunday School papers.

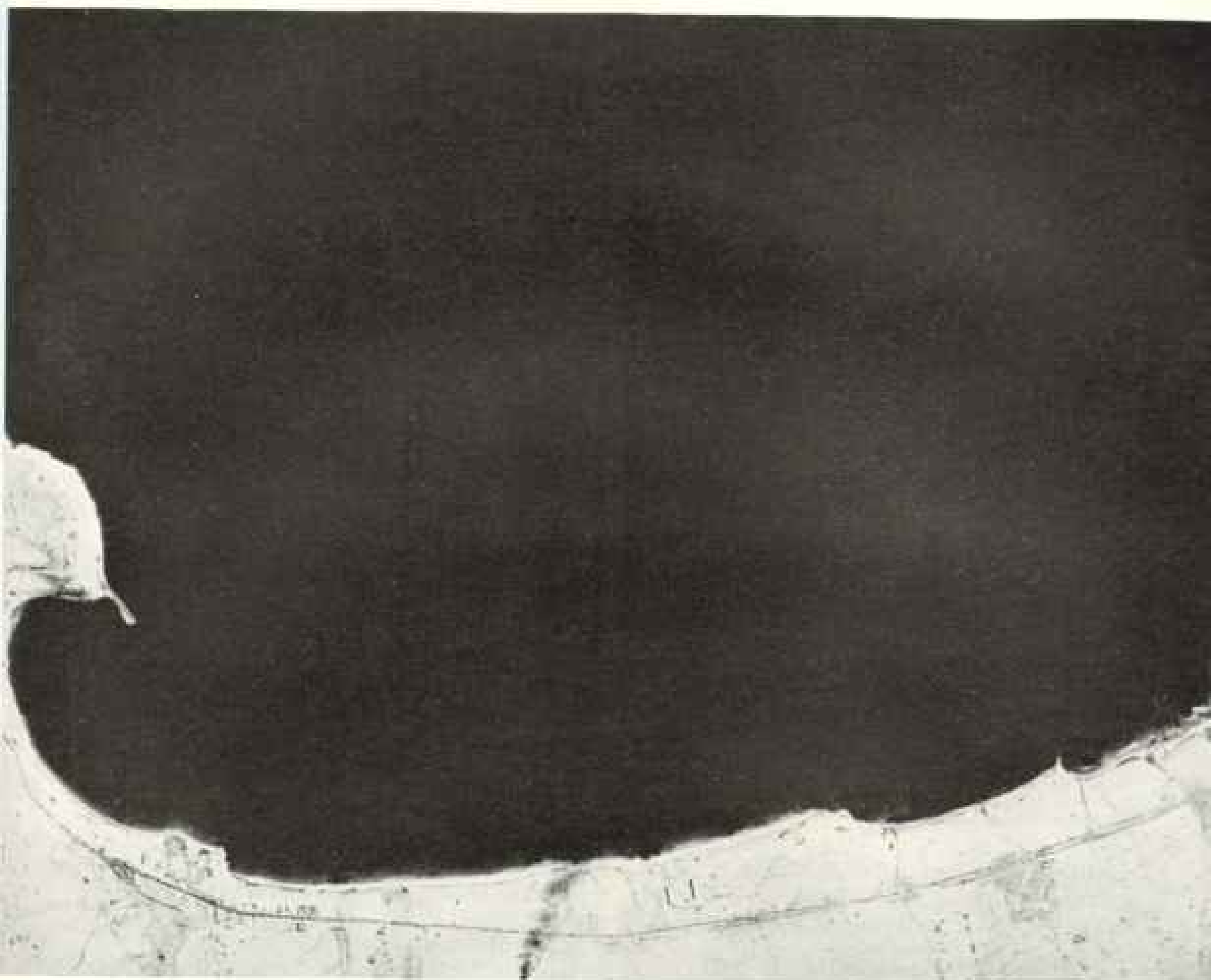
#### Wool Worn to Keep out the Heat

White-robed figures stood about in the morning light like so many pillars of salt. The North African wears wool to keep out the heat.

"If I had known it was going to be such a hot day, I would have worn a heavier burnoose," is a common remark.

The burnoose is a loose flowing garment, usually white, topped with a hood and reaching to the ankles. Below it flash a pair of bright-red or yellow *babauches*, heelless slippers.

From under the hoods smile white faces, brown faces, and even black faces. The blacks are probably slaves. The French, of course,



### 20,000 Feet Above Egypt, the R.A.F. Sights the Doomed Afrika Korps in a Traffic Jam

At Salûm (left), 500 fleeing vehicles pile up where bombers have disabled tanks or pitted the Mediterranean coastal road. Sand outlines the foundations of ruined buildings. Smoke drifts from a supply dump. On this November 7, 1942, Rommel's tanks and trucks had all North Africa for a flight road. On the 8th, Anglo-American landings headed them off.

do not encourage slavery. The buying and selling of human flesh has to be done furtively.

The plump men standing a little apart, clad in black gaberdines and skullcaps, are Jews. The Jews have been here from time immemorial. Their number was augmented when Spain drove out its Jews in the days of the Inquisition.

Black is the color worn by the Jews, at first by the compulsion of the Arabs, now by choice. They are proud to be known as Jews. Much of the progress of North Africa is to their credit.

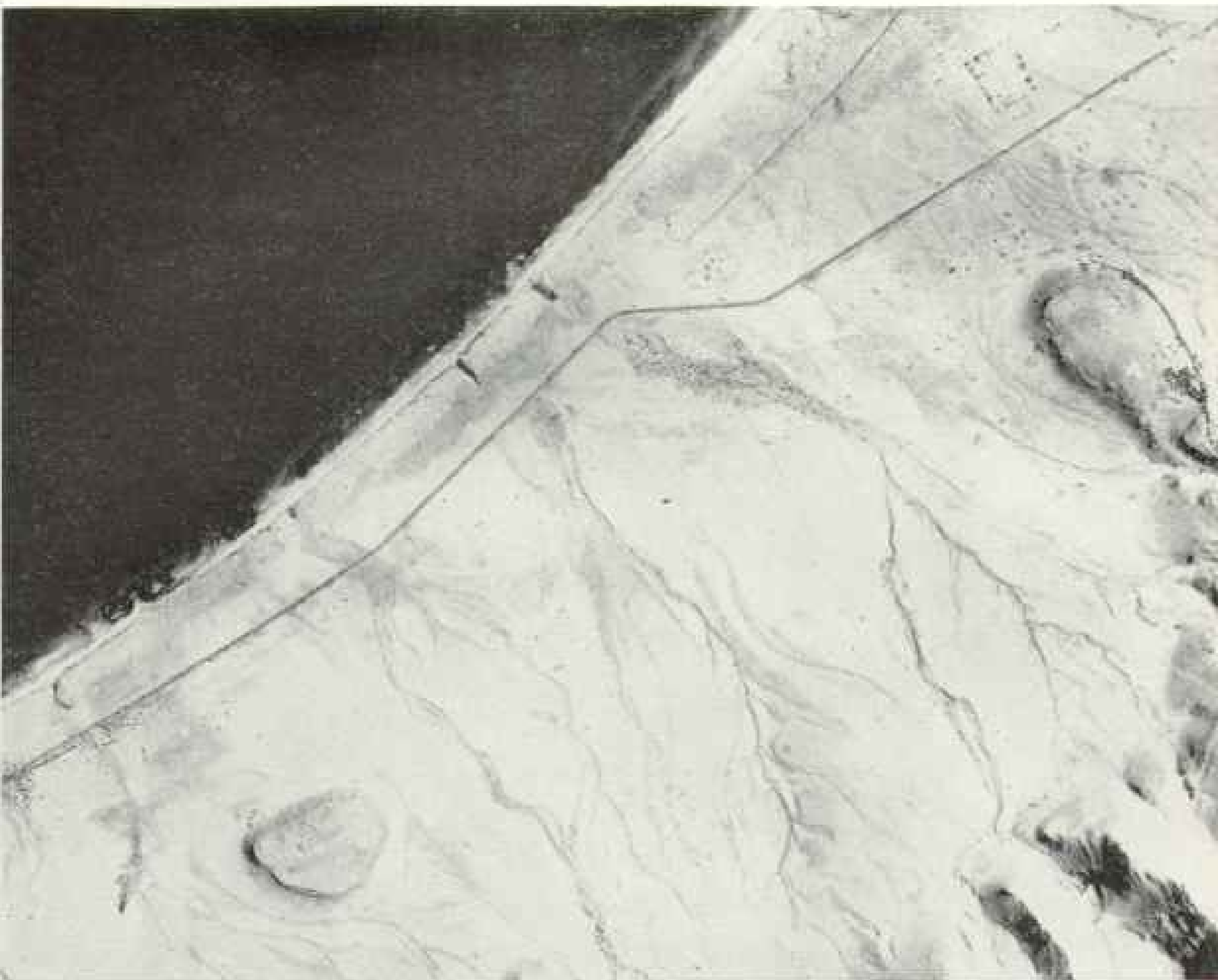
However, they must live in a ghetto, or *mellah*. The most unwelcome tasks of the community fall on them. In former times

they were required to pickle in salt the severed heads of rebels before they were placed over the city gates.

But how long will the eyes of the visiting Yanks linger on the men? There are women here, too, and they are not to be ignored.

Black eyes flash behind the lattice of a balcony. Faces appear and disappear behind the parapet of a flat roof. Standing in the crowd are a few women, but most of them are closely concealed in the long white *haik* and the veil that covers all the face with the exception of the eyes (page 5).

It is hard to judge by a pair of eyes alone. The owners of them may be as homely as sin, or as beautiful as the desert gazelle with



British Information Service

### Massed Like Prewar Sunday Drivers, Fleeing Axis Vehicles Writhe on Road and Detour

More than 1,000 crowd the five road miles from Salûm Pass (far left) to Hallâya ("Hellfire") Pass. Some 300 are in a bottleneck above the second smoke column. On Hallâya hill road (right), others form a knotted string on the rim of the "oyster shell." Not to be mistaken for tanks, thorn bushes grow in two dried-up river beds. Soon General Montgomery's Eighth Army will appear on the scene.

which women are so often compared in Arab love poems. The veil may be a curse to the Moslem woman, but it is also a boon. It gives her the benefit of the doubt.

#### Moslem Women Lavish Care upon Their Eyes

Since only her eyes are revealed, she lavishes endless care upon them. She massages the corners with cream, she makes lustrous the lashes with oil, she enlarges the pupils with belladonna, she darkens the lids with *kohl*, a powder of antimony. She makes her eyes two dark, gleaming jewels calculated to set any man dreaming.

But if there is a dreaming Yank on that

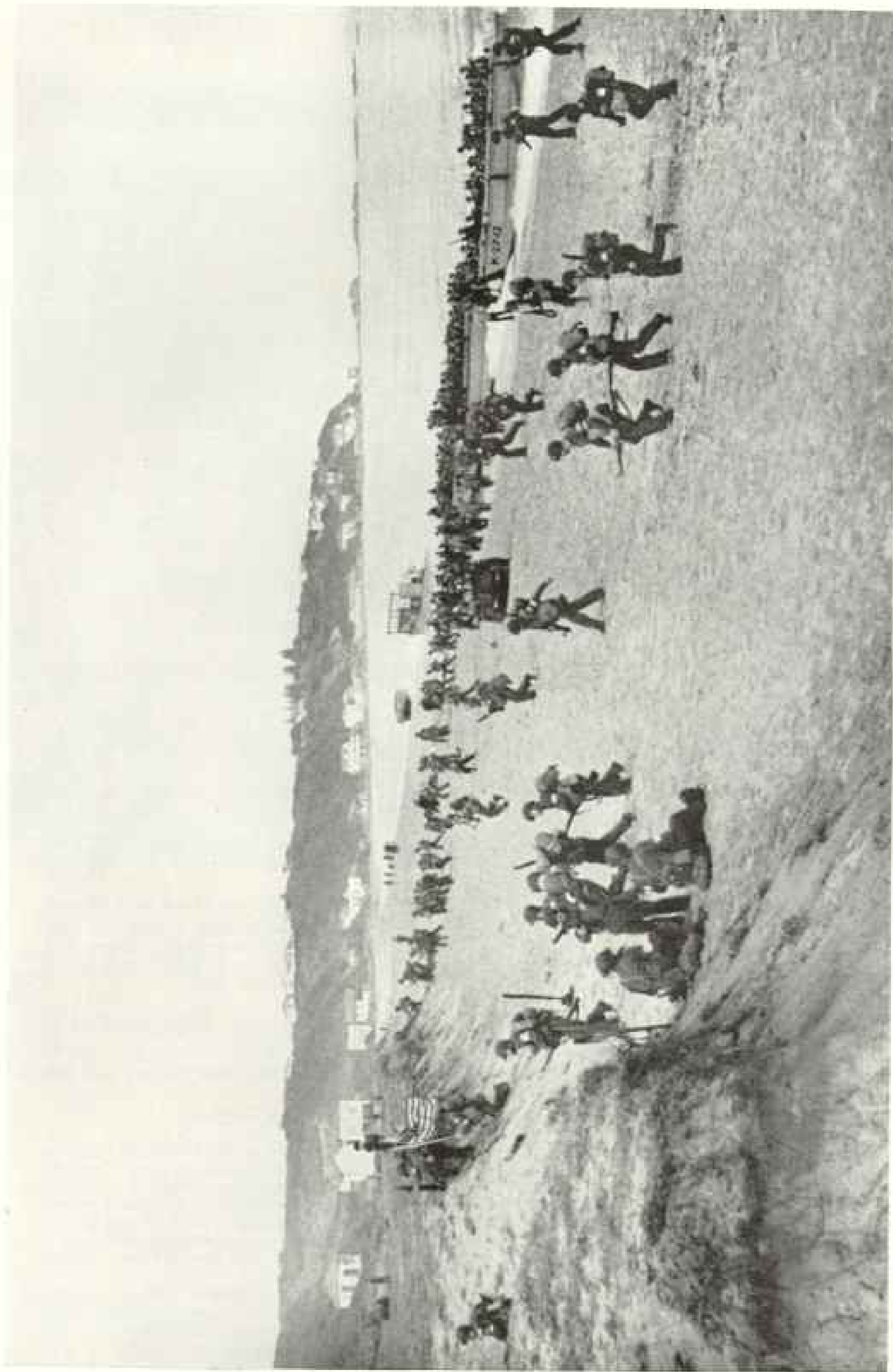
beach, he quits dreaming when his hand in his pocket encounters his rule book. For he knows what that book has to say on the subject of women.

In Chapter 14 it is written:

There is no Arab custom which must be respected more completely than their attitude toward women. The difference between peaceful and friendly relations with the natives on the one hand, and serious difficulty on the other, may depend on whether or not every single one of us understands and respects the very special outlook the Moslems have toward women.

You must not talk to Moslem women. Never, under any circumstances. The most innocent word addressed to a Moslem woman is considered an insult and is bitterly resented by Moslem men.

If an Arab asks you to his house, the women



As a Symbol of Friendship, Old Glory Leads a Wave of Americans Landing at Suroouf

In the early dawn, an assault wave came in boats and cleared this beach. Algiers, 14 miles away, quickly capitulated as the Yanks infiltrated from both sides. Here some trot, others walk in boats, and a leisurely few sit to adjust equipment.

British Official, Crown Copyright Reserved

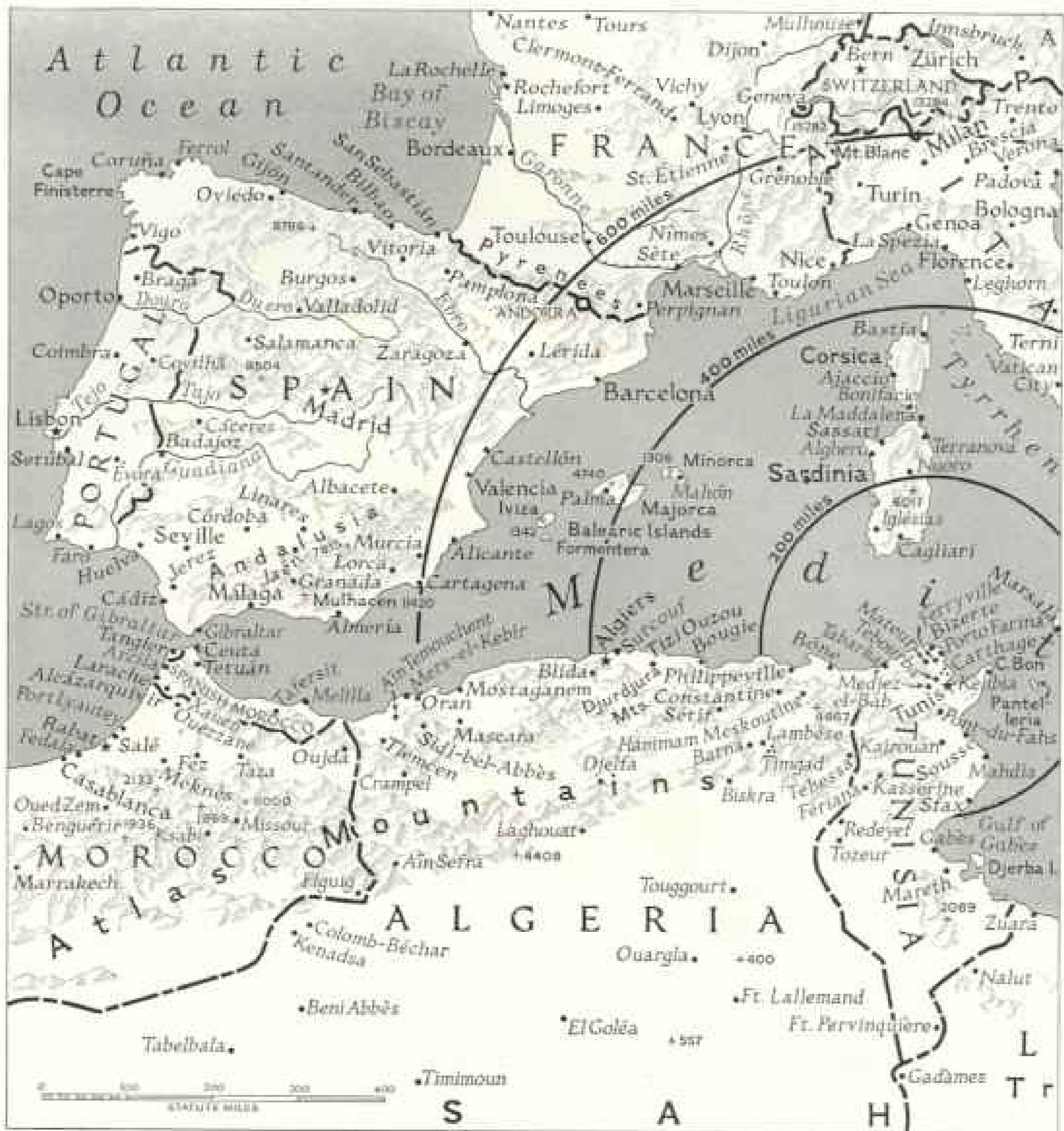


U. S. Navy, official

**In Casablanca to Demand Unconditional Axis Surrender, President Roosevelt and Winston Churchill Woo the Sultan of Morocco**

Standing, left to right, are Lt. Gen. George S. Patton, U.S.A., Robert Murphy, Harry Hopkins, the Crown Prince of Morocco, French Gen. Charles Nogues, the Grand Vizier of Morocco, the Chief of Protocol of Morocco, Col. Elliott Roosevelt, A. C. Res., and Capt. John L. McCrea, U.S.N., the President's naval aide.





Bizerte Is a Bomb Bay Aimed at Italy—600 Miles Takes Our Planes to the Alps

are confined to their quarters. If anything is said or done by you which would make the Moslem men feel that you have shown disregard for their women, there will be no limit to their righteous indignation.

Regarding Moslem women, you must put aside all your preconceived notions and ideas. You must remember your conduct in this matter may decide the fate of this campaign.

Remember this at all times. It is a most serious warning.

**Begging for "Unclean Christian Money"**

There are sure to be beggars in any crowd, and they regard the foreigners as easy picking. When they are tossed a coin, they mur-

mur what their benefactors may suppose to be thanks. Instead, they are probably calling down a curse upon the infidel to atone for the sin of receiving "unclean Christian money."

A favorite anathema is, "May a pig die on the grave of your grandmother!" Another member of your family often singled out for special attention is the wife of your great-grandfather. She is invited to broil eternally in the nether world.

The devout Arab walks continually between heaven and hell, warily conscious of



Drawn by H. E. Hartwood and Irvin E. Allenman

2,200 Miles of Secure Mediterranean Cuts 5,000 Miles Off England-to-India Voyages

both. Heaven is not forgotten in this crowd. Many of the men and boys have their heads completely shaved except for a single long lock or pigtail left behind one ear. This lock is a passport to Paradise.

The blind angel of death, Sidna Azrain (Azrael), will some day lay hold of it and draw the faithful Moslem up to that land where he will be welcomed with a feast of 300 courses, each one giving him a new appetite for the next.

He will have 80,000 servants. Seventy-two musk girls will become his wives. He

may also keep the clay wives of earth if he wants them. He will always be fit as a fiddle, even the morning after the wildest party, and he will be only 30 years old forever.

But faith here has been rather tarnished by the nearness of infidel Casablanca, with its "Christian dogs," its dance halls, its cafes, and, until recently, its American movies.

#### A Visit to Fabulous Marrakech

Let us go back four hours' journey into the country to fabulous Marrakech and we shall find the true Morocco.

First surprise of the trip is that Morocco does not agree at all with our imagined picture of North Africa. We have heard much about the fighting over the deserts of Libia and the sands of Egypt. We have read of the rolling dunes of the Sahara.

But we look in vain here for the burning desert. This countryside is a cross between Ohio and California.

Its softly undulating surface is marked off into big squares where wheat, barley, beans, and linseed are raised. The soil is dark and fertile.

The climate is warm and mild, shielded by the Atlas Mountains from the hot winds of the Sahara. The farmer thinks nothing of getting three crops of potatoes in a year. Corn may be gathered 40 days after it is sown.

We pass thriving orchards which produce bumper yields of almonds, walnuts, oranges, olives, figs, and pomegranates. There is little tobacco because of Moslem objection to its use. Vineyards are plentiful, for, although the Koran frowns upon wine, it has nothing to say against the fresh grape.

The straw houses in which many of the Berber farmers live are like animated haystacks. Around them large flocks of plump hens scurry about. Poultry and eggs are among Morocco's chief exports.

On the grassy slopes graze thousands of cattle and sheep.

In ancient times North Africa was the granary of Rome. During the present war Hitler has been drawing food from all that part of North Africa that has been under the control of Vichy France to feed his German armies. With the Allied occupation of this territory, a valuable source of supplies is lost to the Axis.

Morocco is a garden, and before us, as we go toward Marrakech, we see the garden wall. It is some 12,000 feet high. The Atlas Mountains shoot up abruptly from the plain to snowy heights. Behind it is the Sahara. Before it, like a small stage against a stupendous backdrop, is the city of Marrakech.

A great rampart seven miles long girdles the city. It is punctuated by 200 towers and ten gates. The clay of which the wall and towers were made was once red; now it has faded to the color of withered rose petals.

Marrakech was the great capital of old Morocco. Out through these gates came armies that conquered Spain. Here the Sultans reigned in splendor. It was the center of art and learning.

It was also the center of turmoil: five times the city was destroyed and rebuilt. One fanatical conqueror, not pleased with the

brand of religion of the inhabitants, vowed to pass the city through a sieve and practically kept his vow. But, every time, the red earth grew up again into red walls and red houses.

If we climb to the top of a gate, we look down upon a rose city of flat roofs interrupted by the white domes of marabouts' (saints) shrines, the slender minarets of almost a hundred mosques, and the grand tower of the Koutoubia Mosque.

There are many green patches. These are the scented gardens of the Sultan, the Pasha, and other high officials.

### The Mystery of the Missing Donkey

I had a slightly uncomfortable encounter with the Pasha on my first visit to Marrakech. The Pasha is the native ruler of the city, under light French supervision.

An American friend and I called upon him by appointment, leaving tethered outside his gate the donkey upon which we had brought some motion-picture equipment.

The great man entertained us with a dance of the famous Chleuh boys, who dress, rouge, lipstick, and perfume themselves to appear as girls. He showed us the wonders of his palace with its exquisite beauty of rainbow mosaic, sculptured plaster, and carved wood on which the artists were still occupied after 17 years of continued labor. We passed out of the orange-scented garden, through the dark corridor to the outer gate into the street, only to make a shocking discovery.

Our donkey was gone!

The big Senegalese doorman of the palace saw our discomfiture and said courteously, "The Pasha expresses his gratitude for your gift."

If we felt like protesting, we curbed the impulse. Shouldering our heavy equipment, we set out for the hotel. That evening we dined with a Britisher who had made Marrakech his home for many years. He laughed heartily over our experience.

"I lost a dozen good horses that way," he said. "You see, it is the custom to make presents in this country. An official expects you to bribe him with a gift either for himself, or for his servants or slaves.

"While the Sultan was in his palace in Fez there was a time when I was called in almost daily. I would leave my horse outside the gate in charge of the black slaves. Every time when I returned I found it gone.

"After this had occurred repeatedly, I lost my temper, and once, when a horse I prized highly had been taken, I plunged back into the palace, demanded an audience with the

Sultan, and told him forcefully what I thought of such piracy.

"He was bland and soothing, and instructed the Grand Vizier to have the guilty slaves punished so that they would never trouble me again.

"The Grand Vizier accompanied me to the street. He ordered the bastinado administered to the slaves, but, at my request, it was applied so lightly that no one was really hurt. Then, with many bows, the Grand Vizier retired into the palace.

"I turned to mount my horse. It was gone again!

"It had been taken by the slaves who had administered the bastinado. Now they demanded money for the work of flogging their fellow slaves, and the latter demanded money for having been flogged!

"I paid through the nose and got my horse back.

"After that, I went to the palace on foot."

These Sultans incarnated all the fantasy of the *Arabian Nights*. Even the present Sultan, Sidi Mohammed, lives an exotic life. He resides, not in interior Marrakech or Fez, but usually in the coast town of Rabat, where the French Resident General and some ships of the French fleet are a steady influence. But he is allowed to live so magnificently that it is easy for him to forget these restraints (page 7).

#### George Washington Got Renewal of First Moroccan Goodwill Treaty

He is still honored by the Moroccans as their spiritual if not temporal leader. Therefore it was wise for General Patton to present himself at the palace shortly after the American landing and for President Roosevelt, in a special message, to assure the Sultan of American goodwill and to remind him of the "traditional friendship dating back to the days of George Washington, first President of the United States."

The reigning sultan wrote:

"To the great President of the American States: I salute you with empressement and hope in God you are well . . . We accept your demand, and peace be between us on land and sea, and according to the Treaties you demanded from us . . . I join with you in perfect peace and friendship."

Thomas Jefferson and John Adams through their agent, Consul Thomas Barclay, negotiated our first treaty of peace and friendship with Morocco in 1786. Sultan Sidi Mohammed put his seal to it at Marrakech, and the Continental Congress ratified it in 1787.

A few years after the United States began

life as a nation, President George Washington requested the old sultan's successor, Mulai Soleiman, to ratify it, which he did in 1795, at Rabat.

After a long and eventful history, Tangier today has nothing to do with French Morocco, being an internationalized zone in Spanish Morocco, a territory omitted from the scheme of Allied occupation to avoid complications with Spain.

Allied troops, backed up solidly by the British Fleet, landed not only near Casablanca and Rabat but at Oran, Algiers, and smaller points along the coast of Algeria. This was a perilous undertaking because of the presence of German and Italian naval and air forces in the Mediterranean.

Now, instead of passing through the Mediterranean, troops may disembark at Casablanca and go overland to Tunisia and Libya. In addition, the recent defeat of Rommel has eased the Mediterranean situation even more.

A railroad runs from Casablanca through Rabat, then to historic Meknès where the fantastic Sultan Mulai Ismail built a great palace for his 2,000 wives and 800 children, erected three miles of stables for his 12,000 horses, fed his pet lions upon the flesh of his slaves, and buried many Christian captives in the walls. Once he filled an unfaithful wife with gunpowder and blew her to pieces. He was balked only when he aspired to the hand of the daughter of Louis XIV.

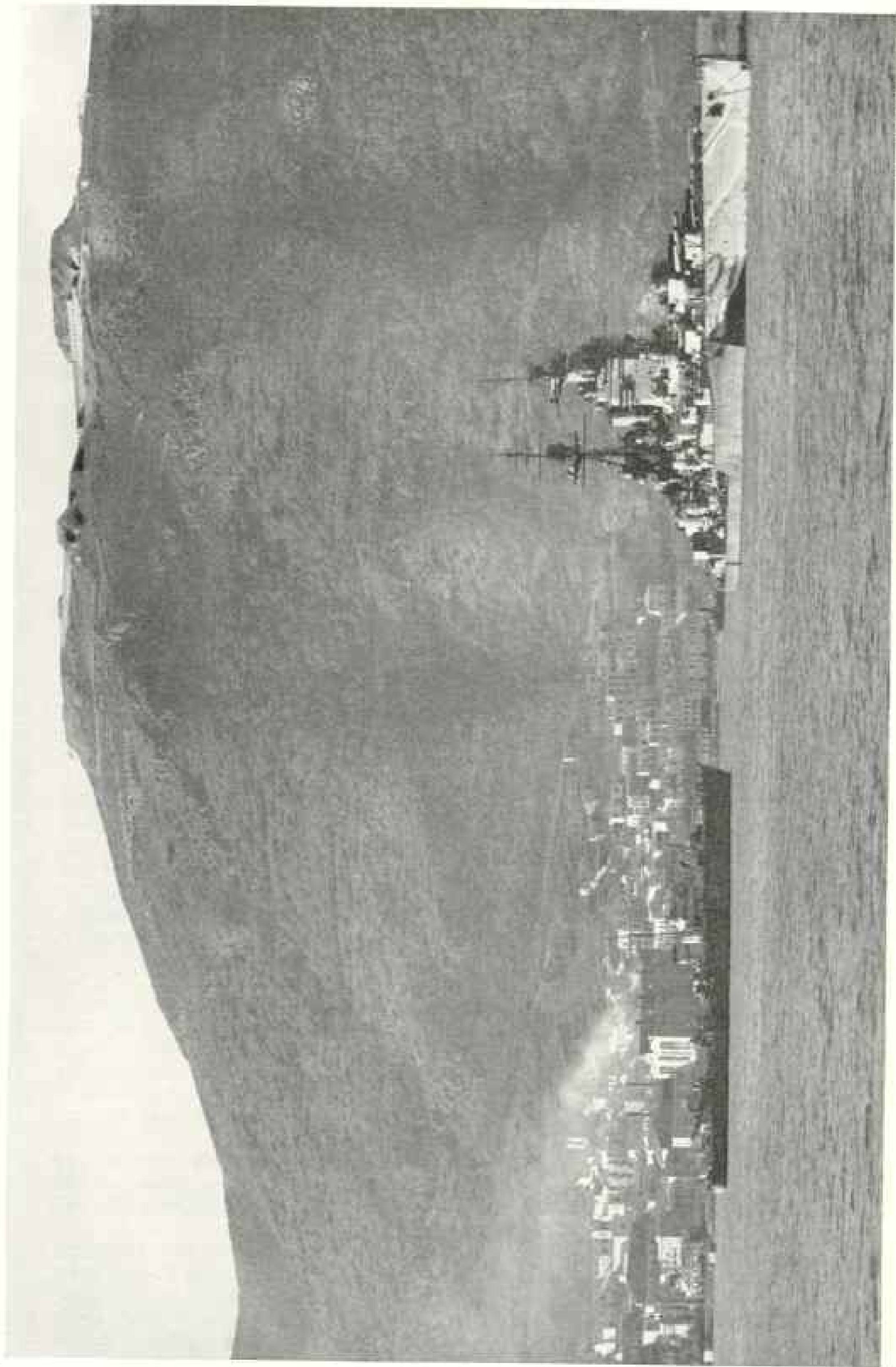
Thence the road runs on to marvelous Fez, one of the most beautiful cities of all Islam, across the Moroccan border to Oran, Algiers, Tunis, and Gabès.

Paralleling this railroad is a road as fine as any highway in Europe. There are no high mountains or other natural obstacles, there are gasoline stations every few miles, and plenty of water and food.

This entire strip, called the Tell, lying between the Atlas Mountains and the coast and extending through Morocco, Algeria, and Tunisia, is one vast farm, rich in grains, fruits, garden produce, and livestock. Planning for postwar feeding of the famished millions of Europe should take into account the resources of North Africa.

Following this route, we pass over miles of fat red loam to Oran, Algeria, another of the historic landing points of the American and British forces (page 12).

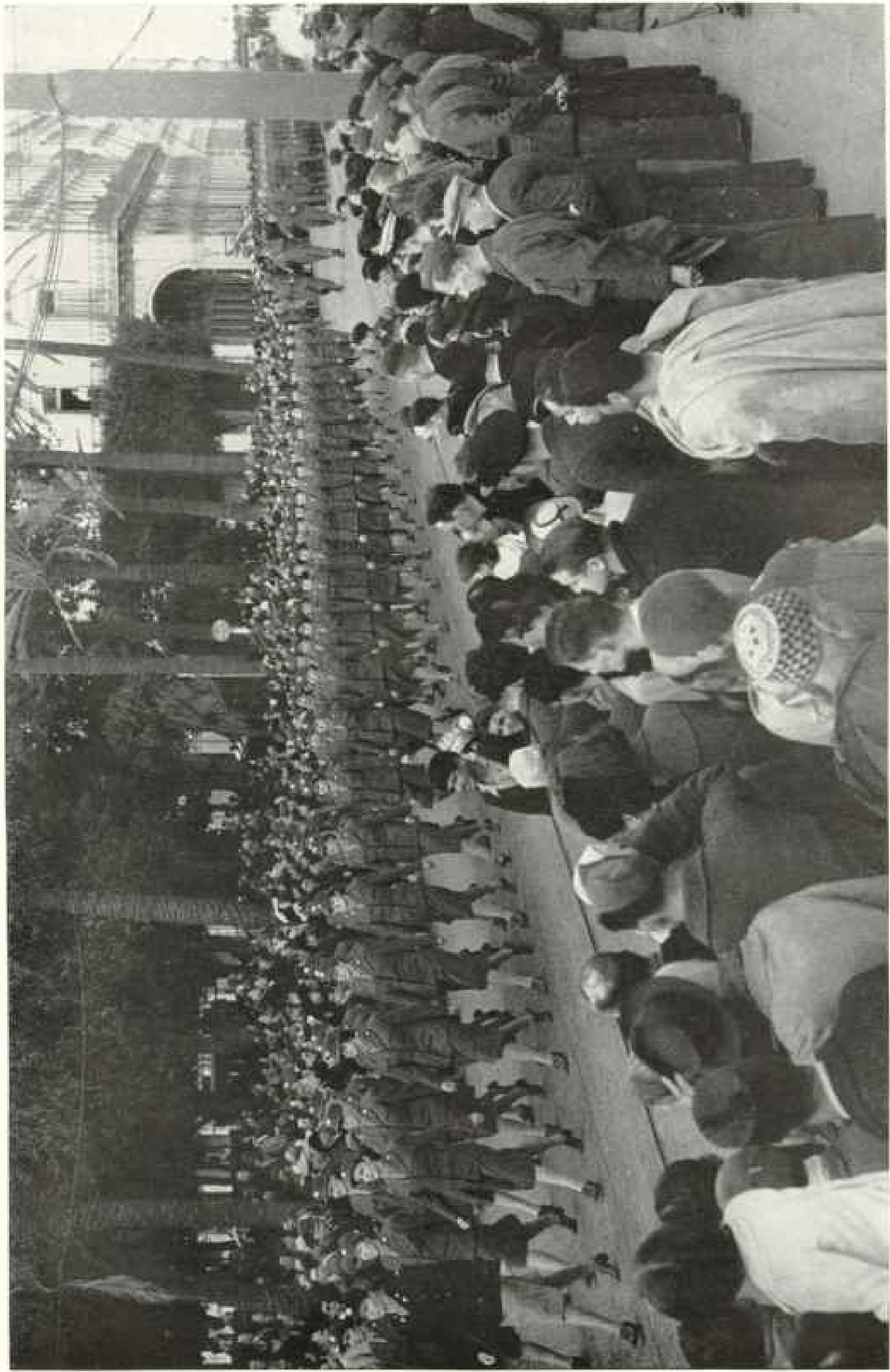
When Oran surrendered, the Americans found themselves in a modern French town with a decided flavor of Spain, for the Spaniards once ruled Oran. The Moorish castle on the hill was succeeded by the Spanish Castillo Viejo, and that by French barracks. Old



British (Special) Photogram

### British Warships Anchor Off Mers-el-Kebir, Oran's Rocky Naval Base, Two Years After the Defeat of a French Fleet There

The battleship *Rodney* and her destroyer escorts, having protected the American Army's landing, have no fear of the big guns in the mountain, for Oran has surrendered. Like her sister ship, the *Nelson*, the *Rodney* carries her nine 16-inch guns forward, sacrificing five power shafts.



U. S. Army Signal Corps, Oran

**Algiers Moslems, Who Keep Their Women Veiled and Secluded, Gape as a Platoon of WAACS Leads Tommies on Parade**

Frenchwomen exclaim over their handsome uniforms. Doughboys demand "more WAACS who can jitterbug." In Algiers there was little time for dancing. For nine to fourteen hours a day they operated truck, switchboard, or typewriter. At "leisure" they cooked, hundered, and kept house at a convent where 200 were quartered.

Spanish forts remain here and there. Oran is too busy to pay much attention to them. Next to Algiers, Oran is the chief port of Algeria.

Passing on through Algeria, the country, although it lies east of Morocco, is far more modern than the "Extreme West-land." The French have been here since 1830.

#### When Americans First Visited Algiers

But the Americans were here before that!

Doughboys who have recently seen for the first time Algiers' splendid Boulevard de la République, built over the roofs of vast warehouses that flank the harbor, may not have realized that Americans paid a visit to Algiers when it was the most notorious hellhole on the Barbary Coast. In fact, they had much to do with changing its character.

For about three centuries the corsairs of Barbary—so called because it was the land of the Berbers—had terrorized the seas. Long before the Italians conceived of the Mediterranean as their own sea, the Barbary States had the same idea, the only difference being that they made it work.

They closed the Mediterranean and put up a ticket booth at the entrance. Tribute was the admission fee. England paid nearly \$300,000 a year so that her ships might be immune from attack. France paid a million francs a year, besides many rich presents. Holland, Sweden, and Spain also paid heavily.

The young and weak American nation had, for a time, no choice but to follow suit. Up to 1802 more than two million dollars of American money went as tribute to the four Barbary powers.

Even this blood money did not insure safety. Ships and cargoes were confiscated. Crews and passengers were thrown into vile prisons and held for ransom. The prisons of this city alone were built to accommodate 20,000 Europeans and Americans, and were full.

Thousands starved to death or died of disease. The powers maintained special consuls in Algiers and Tunis for the express purpose of conducting ransom negotiations.

In thousands of cases the required ransom was not forthcoming. Then the white prisoners were put on the slave block and sold to the highest bidder. It is estimated that, in all, 600,000 Christians were enslaved. The descendants of American slaves may be found in North Africa today.

Cervantes was a slave for more than five years.

The pirates extended their depredations to the Atlantic. They responded to a threat from the British fleet by boldly announcing

that they would land in England and drag Englishmen out of their beds. They went ashore at Penzance and kidnaped 60 men. They raided the town of Baltimore in County Cork and made off with more than 200 Irishmen, who were sold at auction on the Barbary Coast. They even ravaged the coast towns of Iceland.

When Capt. William Bainbridge of the U. S. Navy took the customary "presents" to the Dey of Algiers in 1800, the Dey ordered him to run an errand for him to Constantinople.

"The English, French, and Spanish captains have always done this service for me," said the Dey. "You also pay me tribute, and you also are my slaves."

The American captain had to obey or lose his ship.

#### Decatur Refuses to Pay Tribute

But American patience was wearing thin.

The showdown came when in 1815 Commodore Decatur with an American squadron defeated the Algerian squadron near Cartagena, Spain, then boldly entered the harbor of Algiers and sent word to the Dey that there would be no more tribute. The Dey, unimpressed, demanded a gift of powder for his fleet.

"You shall have the powder," replied Decatur, "but the balls go with it."

He prepared to demolish the city. The Dey surrendered. He signed a treaty ending the slavery of Americans and renouncing all demands for tribute in the future. A year later Britain exacted a similar treaty.

Depredations on other shipping continued, but were ended once and for all when the chief victim, France, took control of the country in 1830.

Algiers has since become another Marseille—up to a certain point. That point lies between the sparkling, modern, broad-streeted harbor city and the hillside native town.

The latter's narrow balcony-shaded alleys twist upward through the half gloom to the moldering citadel where the Dey used to hold court and suspend the heads of executed Christians and criminals over its gate. Algiers is now more than half European.\*

But a short motor ride will take you up into the near-by Djurdjura Mountains where the people, who live in tiny red-roofed villages on the very peaks, are largely untouched either by Frenchman or Arab.

They are Kabyles, of Berber stock. In the purest types the skin is rosy and the complexion fair. They are as agile as their own

\* See "White City of Algiers," by GORDON CASSELY, NATIONAL GEOGRAPHIC MAGAZINE, February, 1928.



Doria Bellini from Black Star

#### A Beaming Young Reaper Stays Her Sickle and Displays an Elegant Tattoo

Since she is Moslem, the "cross" on forehead has no religious significance; it could be an inheritance from pre-Arab times. The design on her chin likewise is mere decoration. True meaning of these symbols, a few dating from Punic times, has been lost. Tattooing is common among the Berbers of the Atlas.

mountain goats. They have a passionate love of freedom. The French get along with them by leaving them alone.

#### An Ancient "City of the Clouds"

Proceeding eastward, we come to the city of the clouds, Constantine, built upon a great rock 2,130 feet above sea level. It is almost completely surrounded by a gorge from 500 to 1,000 feet deep, probably the mightiest natural moat of any city on earth.

It was hoary with age before Julius Caesar was born. It was nearly ruined by invaders. The Roman Emperor Constantine in 313 rebuilt it and renamed it.

A boiling hot waterfall tumbling over a marble-white precipice some fifty feet high may be seen at Hammam Meskoutine. The river thus given birth winds, steaming, through a green valley. People from near-by houses come to cook their eggs and wash their clothes in the hot stream.



The source of the water is a large number of hot springs just above the cliff. Beyond them are curious rock cones, some of them 40 feet high. It seems that there were once springs at these spots. The water bubbling from the ground formed a deposit of carbonate of lime. This grew higher and higher, until the spring, having no force to rise farther, found a new outlet.

### Green Paradise of the Tell

As we ride through the green paradise of the Tell, nothing seems more remote than the desert. The Americans of the present expedition will be curious to know what lies behind the mountain wall. Few will find out. But it is safe to say that their interest will be so aroused that, in some more peaceful year, some of them will return to Algeria to take a trip farther south.

They will cross fertile plains, see thousands of fig and olive and orange trees, and then dive through a tunnel and rub their unbelieving eyes as they come out on the brink of the Sahara, golden yellow in the setting sun, stretching away to a plum-colored horizon. It is a sudden change from abundance to desolation. But the desolation, too, has its beauty and its possibilities.

The first large oasis is Biskra and a wonderful place it is. But those who are really anxious to see the Sahara will hardly pause here.

At Biskra or Touggourt they will fit out a camel caravan and set out by compass over the yellow ocean to discover the secrets of the Sahara.

One of the secrets will dawn upon them before they have gone a mile. It is that riding a camel is not as easy as it looks when a Bedouin does it.

I had ridden a horse since childhood. That fact did me no good. The motion of a camel was a complete surprise. It is a violent pitch, forward and backward. The wave passes up the spine like the crack of a whip. The neck becomes tired from the effort of the head to adhere to the body.

After a few hours of such going, what a relief it is to transfer your disjointed bones to one of the humble horses or donkeys!

The camel has no bridle. A cord is tied about his nose. If you want him to go to the right, you pull his head to the right, whereupon he goes where he wants to! It is the same for going to the left.

If you find the cord unsatisfactory, you may use your bare toes, as the Arab does, wriggling them against either side of the camel's neck.

To make your beast go, you persuasively say "Oo-sss! Oo-sss!" To slow him down or stop him, you cluck like a hen. But if you do not give the correct Arabic intonation to these sounds, he will not understand you.

And do not think that the same vocabulary will do for your other animal friends. A horse will go only if you say "Ash!" and stop at "Whoa-la!" A donkey picks up speed when he hears a threatening "Ar-r-r-r-r zit!" You bring him to a halt with a "Uishshshsh."

The *mehuri*, or racing camel, is a triumph of evolution. He is a beautiful sleek animal, lighter in color than the freight camel, and has a much more amiable disposition.

### Meat, Hide, and Hair of Camel All Utilized

The camel can go five to ten days without water, and live on the fat of his hump. His padded feet, as big as platters, carry him over soft sand, his nostrils may be closed against the dust, and his eyes are protected from glare and sand by sweeping eyelashes that would be the envy of a Hollywood star.

Dead, he is still useful. His meat is wholesome, his hide is turned into fine leather, his coarse hair becomes clothing, tent cloth, and rope, and his fine hair has painted many great works of art and gone into valuable shawls and rugs.

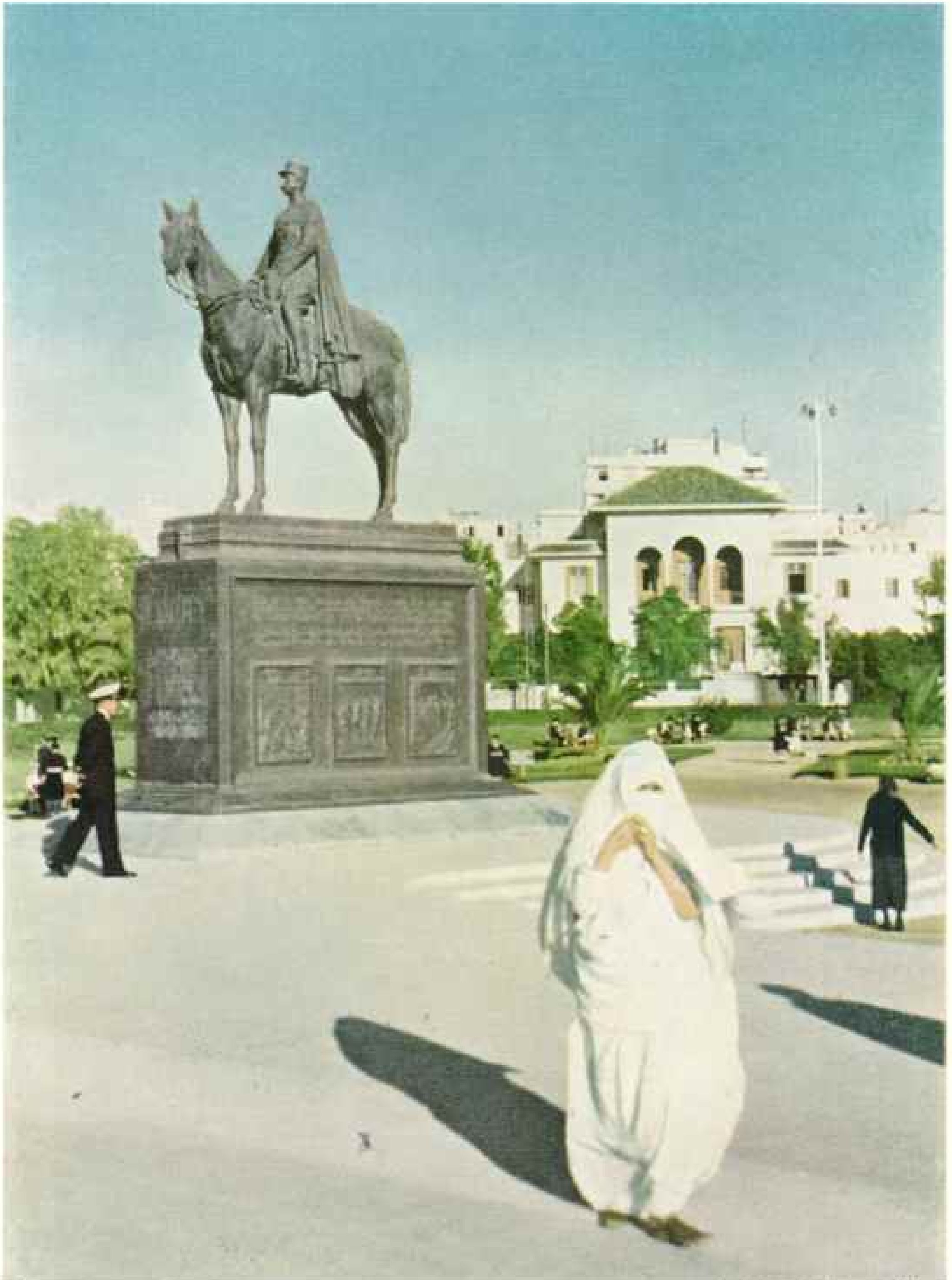
The Sahara, larger than the United States, has had a varied history. It was once partly flooded. When the waters subsided, it became a fertile tropical country. Fossils of animals that demand a damp green habitat have been found in the Sahara—the hippopotamus, rhinoceros, and elephant. The camel was introduced much later.

The parching of the Sahara, with extremes of temperature day and night, broke up the old granite and other hard rocks, which cropped out here and there, into sand, and the wind distributed the grains over the present Sahara area. This apparently arid soil is in some places even more fertile than much land where rain is common. Here the potash and other fertilizing matter have not been leached out of the soil by flood.

Everything is there waiting only for seed and water. Of water there is an abundance, if you drill for it deep beneath the crust. The French have been sinking artesian wells, and many new oases have been made to bloom.

Desert travel is not monotonous. On one night we camp in a green oasis; on another, upon the *hamada*, or rocky desert; on another, among the great dunes; on another, at the edge of a salt lake over which a mirage makes weird changing scenes.

## Casablanca Smiles



© National Geographic Society

Kodachrome by Herbert P. Marshall

### Veiled Moslem Woman and U. S. Naval Officer Pass a Statue to Marshal Lyautey

Lyautey bequeathed an empire to the French Republic. Swift in battle, he subdued savage tribes. Patient in diplomacy, he won their friendship. In World War I he held French Morocco with a handful of troops. Taming the Atlantic's waves, he built the jetties that made tiny, exposed Casablanca a thriving, sheltered port.



© National Geographic Society

Recreation by Herbert P. ManSoll

**American Soldiers Pitch Camp in a Park, Sailors Stroll by, and Old Glory Flies above the Palms**

Casablanca remembers an earlier, bloodier invasion. In 1907 French naval guns, avenging the murder of Europeans by a Mohammedan mob, bombarded the town. Above its ruins the French constructed a gleaming, modern city. From Casablanca their occupation spread across Morocco.



© National Geographic Society

Kashimura by Herbert P. MacNeal

### Young Morocco Greets the Yanks with Beaming Faces and Eagerly Poses for Its Portrait

"These natives endeavored to be as sociable as possible with my limited French," writes the American photographer (Plate VIII). "Gone are Moorish fears of the camera's 'evil eye.'" Commenting to pose on the donkey's back, the youth in modern dress confessed he was an amateur photographer! The boy at left holds a ball.



© National Geographic Society

Enlargement by Herbert P. MacNeal

### Hub of Casablanca Is Place de France with Its Slender Clock Tower

Resembling a Moorish minaret, the shaft was erected by the French in 1910. A modern apartment house stands beside it. Luxury shops in the square were soon discovered by American service men. Their stocks didn't last long! French veterans have an armory at right.

## Casablanca Smiles



### When East Meets West in North Africa, Smiles Speak a Common Language

Tarboosh and turban cover the camel boys. Their bridleless "ship of the desert" is guided by the cord around its neck except when the rider's bare legs give directions.



© National Geographic Society

Photographs by Herbert P. MacNeal

### A Moslem Family Carries Suitcase and Carpets on Head and Shoulders

Two girls pose with veils lowered as willingly as they did with faces hidden. The one bundled in white is tattooed on her chin and forehead.



© National Geographic Society

Reproduction by Herbert P. MacNish

**Tiny Donkey, Doubly Laden, Nods While Master and His Friends Patiently Prepare for the Camera**

The finger belongs to a volunteer stage director. He wears a bright skullcap knit of reclaimed wool, as do several others. A boy with shaven pate sports a topknot resembling a rope's frayed end. Two Moroccans have adopted the European ready-made suit, but not the hat.



© National Geographic Society

Blacksmith by Howard P. Munnell

**Ten-year-old Apprentice Furiously Pumps the Double Bellows While Blacksmith and Helper Sit at Ease before the Glowing Forge**

On this street in Casablanca's new native quarter, Americans found boys all but monopolizing work at a score of smithies. This lad refused to stand still even for his picture. As a result, his face is blurred. Horse and donkey shoes are fashioned here.





**French Sailors, Yesterday's Enemies and Today's Allies, Point to the Battle Site**

These sight-seers from the battleship *Jean Bart*, which hurled 15-inch shells at Americans, told the photographer, "We are your friends now." At Fedala, 15 miles from Casablanca, they survey landing barges wrecked by surf.



© National Geographic Society

Photographed by Herbert P. MacNeal

**The Author of This Series Borrows a Pet to Share His Own Picture**

Major (then Captain) MacNeal, surgeon in charge of an Army transport hospital, writes: "Casablanca natives were curious and good-natured. They frequently asked for coins, but not for having their pictures taken."

And the final shock, after a short train trip from the burning sands to chilly Batna, is to wade through snow a foot deep!

It was on this high and frosty plateau that the Romans preferred to build their cities. We pass the Roman arches of Lambèse, which mark the headquarters of the famous Third Legion.

We reach the amazing ruins of the city of Timgad, founded by Trajan A. D. 100, destroyed by Berbers in the sixth century, again destroyed in the seventh century, buried for twelve centuries under the deposits of torrents, and finally dug up by the French. Here the life of a Roman town may be studied in detail.

### Crossing Tunisia

We come to the end of Algeria and the border of Tunisia. The borderland is a howling wilderness. But British and Americans plowed through it.

Before they cut the road deep and clear with their trucks and tanks, crossing Tunisia by this route was a job for an explorer. The trail was a vagrant wisp that lost itself time and again and was likely to bring its follower to grief in the savage mountains around Tebessa.

Fired with enthusiasm to explore this possibility of a short passage to Libia, I set out by car one stormy February day with an American companion.

From Tebessa the dirt road started out bravely in the direction of our goal, Feriana, beyond the mountains. The road seemed quite reasonable—it had two definite ruts.

As we went endlessly on, it grew less reasonable. When day faded, so did the road, and we frequently brought up before a bush or great rock, the plain inference being that we had lost our way.

Then I would walk back through the blinding sleet and endeavor, with a flashlight, to find the lost trail.

At last, when it was lost irretrievably and we had resigned ourselves to the prospect of sleeping the snowstorm through in the open car, we heard the bark of a dog. We blew the horn. Dogs came from nowhere. After a time Arabs followed them with lanterns.

The car was stuck in its tracks. We walked after the Arabs through ghostly Roman ruins to a square black fort. Inside, it was a cold, bleak vault of stone. There were no windows. The wind whistled in through gun slits in the thick stone walls. Now and then over the storm came the yip of a jackal and once the quavering human wail of a hyena.

Since uprisings of the tribes were now rare,

there were no French soldiers in the fort; only half a dozen Arabs.

They gave us all the comforts the place afforded. We were seated on sheepskins on the floor. A flicker of fire was started on the great hearth. The lantern gave a smoky light.

We conversed by means of a little Arabic and much pantomime. We were told that it was impossible to reach Feriana by this route. We would have to go back to Tebessa and try again. But they would not think of our going until morning.

The conversation lagged and the tomblike room grew more chilly in spite of the fire. We could hardly hope for food in such a place, so the surprise was all the more delightful when it came.

A huge bowl of disjointed chicken was placed on the floor. The Arabs and their guests sat in a circle and plucked out fragments with their fingers. A cartwheel of barley bread was passed around. It was only half an inch thick, but a foot and a half in diameter. We broke off pieces. To the hungry, it was delicious. The food was washed down with drafts of muddy water from a goatskin.

Preparations for bed were simple. We lay down on one sheepskin and drew another over us.

When morning glimmered in through the gun slits, the snow had turned to cold rain. We struggled back to Tebessa, frequently getting out in the downpour to push the car out of a mudhole. Our passion for exploration was satisfied. We never did get to Feriana.

### Shoulder of Tunisia Promises Bridge to Europe

The great shoulder of Tunisia jutting into the Mediterranean has as its epaulet the glittering city of Tunis and the neighboring naval base of Bizerte (page 8). From this vantage the United Nations hope to shoulder their way into Europe.\*

Nature had the idea first, for in prehistoric times the Mediterranean was bridged by land at this point and men and animals went back and forth. The old bridge, now known as Adventure Bank, lies today about 1,300 feet under the surface. This is a slight depth compared with the greatest depth of the Mediterranean, more than 13,000 feet.

Sicily is less than a hundred miles from the African coast. No wonder the bridge of planes now covers this narrow strait where

\*See "Time's Footprints in Tunisian Sands," by Maynard Owen Williams, March, 1937.

the land bridge once stood. No wonder it is believed that he who commands the Tunisian shoulder will command the Mediterranean and may command Europe.

Looking across this strait, the boy Hannibal swore eternal hatred of the Romans. The man Hannibal ravaged Italy for fifteen years. Then he retreated across this fateful strait and defended his country against Scipio, to be utterly defeated in the end.

Superb Carthage, with its untold treasures, its homes of a million people, its stables of war elephants, its military harbor large enough for 220 iron-beaked ships, was completely destroyed by invaders from across this strait.

And across this strait in more recent times Italians have streamed into Tunis until there are today more Italians than French in this French city.

Where the many-eared galleys once fought, the pilots of Flying Fortresses and Liberator bombers are thinking of Rome and Berlin.

Americans who remain in Tunisia as part of the army of occupation will find some consolation in the wonders and curiosities of that former seat of world power.

#### Dido's Carthage

Today the chief impression you have when standing upon the site of once-mighty Carthage is of nothingness. The grass is green and the goats graze and the view across the Bay of Tunis to Bou Kornine (Two-Horned Mountain) is beautiful.

The scene is almost as peaceful and rural as on that day in the ninth century *a. c.* when that shrewd businesswoman, Queen Dido, bought from the country folk "as much land as could be contained by the skin of an ox" and then, by cutting the oxhide into strips, encircled the entire hill.

On this hill she built her city. It expanded to take in neighboring hills and those coastal lowlands in which picturesque serpentine harbors still wind through the rank grass. Nor were the Carthaginians content with this. They conquered Spain, dominated the Mediterranean, took part of Sicily, and threatened Italy.

"How could such a great city disappear so completely?" I asked the man standing beside me. He was one of the White Fathers who have had so much to do with the excavation of the treasures of Carthage.\*

"It's the fate of the aggressor," said the father.

If Carthage had curbed her ambition, she might be alive today. She resolved to crush

Rome. Rome resisted, and finally destroyed her dangerous rival in 146 *a. c.*

These successful wars gave Rome herself a taste for aggression and she stirred up enmities throughout all Europe, thus preparing the way for her own fall.

The Yank on leave in a North Africa once more peaceful will be glad to shake off the ghostly spell of Carthage and visit near-by Tunis.

Here there normally are really two cities: a bright, modern, musical French metropolis full of flowers and cafés and fine hotels and Parisian shops, and a walled oriental city of narrow, winding streets, the houses being frequently built over the streets, turning them into cool caves miles in extent.

In these caverns are the *souks*, the bazaars or markets. The Yank's home folks may prepare themselves to receive perhaps a copper kettle from the clanging metal market, or dainty slippers of Saffian leather from the Souk of the Women, or a tiny vial of attar of roses from the scented tunnel known as the Souk-el-Attarine, or a ring from the Street of the Jewelers, once the slave market where captured Christians were sold at auction.

Next door to Tunisia is Libia, scene of many of General Montgomery's exploits. The easiest way to reach it is along the coast through Sousse, Sfax, and Gabès.†

#### A Desert of Blistering Stones

The Libian road from the Tunisian frontier to the key city of Tripoli is wide, paved, and as fine as any road in Europe. Between the road and the Mediterranean are rolling sand dunes, and many a voyager in a cruise ship offshore has written in his diary that he has seen the place where the Sahara meets the sea.

But the curious fact about these dunes is that they come not from the desert but from the sea. Sand is washed up on the beach by the waves and then blown inland.

Back of these coastal dunes and usually unseen from the ship's deck is a Garden of Eden. It covers fertile slopes that rise finally to the *hamada*, a desert of stones too hot to walk on at midday. Down this incline run surface rivers during the winter rains and subterranean rivers the rest of the year.

\* See "Ancient Carthage in the Light of Modern Excavation," NATIONAL GEOGRAPHIC MAGAZINE, April, 1924.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Old-New Battle Grounds of Egypt and Libia," by W. Robert Moore, December, 1940; "Cirenaica, Eastern Wing of Italian Libia," by Harriet Chalmers Adams, June, 1930; "Crossing the Untraversed Libian Desert," by A. M. Hassanein, September, 1924.



U. S. Army Signal Corps, Official.

### "Give Us Modern Weapons," Begged French Africa, and U. S. Guns Answered Its Plea

Trained by the American Fifth Army, 11 French divisions are being organized. French buttons and insignia will be worn over American uniforms. Here a Yankee corporal instructs Frenchmen and seized colonials in the assembly of a 50-caliber machine gun.

Thousands of wells have been dug to tap these streams, and blindfolded camels circle endlessly drawing up the water. Thence it is channeled to the fields. Sometimes there are fish in the water! This indicates that the underground river still gets some aeration.

Harvest continues the year round. January finds the orange and lemon season well under way. Then come the famous "Malta potatoes," once so prized in fashionable European restaurants. April, May, and June see the harvesting of apricots, almonds, and corn.

There is no time to rest, for in July and August the peaches must be gathered, and at the same time the grapes, which vie with those of Sicily. During the early fall the dates must be picked, also the olives and the figs. By November the oranges again demand attention.

At the oddest times of the year the American will see the farmer sowing or reaping wheat, barley, and maize, tending his gardens

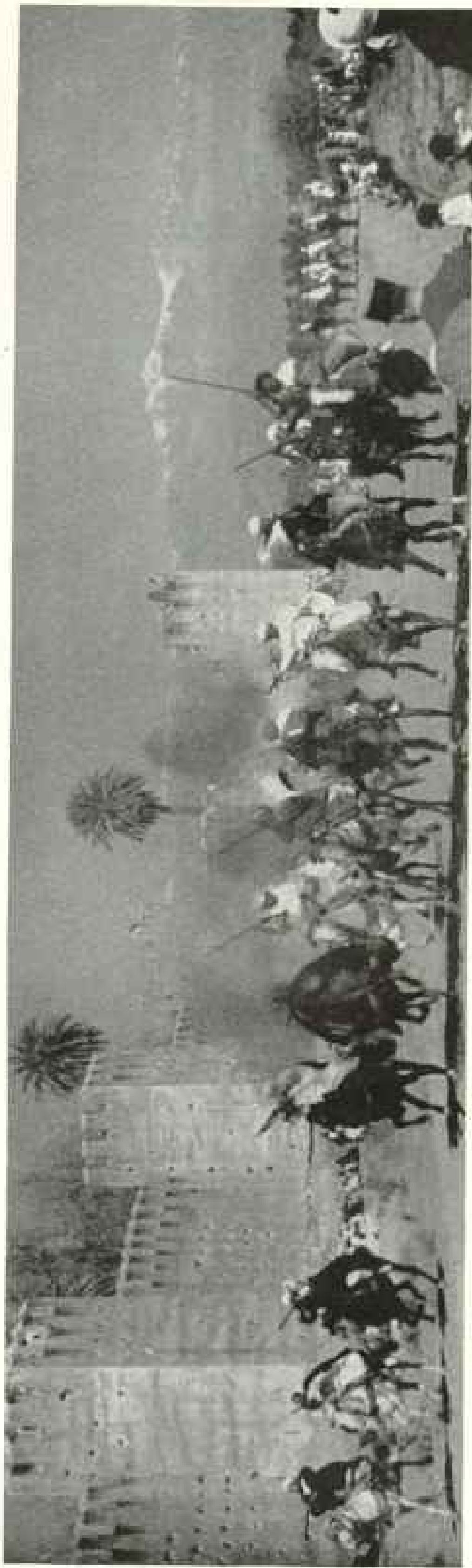
of fine onions, tomatoes, beans, spinach, and melons, cultivating his mulberry trees to supply food for his silkworms, or driving his cattle and sheep to the ports to be shipped to Europe.

### Mussolini There in Marble Only

Arriving in Tripoli, the traveler finds himself face to face with Mussolini in marble. Il Duce has expressed himself in imposing façades, broad avenues, brass and gold trimmings. He has put up a "big front" in the splendid boulevard along the crescent-shaped bay.

The city rises from the harbor in terraces of white flat-roofed houses broken by numerous mosques with minarets and cupolas in the Turkish manner. For it was from the Turks that Italy wrested the city in 1912.

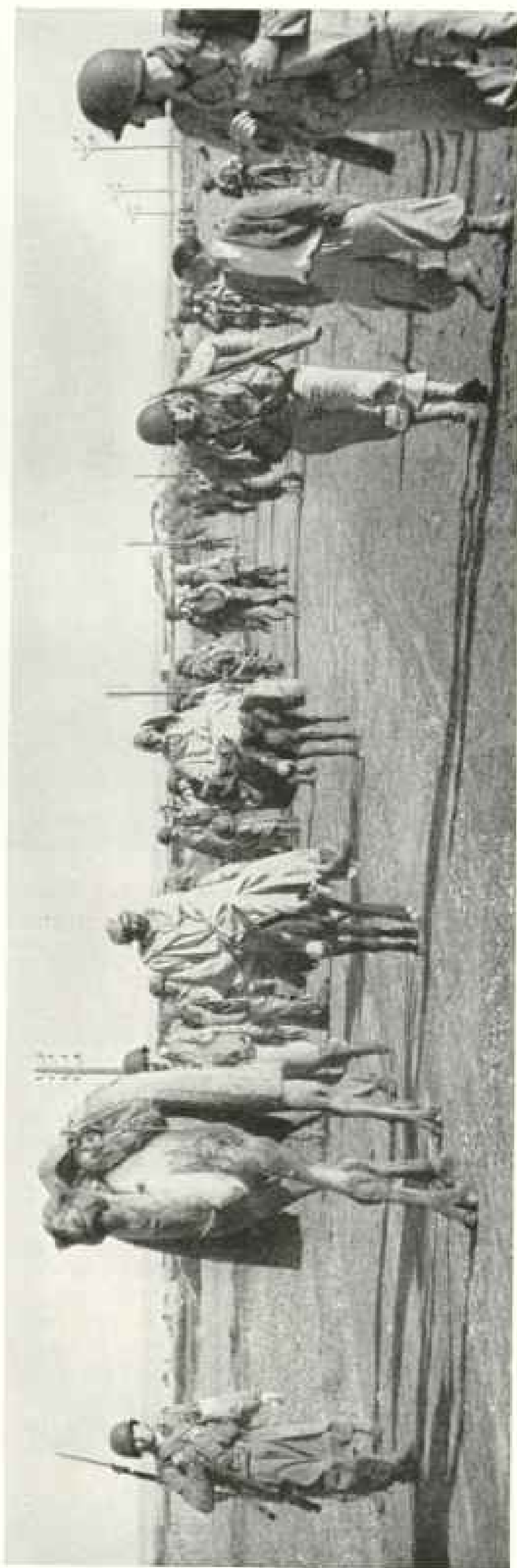
Tripoli has good hotels, running water, a gay casino, and a Lido Beach; also a band that plays every afternoon.



Charles W. Herbert

**In a Headlong Charge before Taroudant's Bastioned Walls, Moroccan Cavalymen Drop Reins and Fire Muzzle-loaders**

Loyal native allies like these joined French armies in the Allies' victorious drive on Bizerte. Atlas snowcaps glisten in the distance.



Acacia

**Camel, Donkeys, Drivers, and a European in Plus Fours Calmly Share the Fedala Road with Arriving Americans**



By the Courage

### Male Relatives of a Bride-to-be Pack Her Belongings for Moving to the Bridegroom's Home in Tunis

Carpets, cushions, and tiled wall are oriental; bed, dresser, and doll are European. Slippers and wedding presents fill the baskets. The bridegroom's gift is the ivory-inlay chest. Following separate ceremonies, the young couple will see each other for the first time. In Moslem Tunisia, parents arrange engagements.



E. R. Army Hospital Corps from Africa

### Army Nurses on a Day Off Bargain with an Algiers Salesman for a Necklace

Lieutenants Helen Hinckley (left) and Florence Christman are authorized to wear the trinket only with evening dress, unlikely equipment in North Africa. In place of blues, too easily spotted by the enemy, Army nurses have been promised a new dress uniform of olive drab. When Lt. Bernice Wilbur nursed wounded Lt. Gen. Lesley J. McNair in an evacuation hospital, she wore men's coveralls and G. I. boots. Director of the nursing service for the North African theater, she has been promoted to lieutenant colonel.

The massive jowl of Il Duce has long decorated walls along with some of the dictator's epigrams, which must now offer cold comfort in the light of recent events:

Believe, obey, fight.

Many enemies mean much honor.

Better to live a day like a lion than a hundred years like a lamb.

Europe will be Fascist tomorrow through the logical development of events.

#### Ostrich Feathers, Ivory, Ebony, Dates

But behind this braggadocio is another Tripoli. It is the neglected native city, a maze of squalid, twisting tunnels ten feet wide that grope beneath the decaying buildings of Arabs and Jews. The wealth that was once here has gone into the pockets of the black-shirted Fascists of the new city of marble and brass.

Gold dust, ostrich feathers, ivory, ebony,

cotton, dates, pour into Tripoli from the camel caravan routes across the Libyan Desert. A good trail connects Tripoli with Lake Chad.

The trek from Tripoli to the Egyptian border has been the road of death for many thousands of Allied and Axis soldiers.

Added to the hazards of battle are the dangers of thirst, starvation, exhaustion, burning heat, and bitter cold.

Supply lines are perilously long. The road often disappears and trucks go by compass across the wastes.

To get lost, or left behind by your convoy, may mean very bad luck. Every sign of a track may be wiped out by the blowing sand. When a car runs out of gas, the driver must walk. Hyenas and jackals hover at a respectful distance waiting for him to fall. Bandits are plentiful because of the impoverished condition of the Bedouin tribes.

Towns are few and poor. They look grimly at the hostile desert which here comes close to the shore. Misurata peers over a high wall that has only two gates, one in the north side and one in the south. Sirte, too, is like a fortress. Beyond Sirte is a riot of color in March when the desert flowers bloom.

Next, there is an ancient sea bed to cross, flat as a billiard table, then treacherous dunes, then a shallow lake with quicksands that swallow a car.

On a hill is the tomb of a marabout, a holy man. From sticks dangle rags in which coins are tied. He who wishes to do a holy deed places some money here in the care of the dead marabout.

Any passer-by may take the money if he is in need. If not, he is expected to take a coin from his own purse and tie it in the rags. Bedouins observe the custom.

Another grim fort in the midst of desolation is En Noflia. Many wanderers have died hunting it, for it lies hidden in a hollow between high hills.

The most forlorn stretch is the next, to El Agheila and Agedabia. It is flat, much of it consisting of salt lakes where mobile units may roar at high speed over the perfect surface of crystallized salt.

"The Agheila bottleneck," as the news dispatches called it, served Rommel as a strong defensive position. Here the only practicable route is through a narrow passage between a line of hills and the sea. A little farther west the hills disappear. Their place is taken by a series of swamps and salt marshes that defy land craft or water craft.

To reach El Agheila General Montgomery's Eighth Army had to go through strange country, different from that I have described.

#### Forests of Pines

Roads winding along jagged precipices through forests of mighty pines do not seem to belong in Africa.

But it was along such roads, under freezing rains, that one of Montgomery's columns tried to cut across the mountains of Cirenaica to intercept Rommel, while his main force followed the coast through Tobruk, Derna, and Bengasi.

Delayed by weather, the mountain column reached the coast just after the fugitive German army had hobbled by, hurrying to reach the bottleneck of Agheila where a stand was to be made.

While the armies raged back and forth through Libia, the Bedouins discreetly retired to the oases of the Libian Desert. The conflict means little to them. They are suspicious

of all Europeans and they know nothing of Americans. The Turks treated them badly. The Italians, when they came, expected to be received with open arms. They were astonished to learn that the Moslem desert dwellers would rather be misruled by their co-religionists than well ruled by Christians.

Not that the Italians had any idea of ruling them well. That was not the philosophy of the Italy of iron and blood. There was no attempt to conciliate rebel sheiks. They were ruthlessly dealt with, their desert wells were filled with concrete so that their cattle would die and their men must either perish of thirst or come and give themselves up.

Black Shirt policy has been quite different from that of the French, whose notion of colonial rule was well expressed by the great Marshal Lyautey:

"I had a dream of creating, of raising into life countries which had been asleep from the beginning of time, of showing them those riches of their own which they are ignorant of, and breathing the breath of life into them."

The Italians brought in black troops from Eritrea and encouraged them in the most blood-thirsty reprisals upon Arab "rebels." And yet the Roman schoolbook blandly informed the Arab child:

"In the old days there was savagery and barbarism in this country, but now the Romans have returned!"

#### Decatur's "Most Bold and Daring Act"

True, there was once barbarism here. The Dey of Tripoli joined with the other deys of the Barbary Coast in terrorizing the Mediterranean.

The United States was twice involved in war with Tripoli. In 1804, Decatur, in what Lord Nelson called "the most bold and daring act of the age," entered Tripoli harbor and, with his dramatic destruction of the captured *Philadelphia*, struck a mighty blow at the tyranny of the Dey. He was back again in 1815.

Now, by one of the curious reversals of history, the brand of barbarism has passed into the hands of two nations that once held a lamp of enlightenment. The contributions of Romans, Italians, and Teutons, along with those of Greeks, Phoenicians, Egyptians, English, French, and Arabs, to the culture of the Mediterranean Basin have been incalculable.

The Americans who now tread those shores may well feel humble that it has fallen upon them, comparative newcomers among the world's peoples, to help restore the heritage of this early home of civilization.



# Birds on the Home Front

BY ARTHUR A. ALLEN

*Professor of Ornithology, Cornell University*

*With Illustrations from Photographs by the Author*

"WHEN Jerry was shot down and by a miracle landed safely in a New Guinea jungle," remarked his Dad, "his interest in bird life helped keep his morale high the ten days he was lost."

Yes, it is strange the way the boys who are infected with bird study never mind where they are sent or how hazardous the journey if it gives them an opportunity to see new birds. Of course, it is distracting to have to stand at attention when a strange bird flits across the road, or to keep on peeling spuds when an unknown song pours out of the tree right over the mess hall. And it takes concentration to hear the sergeant's bark when a troop of noisy parakeets goes winging overhead.

But once the vaccination has "taken" and the avian antibodies have become well established in the blood stream, it takes more than a blitzkrieg to destroy the impulse to look and listen when a feather floats by.

Students who recently gathered on Monday evenings in the ornithology seminar to discuss research problems and check over the birds seen about Ithaca, New York, are now scattered in Army and Marine camps all over the country and on many fighting fronts. Letters they write back are filled with notes of the new birds they have seen.

## Mentions of Birds Betray Boys' Stations

Sometimes the boy's whereabouts has been deleted by the censor. Only by references to birds can we guess where he is. The letter comes from San Francisco, but we know the "goonies" mentioned do not nest east of the Hawaiian Islands. It is a pretty sure guess that Jim is on Midway or stopping on some lesser island on his way to the Solomons.

Tinamous are Latin American; sand grouse are Asian and African; broadbills are mainly Indian; honey suckers, Australasian; birds of paradise are confined to New Guinea and near-by islands; and so on. The distribution of birds takes on a new significance.

On the other hand, my own son, who never became infected with the bacillus of bird study sufficiently to master the principles of classification and distribution, was unable to tell us anything of the natural history of his island. We could not guess within a thousand miles of where he was stationed, for

coconuts and oranges and sharks and jellyfish, and even "wild chickens" are widely distributed throughout the Tropics.

However, it is not with the birds of the battle fronts that this article is concerned but rather with the birds the boys have left behind them. They offer us stay-at-homes an excuse for getting out into the open country, enjoying the new sport of pedestrianism, and building up a reserve of pleasant experiences to offset the bad news that is bound to overwhelm us from time to time.

When the war is over, we may once again enjoy the sport of touring for birds, but meantime, fortunately, the sport of bird study can go on in city park or suburban back yard without expenditure of gasoline or tires. And when we have exhausted the possibilities within walking distance, there are still streetcars and a few buses that can drop us off near lake shore or woodland or marsh for a few hours in a different environment.

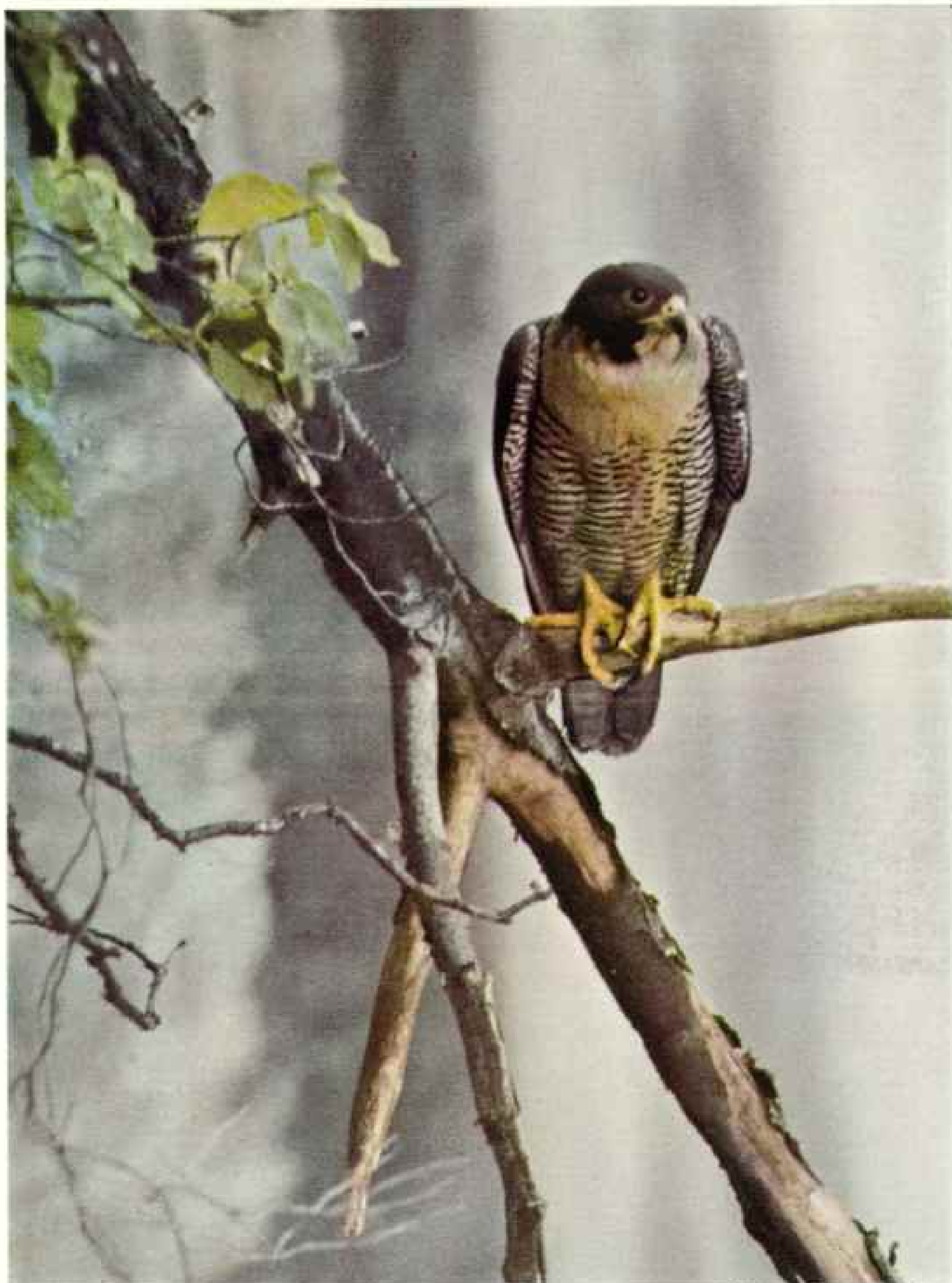
## Birds Working on Home Front

We need not feel unpatriotic because of our continued interest in bird study, for every hour spent in the field convinces us of the need for encouraging bird life. The birds are working on the home front just as assiduously for the protection of our forests and our crops as if we had supplied them with hoes and spray guns.

We watch a Least Flycatcher in the sycamore by the roadside (Plate XI). In ten minutes he darts from his perch eight times to snap up passing insects, and he keeps this up all day.

There is a Yellow-throated Vireo (Plate XV) nesting in the next tree. Without so much as the loss of a single phrase of its song, it gobbles up one cankerworm after another at the rate of two a minute.

With watch in hand, we time a Chickadee (Plate XII) bringing food to its hungry youngsters in the hollow of a stump. In 30 minutes it returns 35 times—not with a single insect each time, but with a whole bill full. Indeed, there is a record of a house wren that was watched continuously for the 15 hours and 45 minutes of daylight, and in that interval it fed its young 1,217 times! Thus the story goes on.



© National Geographic Society

Illustration by Dr. Arthur A. Allen

### Bold and Ruthless Is the Peregrine of Taughannock

This falcon makes its home and rears its young in central New York near 215-foot Taughannock Falls (background). Magnificent pirate of the air, the bird knows neither fear nor pity. **Peregrines**, or **Duck Hawks**, are found in several forms throughout the world and in many places are used for hunting feathered game.



The Expression "Thin as a Rail" Might Refer to This Bird

Compressed for slipping through the dense vegetation, the Virginia Rail lives in the fresh or brackish water sedge and cattail marshes throughout the United States and southern Canada.



© National Geographic Society

Illustrations by Dr. Arthur A. Allen

From the Salt Marshes Comes a Noise Like Applause

The call of this Clapper Rail, however, sounds more like a rattle than hand-clapping. Known as the "marsh hen" in Sidney Lanier's *Marshes of Glynn*, it is found in coastal salt-water marshes from Connecticut southward.

## Birds on the Home Front



### A Water Chicken Returns to Its Nest

Though often called "mud hen," it is properly named the **Florida Gallinule**. This close relative of the European moor hen dwells in the larger fresh-water marshes from Ontario to Panama and the Galapagos Islands.



© National Geographic Society

Illustrations by Dr. Arthur A. Allen

### The Hell Diver's Home Is a Houseboat Made of Floating Debris

Sometimes the nest of the **Pied-billed Grebe** is not even anchored and rises and falls with the water. The bird's nickname comes from its habit of diving so quickly at the flash of a gun that it escapes the shot.



© National Geographic Society

Reproduction by Dr. Arthur A. Allen

### **This Bird Is Stepping Up from Near Extinction**

Twenty-five years ago the **Upland Plover** was listed among the vanishing species; but today, through efficient protection, it is fairly common again in some of the northern States. It winters in Argentina.



Reproduction by E. A. Grinnon

### **He Digs His Home with His Sharp Beak**

Belying its common name of "highhole," this **Flicker** has drilled its nesting cavity in a lowly fence post. Often seen on the ground probing for ants, it is found throughout the United States and Canada east of the Rockies.



© National Geographic Society

Photograph by B. A. Gruner

**Canada Geese Mate "Until Death Do Us Part"**

Both parents cooperate in raising the family, braving all dangers in defense of their young. Wintering in southern States and nesting mostly in Canada, migrating flocks of **Canada Geese** flying in V formation herald spring or the approach of winter. Many a heart thrills at their wild honking.



Here Is a Real Ruff-neck

**Ruffed Grouse**, or "partridge" of northern United States and Canada ("pheasant" in the southern Appalachians), shows off regally for courtship or challenge. He shakes his head until the ruffs seem to rotate.



© National Geographic Society

Kodachromes by Dr. Arthur A. Allen

The Drummer Beats a Tattoo, Then Rests

With his fan tail touching the log, the **Ruffed Grouse** whips the air with quick forward and upward strokes of his wings to produce a thumping sound which ends in a prolonged roll like thunder.



Kodachrome by Dr. Arthur A. Allen

**A Wise Old Bird Is at Home in the Sticks**

Having appropriated in February material left 30 feet up in the beech tree last year by a Red-shouldered Hawk, this Great Horned Owl sits on three large white eggs, and a Norway rat saved for an evening snack.



© National Geographic Society

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

**Beau Brummell of the Bird World Has a Suit for Every Season**

The White-tailed Ptarmigan of the high Rockies molts almost continuously. Pure white in winter and heather brown in summer, with intermediate plumages for spring and fall, it enjoys year-round camouflage.





Illustration by Cleveland Grant

### The Bills Are Both for Defense and for Ornament

Though nesting in burrows on rocky islands along the coast from Maine northward, Atlantic Puffins pass most of the year at sea. They are often seen in the English Channel.



© National Geographic Society

Illustration by Dr. Arthur A. Allen

### He Can't Make Both Ends Meet

The curious bill is a useful tool for the Black Skimmer as he glides close to the water and drops the long, lower mandible to snap up tiny shrimps and killifish along the warmer shores of the Americas.

Some of the insects birds eat we recognize as deadly enemies; others we are not so sure about. Still the birds keep right on eating, and few crannies go unexplored.

There are insects that live on the bottom of ponds, others burrow in the soil, crawl on the surface, or infest the grass and lower vegetation. There are insects that eat up our crops and defoliate our trees and go flitting from one farm to another. There is no bird that feeds on all kinds of insects wherever they may hide, but, fortunately, we have many kinds of birds of many different habits.

We have the Grebe (Plate III), which dives to the bottom of ponds; the meadowlark and the Upland Plover (Plate IV), which probe in the soil or glean from the surface of the ground; the warblers, vireos, and orioles (Plates IX, XIV, XV), which scan the leaves and small branches; the nuthatches and creepers, which examine the crevices in the bark; the woodpeckers, which dig into the heart of the tree for borers and carpenter ants; and the flycatchers and swallows (Plates IX, X, XI, XIII), which dart back and forth over field and forest to catch them on the wing.

The adaptations among birds for varied activities and methods of finding food are well illustrated in the accompanying color plates. Some of these species are more valuable than others, and some work for the good of man more continuously or more effectively. But each has its place in the scheme of things and at times proves itself indispensable to the common good.

There are times when we feel that we could get along with fewer doctors, or that there are too many lawyers. Certainly in the present emergency some college professors are a luxury. Normally, however, each group serves a useful purpose and we need them all. Even in peace we feel we should maintain a considerable standing army at heavy expense.

#### Birds Battle Insect Invaders

Thus it is with many birds. We do not realize their usefulness, we even denounce them as robbers when they vary their diet with a few cherries; but we are always glad to have their services when emergencies arise and pray for more of them to do a better job of exterminating some insect pest that is out of control. As a matter of fact, it is a wonder we are not continually besieged and run off the earth by any one of a thousand species of insects, so great is insect reproductive capacity.

Students of entomology and arithmetical progression tell us that the offspring of a single plant louse at the end of one year, should they all live and reproduce at a normal

rate, would weigh more than the combined Japanese and German armies. And that the Japanese beetles in this country just a few years after their introduction far outnumbered all the people in Japan.

Of course, not all birds—the hawks and owls, for example—eat insects. Only the smaller species, such as the sparrow hawk and the screech owl, take an appreciable number of insects, and these are mostly of large size, such as grasshoppers, hawk moths, and beetles, (page 45). Some of these predaceous birds eat other valuable birds, but the food of most of them consists largely of small rodents.

Orchardists who have lost hundreds of trees from girdling by meadow mice should rejoice when a flock of short-eared owls locates in the vicinity. They should be glad to save one hollow tree for a screech owl to make her home, for the owls are Mother Nature's mouse-traps.

The Horned Owl shown on plate VII was incubating three eggs when the photograph was made from an adjoining tree, and when it flushed I could see a large Norway rat stored on the edge of the nest. The bird apparently had caught more than it could eat the night before.

The rat, more than any other rodent, harbors the fleas that carry endemic typhus and spread bubonic plague. Other small rodents which hawks and owls destroy harbor the fleas and ticks that spread spotted fever and tularemia. We should not begrudge them an occasional bird or chicken.

Even those species that feed largely on birds, such as the magnificent Peregrine falcon, or Duck Hawk, on Plate I, have been held in high esteem since ancient times by those who thrill to the wild stoop of the falcon. Certainly the grandeur of Taughannock Falls is enhanced by this glorious bird, and it would be a shortsighted policy to destroy it because it sometimes strikes down a slow-flying pigeon from the adjacent countryside, or a wild duck from the migratory borders that pass through the Finger Lakes on their way north and south.

#### Weed Destroyers, Scavengers, Game Birds

Some birds, such as sparrows and doves, get most of their food from the seeds of weeds and serve man as weed destroyers; others, such as the vultures of the southern States and the gulls of our harbors and seashores, serve best as scavengers; still others serve best as game.

There was a time when any bird large enough to provide a bite was considered a game bird. Robins and meadowlarks and



#### Parental Devotion Overcomes Timidity

This little American redstart flew right into the child's lap to feed his young. The bird is an untiring hunter of spittle insects, tree hoppers, and leaf hoppers. So vivid are its colors that Spanish imagination has coined for it the name *candelita*, "little torchbearer."

sandpipers furnished out the table of many a nimrod in this country, but that day is past. Today we reserve the name "game bird" for those species which are not more valuable as destroyers of insects, or whose esthetic appeal does not overbalance the bit of meat they might bring to our tables.

A game bird must be prolific to withstand the strain of hunting in addition to the many other destroying factors. Some birds, such as the snipe and the woodcock and the dove, normally considered game, are having difficulty maintaining their normal numbers because they lay so few eggs. We should be particularly careful in these days of meat shortage lest, in the name of emergency, we

loosen the bars of protection erected through the years, and in a single season undo the work of restoration that has taken so long to build up.

The Ruffed Grouse (Plate VI), however, is an ideal game bird. Possessed of amazing skill in eluding gunners, it lays a normal complement of 7-16 eggs, sufficient to maintain its numbers under any reasonable hunting pressure. It is only when disease suddenly strikes, or the ax destroys its coverts, that it is in danger. On the other hand, the Upland Plover (Plate IV), which formerly was an abundant bird on the prairies and hayfields of northern United States and southern Canada, was so depleted by excessive shooting that 30 years ago it was thought to be on the verge of extinction.

Only today, after years of complete protection, has it begun once more to be a familiar bird over part of its former range. And even now, since it lays but four eggs and never

has a second brood, haying operations alone sometimes prevent whole colonies from rearing young. This is disastrous because its long migration to Argentina is so hazardous that many are lost and some young must be reared each year if it is to maintain its numbers.

#### "V" Flight of the Canada Goose

The Canada Goose (Plate V) is one of the few nonprolific game birds that seem to be able to hold their own in spite of the millions of shotguns. This ability is due perhaps as much to its own sagacity as to the protective laws surrounding it. Spring and fall their wavering V's traverse the heavens as these birds make their way back and forth between

the southern States, where they winter, and northern Canada, where they rear their families. It takes a canny hunter to bring one to bag.

Unlike most birds, Canada Geese mate for life, and the little families stay together on their southward migration, even when they have joined dozens of other families. Who knows what the youngsters may learn from their parents about the ways of wily hunters beyond that with which their instinct endows them? It is said that if one of a pair is killed the survivor never re-mates, but I think this is a little old-fashioned even for geese.

But why try to put a dollars and cents value on every bird we see? Certain it is that many of them affect man's pocketbook very slightly, if at all. It seems like trying to evaluate a sunset or a glimpse of a mountain lake among the spruces. Many of us would go a long way and put up with much hardship and expense to get the view from some high mountain.

Personally, I would not trade my experience on the Labrador coast with the quizzical Puffins (Plate VIII, upper) or my first view of a flock of yelping Black Skimmers (Plate VIII, lower) in a Florida lagoon for any number of night-club adventures or spectacular melodramas that cost me good money. When I see a Virginia Rail (Plate II, upper) sneaking through the cattails, or hear a Clapper Rail (Plate II, lower) sounding his approach through the salt marsh, I do not ask, "How much are they a dozen?" or "What right have they to live?" Instead, I feel with Sidney Lanier:

As the marsh hen secretly builds on the watery sod,  
Behold I will build me a nest on the greatness of God.

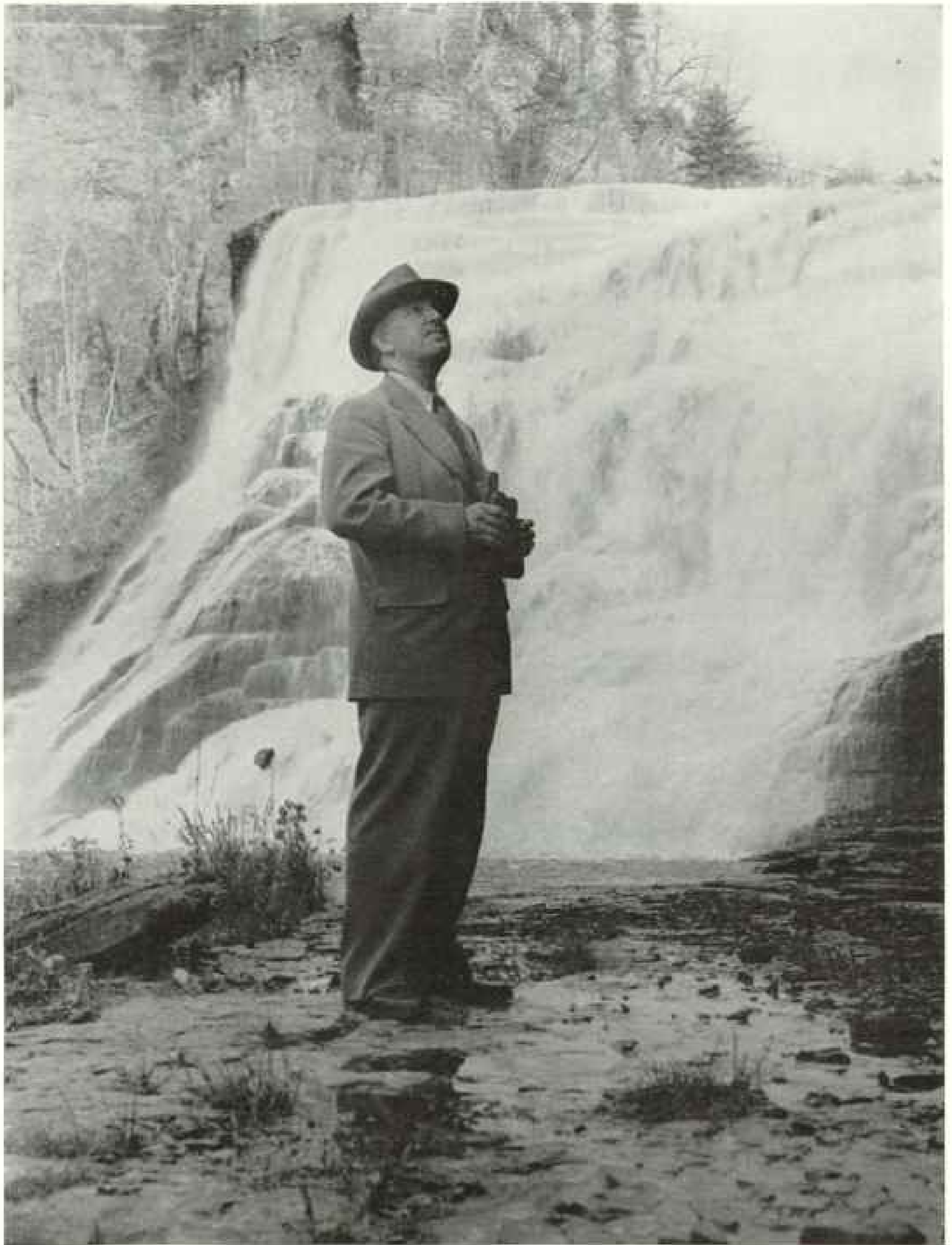


#### Who's Afraid of a Big Man's Shoe?

A black and white warbler, carrying a juicy spider to feed its young, alights on the author's foot. Although a warbler in form, it is a creeper by profession. It flits from tree to tree and climbs over the trunks and branches, scanning every crack and cranny for forest foes such as long-horned beetles, parents of the destructive root borers; weevils, ants, and spiders.

I marvel at the shades of brown and gray by which the rail fades into the background when occasion demands; at the long toes that distribute its weight on the floating vegetation; and at the slim body compressed for slipping easily through the dense vegetation. Perhaps the rails do some good by picking up the larvae of obnoxious horseflies that breed in such places, and perhaps they even destroy mosquito larvae. But it little matters; they are reason enough for their own existence.

And so it is with the pert Florida Gallinule, or "water chicken" (Plate III, upper) and the mysterious Pied-billed Grebe, or "hell diver" (Plate III, lower). The gallinule is sometimes



Edwin Way Teale

#### With Binoculars, Arthur A. Allen Studies Birds above Ithaca Falls, New York

In his half-dozen articles in *The NATIONAL GEOGRAPHIC MAGAZINE*, he has told millions of readers about our feathered friends. His expeditions, equipped with cameras and microphones, have recorded for posterity the portraits and songs of many vanishing and common birds. During his 37 years at Cornell University, 7,000 students have learned about birds from him. He has lectured to 101,340 persons in the last five years.



### Screech Owls Serve on the Night Patrol

Since some insects are nocturnal, it is fortunate that these birds do their hunting after dark. Here a mother has returned from a raid with a large moth to feed her youngster. The weird cry of this bird has been regarded by the superstitious as an ill omen; but it predicts death for none but the vermin and insects it eats (page 41).

classed as a game bird, but the grebe is not even good to eat or pretty to look at. Yet there is a fascination in both these marsh-loving birds.

### The Submersible Grebe

It is amusing to watch a Pied-billed Grebe when it hears an enemy approaching its nest, and see how deftly it covers all its eggs with the loose debris it has gathered about itself while incubating. Just a few quick dabs with its bill and the eggs completely disappear. With no less speed the bird itself dives from sight and seems never to reappear. Of course it cannot get along without air for more than a minute or so, but it is adept in poking its bill above the water or in rising slowly in the floating vegetation, so that it is seldom observed.

When the eggs hatch, the youngsters almost immediately climb upon their mother's back, where they are brooded beneath her wings. They even ride around this way, like little jockeys, with their heads peeping between her wings. Then if she is disturbed she merely clamps down her wings upon them and dives to the bottom, carrying them off to the shelter of the sedges or brush before surfacing again.

Often, instead of diving head first, the grebe merely submerges like a submarine so gradually as to leave scarcely a ripple.

The grebe's legs are located far back near its tail, and the long toes are edged with lobes so as to make it an expert swimmer and diver. On the other hand, this fact makes it practically helpless on land; so it never comes on shore intentionally. Certainly the pond that shelters a pair of grebes is more interesting because of their presence.

So also one's walk through the wood lot becomes more exciting if one hears the distant thump-thump-thump of a drumming grouse, or if one comes upon the actual drumming log itself, even though the bird be not there.

It takes a master woodsman to sneak through the woods so quietly toward the drumming sound that he can finally see the drummer at work. The photographs on Plate VI were made from a blind which was set up near a drumming log for a week until one day before dawn the author crawled into it with his camera to await the coming of the bird.

The drum of the grouse takes the place of song. It is the bird's challenge to other male grouse to keep out of that corner of the woods,



**Lucky the Victory Gardener Whose Premises Attract a Meadowlark**

When ground is plowed for the first time, the "white grubs" shift their diet from the roots of grass and weeds to those of vegetables. This bird has captured a mouthful of grubs and black crickets to feed its young. Popular because of its lilting song, it is also one of the best friends of the farmer.



**Feeding Its Mate, the Prairie Warbler Helps Win the War**

The moth it has brought to the cozy nest might have killed valuable food plants. Moving rapidly among foliage, this bird is an assiduous hunter of pests that destroy vegetation. It is common from Florida to New England and from Nebraska and Kansas to the Atlantic.

and it is his announcement to the female that he is back at the old stand.

Many of these drumming logs are used year after year, and the birds are such creatures of habit that they stand on the same spot on the log and always face in the same direction. Audubon described the performance but he could not have observed it, for he said the bird "beats its sides with its wings in the manner of the domestic cock," when, as a matter of fact, it merely pounds the air.

With forward and upward strokes of its concave wings it strikes with such force that the sound can be heard for half a mile on a quiet day. That is, it can be heard by most human ears for that distance, but the sound is one of very low frequency and it seems no louder at fifty feet than at fifty rods.

#### Horned Owl Has High-frequency Ears

It was always a mystery to me how the drumming grouse escaped its arch enemy the Horned Owl (Plate VII), for the drumming logs are sometimes within hearing range of a horned owl's nest and the grouse very often drums during the night when the owls are hunting. The mystery was solved this year when Ernest Edwards, a graduate student at Cornell, tested the hearing of a captive horned owl and discovered that it could hear high frequencies very acutely, but that its lower hearing range did not extend downward to the 40 vibrations a second produced by the wings of the grouse.

The display of the grouse is as interesting as the drum, but is stimulated usually by the



#### A Few Cherries Pay for Protection from Raiders

Although the waxwing has an unfortunate appetite for fruit, it makes up for its misdeeds by eating enormous quantities of destructive insects. It feeds its young by regurgitation, usually bringing back from a single foray enough food for the whole family. These birds sometimes perch in rows on a mulberry branch, where only the outermost can reach the berries, and pass each tit-bit back from one to the next.

presence of another bird. To obtain the photograph on Plate VI, a captive female was put in a small cage by the log, and the show the male put on for her benefit was magnificent.

Spreading his tail and drooping his wings, he raised the frill of glossy black feathers that a moment before had been quite inconspicuous until they formed an Elizabethan ruff about his neck. Next, shaking his head from side to side, at first slowly and then more and more rapidly, he made a short run in her direction and struck the pose captured in the photograph. With each shake of his head he



uttered a "chug," the sounds coming closer and closer together until at the time of the last run they slid together into a prolonged hiss. At a little distance the performance sounded like a far-off locomotive getting under way.

In most of the training centers the boys report they are kept so busy that they don't have much time to look for birds, but always there are some that demand attention.

In Florida it is the snowy herons that line the roadside ditches; in Louisiana and Texas it is the great flocks of geese that go honking overhead. One does not have to be very observant to see a Bullock's Oriole (Plate IX, upper) or a Vermilion Flycatcher (Plate IX, lower) if one is stationed in the Southwest, though neither bird goes out of its way to make friends with anyone.

The Vermilion Flycatcher is really a tropical species that reaches the northern limit of its range along our Mexican border and is much more common farther south. When you approach its nest, the male flutters up into the air like a little ball of flame, its feathers all puffed out until it is practically spherical, with a little wing vibrating at each side. It does not come very close to the nest, however, until the eggs have hatched, but leaves the earlier domestic chores to its dull-brownish mate.

The Bullock's Oriole is found west of Brownsville, Texas, to the Pacific coast and northward to South Dakota, and it is very conspicuous in the acacia trees of the Southwest, where the foliage is sparse. In the east its place is taken by the closely related Baltimore oriole.

#### Every Spring Sees a Bird Invasion

As often as the month of May rolls around in eastern United States and Canada, two great armies meet in the parks and woodlands. One army is that of the migratory birds invading us from the south.

The other is the army of bird observers, mustered from every walk of life, who get out early in the morning, not to repel the invasion but to cheer it on its way. If April has been cool so that the leaves do not obscure the branches, the warblers are conspicuous as they feed about the opening buds. Bird observers enjoy a wonderful few days with these feathered jewels.

To the beginner, the warblers seem an endless array of provocative color combinations and confusing sounds, while their restless habits are his despair. There are really only 41 species that migrate through eastern United

States, but there seem to be twice as many, because, with most species, the males and females have different color patterns, though their shapes and sizes and idiosyncrasies are alike.

Additional species found in western United States bring the total up to 55, which is about a third of the whole family, but the spring rush of warblers is nowhere else so conspicuous as in the eastern half of the United States.

The family of Wood Warblers to which ours belong is strictly one of the New World, with resident species in Central and South America where ours go visiting during the winter months.

#### Some Wood Warblers Travel Far

Some of our species are greater travelers than others. The myrtle and yellow-throated and palm, for example, winter in the southern States, while others, such as the ovenbird and chat and Hooded (Plate XV), go down into Mexico, and the chestnut-sided and cerulean to Panama. The Canada (Plate XIV, upper) and Golden-winged (Plate XIV, lower) seldom stop short of Colombia or Venezuela, while the blackpoll continues on to the Guianas and Brazil.

Some, like the ovenbirds and water thrushes, are terrestrial, seeking their food on the ground. Others, like the black and white, search out the crevices in the bark, or, like the chestnut-sided and yellow-breasted chat, live mostly in the low vegetation. Still others, like the Blackburnian and Tennessee, keep mostly to the treetops.

Some, like the prothonotary and hooded, stop off in the southern States to nest; others, like the yellow and redstart, continue on to the northern States.

The black-throated blue and Canada nest in southern Canada and only in the mountains farther south; the Wilson's and blackpoll continue on to the northern spruce forests.

On migration a single flock may contain a dozen different kinds feeding in different strata in different ways and aiming toward different destinations, but all traveling together and landing in one's garden overnight, to the delight of the bird lovers of the neighborhood.

If you really wish to feel content with your lot and find some consolation in having to make the daily trek to your office on foot; if you desire to enjoy a trip to the park or your neighbor's garden, seek out a bird-loving friend as you would a doctor and get an injection of Warbleritis or Thrushmania. If it "takes," you will be looking at birds the rest of your life.

## Birds on the Home Front



### "Down with Insects" Is the War Cry of Bullock's Oriole

This species of the Great Plains area and westward replaces the Baltimore Oriole of eastern United States. The hanging nest of **Bullock's Oriole** usually is more firmly attached and does not swing so freely as the Baltimore's.



© National Geographic Society

Photographed by R. A. Getman

### He's Not Too Gay for Family Chores

The **Vermilion Flycatcher** of the Tropics and the Southwest, like most other bright male birds, lets the dull-plumaged female build the nest and hatch the eggs, but he does cooperate in feeding.



**They Furnish Air Defense against Nuisance Raids**

Because they keep down mosquitoes and other pests, **Barn Swallows** are encouraged to build their feather-lined nests of mud pellets and straws inside our barns. They winter in South America and return in April.



© National Geographic Society

Photographed by Dr. Arthur A. Allen

**Soon There Will Be Four More Combatants**

When the eggs of this **Alder Flycatcher** hatch, the young will be fed on the insects that frequent the borders of the marshes and alder thickets of northern United States and Canada.

## Birds on the Home Front



Reproduction by Dr. Arthur A. Allen

### Watchful Waiting Gets a Living

The **Least Flycatcher**, or "chebec," watches for insects to fly past within range and quickly darts out to catch them. It is found along roadsides, in orchards, and in wood borders in northern United States and Canada.



© National Geographic Society

Reproduction by E. A. Grimes

### No Meatless Tuesday for This "Butcher Bird"—It Feeds Mostly on Grasshoppers

The **Loggerhead Shrike** earned its nickname from its habit of impaling prey on thorns or barbs. Occasionally it captures a mouse or a small bird, but usually insects. It frequents open areas in the deep South.



© National Geographic Society

Kindred by Alfred M. Bell and F. G. Henshaw

#### Spent a Summer with a Hummer

The female **Broad-tailed Hummingbird** resembles the Rubythroat, which it replaces in the Rocky Mountain region. It can be enticed by columbines, jarkspurs, mints, and trumpet creepers, or by red vials of sugar water.



Kindred by S. A. Gilman

#### No Objections to This Bill

It is full of good news to farmers as well as baby-birds. As many as 454 plant lice have been found in the stomach of a single Chickadee. This is a **Carolina Chickadee** family of southeastern United States.



© National Geographic Society

Collectors by Dr. Arthur A. Allen

### It Comes as a Harbinger of Spring

**Cliff Swallows** nowadays are cliff nesters only in the West, as they build regularly under the eaves of buildings. They winter in Brazil and Argentina and breed as far north as central Alaska.



Collectors by S. A. Grimes

### "Beware the Night Patrol," Insect Pests

**Chuck-will's-willow** becomes active at dusk, and was to the moth or beetle that comes too near. A large edition of the Whipscorwill, it is found in the southeastern States from Maryland and Missouri to Florida.



**A Feathered Ally Helps Control Leaf-eating Insects**

This is a female Canada Warbler returned from Ecuador or Peru to summer in the northern United States or southern Canada east of the Rockies. In May it comes flocking back from the Tropics in great numbers.



© National Geographic Society

Reproduction by Dr. Arthur A. Allen

**On Golden Wings He Comes to Us from Northern South America**

After enjoying the winter in the tropic air of the republics to the south, the Golden-winged Warbler returns to the northern and eastern States and southeastern Ontario in early May to nest on the ground.

Birds on the Home Front



Kodachrome by S. A. Grimes

**"Hi, Pa! Where Did You Get the Shawl?" Ask Young Hooded Warblers.**

Nests of weeds and dead leaves are placed low in small saplings. Hooded Warblers are found in woodlands during the summer from northern Florida to central New York and in winter from Veracruz to Panama.



© National Geographic Society

Kodachrome by Dr. Arthur A. Allen

**Battle-scarred, an Avian Hero Carries On**

The loss of one leg did not prevent this Yellow-throated Vireo from building its pendent nest and rearing a family. In summer it is found east of the Rockies and in winter from southern Mexico to Venezuela.





**Hidden Treasure Is Often Found in the Stay-at-home's Back Yard**

The deep-green eggs of the **Catbird** are cradled in a bulky nest of twigs and rootlets. Catbirds are common in summer east of the Rockies and in winter from the Gulf States to Panama.



© National Geographic Society

Illustration by Dr. Arthur A. Allen

**He "Follows the Horses" and the Cows**

His gamble, however, is on his neighbors' taking care of his children. This **Cowbird's** gray mate lays her eggs in other birds' nests. In summer the species is found from Virginia and California to southern Canada.

# American Wings Soar Around the World

Epic Story of the Air Transport Command of the U. S. Army  
Is a Saga of Yankee Daring and Doing

BY DONALD H. AGNEW AND WILLIAM A. KINNEY

ROMMEL had swept victoriously toward the Nile and the armor-piercing ammunition needed to check his Panzers was five months away by sea lanes.

The Air Transport Command of the United States Army Air Forces took the crisis in stride and in five days delivered 25,000 rounds of the shells to the British Eighth Army.

When the hospital in war-vital Nome, Alaska, burned down, the nearest duplicate equipment available was in St. Louis. Thirty-six hours later ATC had it in Nome, so a new hospital could be set up complete, from beds and X-ray apparatus to hypodermics and surgical gloves.

From Australia came an urgent message from General MacArthur. Five thousand pounds of small parts were needed to keep certain of his planes in action. ATC rushed them to him in two days and seventeen hours.

## Aerial "Gulliver of All Work"

Such performances, spectacular by peacetime standards, have been multiplied endlessly, and have become routine in the operations of ATC, the Army's globe-girdling aerial Gulliver of all work.

Perhaps the delivery of the sorely needed ammunition to the British Eighth Army last autumn best dramatizes how ATC has slashed distance and time. And how vital a role it plays in a total war.

Rommel could not be expected to wait obligingly for the five months it would take an eight-knot convoy to make the long, tortuous voyage from American ports around the Cape of Good Hope, then up through the Red Sea to Egypt. And U-boat infested seas were no guarantee that such a convoy would reach its destination.

But ATC passed the ammunition by air to the British gunners in one-thirtieth the time. The ammunition checked Rommel's tanks at El Alamein. And General Montgomery was given the opportunity to mount the counterblow that helped smash the Axis in Africa.

The Air Transport Command's story is a fascinating one, for, like Topsy, it "just grewed"—aerially and geographically.

Back in June, 1941, it started out with two officers and a secretary in a couple of

remote basement rooms in the Munitions Building in Washington, D. C. Its operations were limited to continental United States and consisted only of flying Lend-Lease planes to delivery points, where RAF representatives took over.

Today its routes crisscross the globe in all directions, spanning desolate Arctic wastes and shrinking the broad Pacific.

Its personnel now numbers thousands of pilots, crew and maintenance men, specialists, engineers, and soldiers. And it is flying between 50 and 60 types of combat planes to the war fronts.

The operations of ATC grew importantly after the obscure beginning of two years ago, but they remained comparatively small-scale until the bombs fell on Pearl Harbor. The expansion that followed was enormous and little short of incredible.

There is a hint of what happened in the current list of ATC's "Wings"—the designation given to the various geographical areas in which the Command now operates regularly. There is the North Atlantic Wing, the South Atlantic Wing, the Caribbean Wing, the Alaskan Wing, the Pacific Wing, the Africa-Middle East Wing, the European Wings, and other Wings.

Each Wing may mean one or more regular routes, and one or more alternate routes. Before the end of 1942, ATC was flying more than 90,000 miles of routes, as compared with the prewar total of 41,000 miles flown by all domestic airlines in the United States. A number of new routes have been added this year and more are being pioneered.

This enormous expansion was not effected overnight. It represents the product of careful planning, much unsung courage, and a prodigious amount of hard work—almost always under the most difficult geographical conditions.

## Flying an Airport to Africa

Planes must have bases, and ATC had to construct those bases where they would best serve the projected routes, regardless of unfavorable climate or terrain. They ranged from Arctic outposts, with temperatures that dipped to fifty and sixty degrees below zero, to desert airports where midday temperatures



U. S. Navy, Official

#### Flying Back from Casablanca, "Mr. Jones" Cuts His 61st Birthday Cake

"Jones" and "Passenger No. 1" were the President's designations on the *Dixie Clipper's* lists when he made his secret flight to Africa. At his side last January 30 was Admiral William D. Leahy. Facing him were Harry Hopkins and the clipper's captain, Howard M. Cone, Jr. (page 74).

are so blistering that it is impractical to service a plane.

For the construction of one airport in central Africa, a force of 1,200 was assembled, quickly inoculated for tetanus, typhoid, yellow fever, and cholera, then dispatched to the site. When the men arrived, their only living quarters were native mud and thatched huts.

Malaria at once proved a scourge, and in a comparatively short time some 30 percent of the entire operating force came down with the disease. Medical officers set out methodically to combat it. Near-by swamps and lowlands were oiled. Sewers were dug. Long-sleeved and long-legged clothing was devised for the men. And the incidence of malaria dropped to one percent.

Despite the burden of the oppressive tropic heat and the threat of disease, transformation took place quickly. By air came road scrapers, Diesel engines, drums of paints, reels of cable. As the work progressed, 44 tons of prefabricated houses arrived, complete with refrigeration and air-conditioning equipment, a million feet of lumber, and 5,000 bundles of structural steel.

Today at this field you can find Ford sta-

tion wagons from Detroit, office furniture from Akron, comfortable, well-screened living quarters, modern cooking equipment—and a former chef from the Hotel New Yorker to prepare appetizing meals.

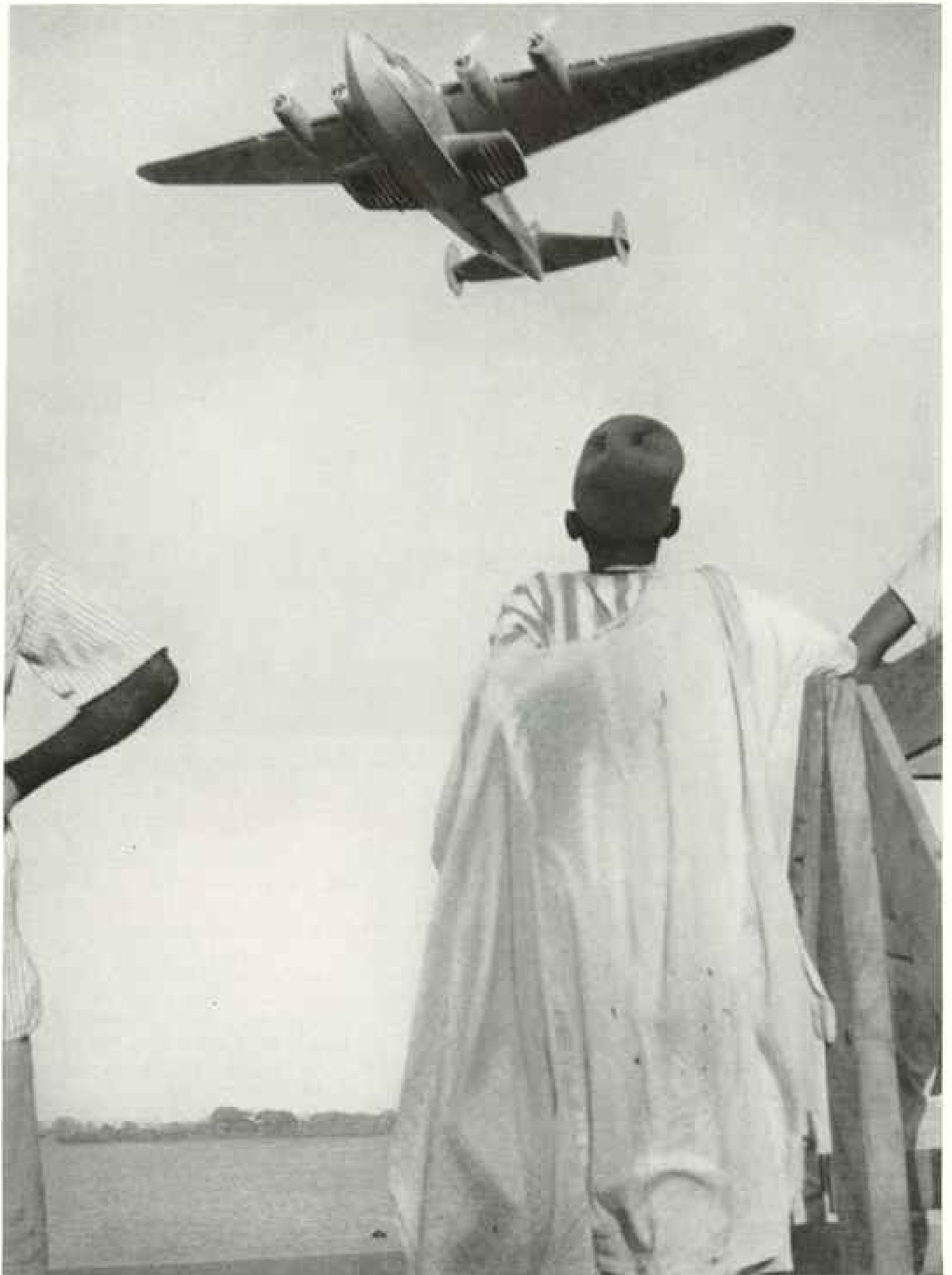
Then you can watch a twilight game of baseball between some of the base's personnel and a scantily clad native team that has been taught America's national pastime—after a fashion.

Another air base in North America was until a comparatively short time ago a wild and desolate region where primeval quiet brooded over the scrub pine and spruce. Now it is one of the biggest airports in the world, with a steady traffic of bombers and fighters hopping off for England two thousand miles away—a hop that has been made in less than seven hours, although the average flying time is between 16 and 20 hours.

#### Weather Men Dropped by Parachutes

Then there is a still-primitive flying field which was hewn out of a plantation. It is one of the last stops on the line for the men who take planes over a most difficult and dangerous flying stretch.

Besides the task of providing bases, this far-



**Africans Gaze in Awe at Old Glory as a Clipper Roars over Bolama, Portuguese Guinea**

Pride of Pan American Airways, this big Boeing-made ship and her sisters rescued thousands stranded by war in Europe and Africa. PAA men endured heat, malaria, snakes, and scorpions to build the ferry's sky path across Africa. This aerial road delivered many of the bombers that flattened the Axis in Tunisia.



### Into the New Guinea Jungle Goes Cargo to Reinforce the Allies

Fighter pilots in the southwest Pacific call such transport planes "streetcars." They greet ATC men with requests for "Transfer, please."

flung aerial operation has entailed the setting up of a vast network of meteorological stations to supply the weather information vital for safe and efficient handling of the traffic along the routes.

The Command is proud of the men who man the lonely and isolated stations, particularly those in the Arctic where some posts are so remote that their crews had to be dropped by parachute and kept supplied by air.

The question of supply has produced endless headaches at many of the bases, but in every case sweat and ingenuity have thus far managed to lick the problem.

One airfield in Africa was developed at the desired location, but it quickly became apparent that arrangements for an adequate fuel supply left much to be desired.

The young officer in charge acted with imagination and promptness. He struck a bargain with the local sheik to hire all the camels in the territory—which were reported to number one thousand—to bring in the

gasoline from a distant supply source, each camel carrying 35 gallons across a shifting desert trail.

The fuel problem vanished after that.

Maj. Gen. Harold L. George, who commands ATC, heartily approves such enterprise in getting things done. "We got a bill from the sheik of that territory for the use of probably all the camels in North Africa," General George said, "but the price was cheap as long as the fuel was there."

Ingenuity also was required to supply an Arctic base with a 1,200-gallon gasoline truck. The vehicle was much too large to get through the door of the plane. So welders were called in and the truck was cut into three pieces. These were flown north, accompanied by the welders, who reversed the procedure on landing and welded the truck together again.

When ATC began operating outside the continental limits of the United States, it was primarily concerned with ferrying combat planes to the various fighting fronts and with



(OWI Official)

**Sky and Trees Roof This Repair Shop as Army Mechanics Weld a Transport Girder in an Eastern India Jungle**

The hanging lamp shows that work may go on in the dark. G.I. (Government-issue) tool kits stand beneath the packing box. A cargo plane hides in the foliage. Near by are the quarters of young airmen.

transporting key military and diplomatic officials on various missions.

**"Flying Boxcars" Carry Vital Cargoes**

However, it was not long before the urgent need for vital war supplies put ATC in the air-cargo business, which has now become such an important part of its operations. And the "flying boxcars" which transport such cargo give double service for the war effort. Not only do they deliver urgently needed military equipment and the like to the actual fighting zones, but they come home laden with strategic raw materials to replenish the Nation's carefully husbanded stock piles.

There have been cargoes of platinum from the Persian Gulf, rubber seeds from Liberia, quartz crystals and industrial diamonds from South Africa, raw rubber from the upper Amazon, hog bristles and silk for parachutes from China, balsa wood from Central America for gliders and PT boats.

Some cargoes are unusual. When a root weevil attacked the hemp plants at an experimental station in Honduras, ATC was called on to ferry in a shipment of beetles from Fiji to combat the weevils.

Recently, important food crops in the Pacific Northwest were threatened by an insect pest. *Cube*, a South American root, was the essential ingredient in making rotenone dust, the insecticide needed to combat the menace. It took ATC, working with the Navy Transport Service, less than a month to fly in 110,000 pounds of the root, and huge amounts of needed foodstuffs were thereby saved.

On outbound trips, not all the cargo space is pre-empted by the goods of war.

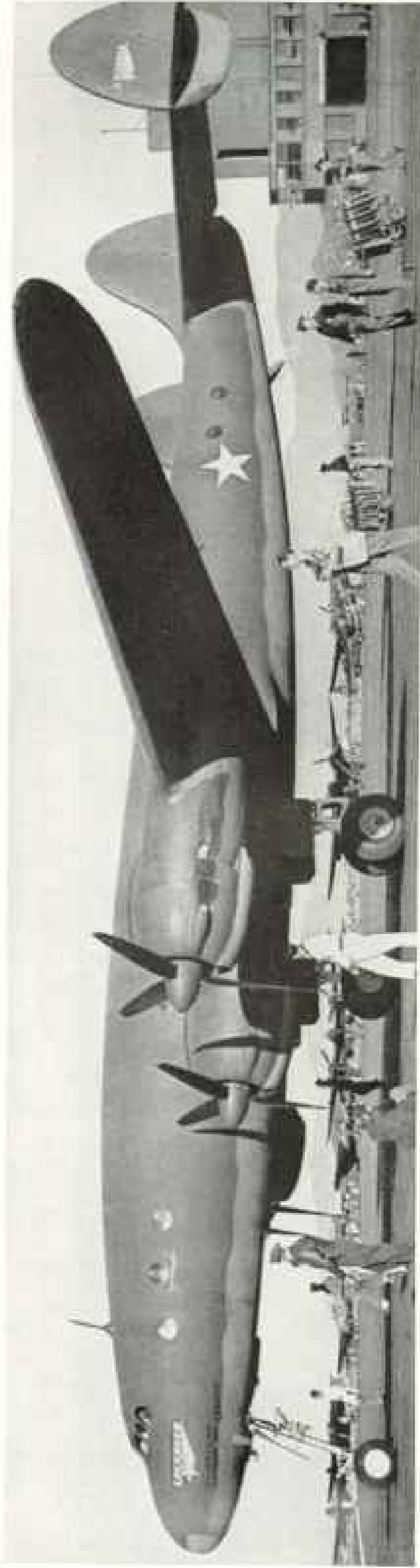
There is mail, for example—the thousands of letters from home that mean so much to the morale of the men serving with the armed forces overseas. The letter that would take three months to reach a Yank in Bengal if it came by boat now is in his hands four or



U. S. Army Air Forces, Official

**By Unloading Transports Such as This C-47, New Guinea Natives Helped the Allies Win the Battle of Papua.**

Other fuzzy-tops, carrying wounded and supplies, crossed the forbidding Owen Stanley Range on bare feet. To air transport, which hauled even four-inch guns and horses, General MacArthur gave a large share of the credit for successes in New Guinea. This one has its cabin windows open, a sign it carries passengers as well as materials. Two natives on a hidden platform appear to be figurines perched atop the giant plane.



International News

**Lockheed's Constellation, Triple-tailed Shark of the Stratosphere, Can Ferry a Tank and Its Crew across an Ocean**

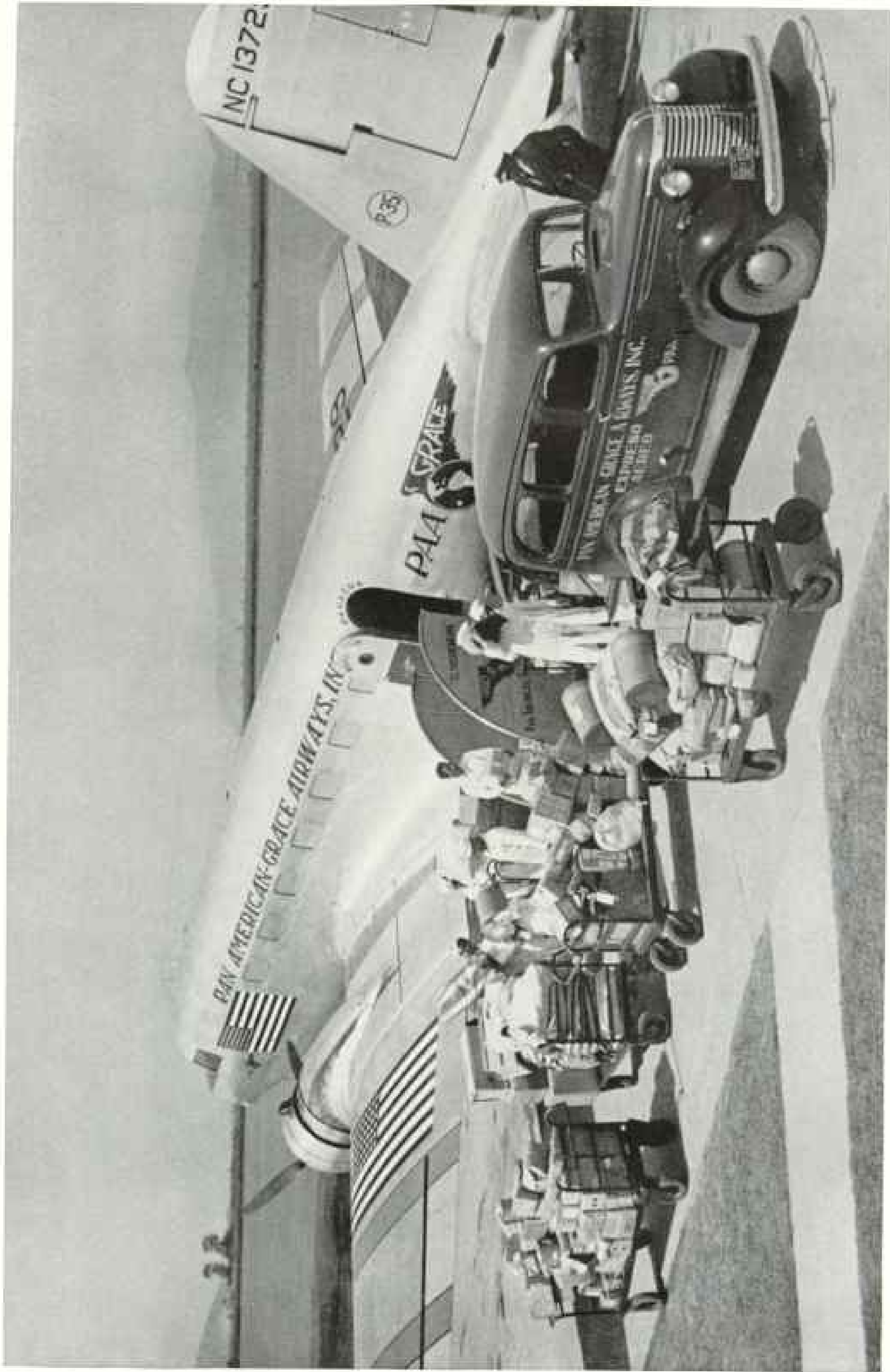
Designed as a TWA luxury liner carrying 64 persons, Constellation is in the Army now as the C-69. Four 2,000-hp. motors can lift it 35,000 feet. She borrowed her wing design from the Lightning fighter; her fishlike streamlining was born in a wind tunnel. She can outrun a number of pursuit planes (page 78).



Army

**Liberators Sit Down for Overhaul in One of Mussolini's Lost Colonies Which Now Serves the Army's World Cargo Route**





**Flags on Wing and Sides, a Pan American-Grace Converted Airliner Loads Vital Freight for Flight over the Andes**

Pan American and associates have adopted 30,000 miles of Latin American airways vacated by the Axis. From Buenos Aires they haul strategic materials 5,000 miles to Miami. Land-based strato clippers now fly lighted airways in South America.

five days after it leaves the United States.

In January alone, the Africa-Middle East Wing carried a total of 29 million pieces of mail to and from troops in that particular theater. The previous month, ATC had a Santa Claus role, transporting three and a half tons of last-minute Christmas mail to General Eisenhower's men.

On occasion ATC's big transport planes have been known to serve as aerial "chuck wagons." To assure U. S. troops in a certain sector in Africa a bountiful Christmas dinner last year, some 18 tons of genuine American beefsteak, chicken, and fresh foods were set down on time and on the spot.

The planes also serve as flying iceboxes for isolated posts in Alaska, regularly delivering fresh meats and vegetables. And when General Stilwell's trapped army of 70,000 Chinese were fighting in Burma a year ago, transport planes got rice and other foods to them by parachute, despite the swarms of Japanese Zeros.

#### Cockpit Lessons in Geography

Many of the men who man ATC planes had never been far east of Coney Island or west of Puget Sound, but they have more than made up for it since. Even ground crew and base personnel can count on seeing distant parts of the world.

The exact course of most ATC routes, as well as the location of many of its bases, cannot be disclosed, but the general sweep of the constantly increasing flights may be indicated.

From an advanced base in northern Maine an ATC crew may take off with a combat or cargo ship for the United Kingdom—the "U. K.," as pilots refer to it. Or a more northerly base may be used.

Another ATC plane takes off simultaneously from Florida and dromes across the Caribbean and down the South American coast, frequently flying over tangled jungle that was never meant for crash landings. The pilot sets the ship down on Brazil's bulge, perhaps after a stop or two en route, depending on his orders.

From Brazil it is eastward ho for bases on the West African coast. The American influence is now apparent at these points. One should not be surprised to hear a black-skinned native singing "Deep in the Heart of Texas," with handclaps at the proper places, or some other popular tune he has picked up from United States personnel. One recent report said that the latest movie hit with them was "Golddiggers of 1937."

From the West African bases the routes fan out. Some planes head north to Morocco

and Algeria. Others strike up across British Nigeria, perhaps pausing to refuel in the heart of French Equatorial Africa at a Fighting French outpost in the Lake Chad area, and thence over the arid southern wastes of Anglo-Egyptian Sudan, before turning northward toward the storied Nile Valley and Cairo.

#### Hamburgers and Soda Fountains in Africa

Or a ship may continue straight across Africa to a large base in one of Mussolini's former colonies—a base which boasts that it has the only soda fountain in Africa! There is another base farther west which claims it is the only place in all Africa offering genuine American hamburgers.

In the Alaskan Wing, it is north from Great Falls, Montana, with stops at bases near places that have almost been forgotten since the days of the Klondike gold rush. Around historic Whitehorse, in Canada's Yukon, river boats are to be found. If the schedule permits, plane crews may enjoy themselves on one of them for a few hours.

The vastest distances and longest over-water flights are in the Pacific Wing. Unerring navigation is essential to reach the pin-point island bases which serve as stepping stones on the long flights to down under.

#### A Disappointment in Nurses

The base crews on these Pacific islands lead a lonely and monotonous life, but, barring the large key bases, ATC ground personnel throughout the Wings shares the same unexciting routine, servicing the planes and speeding them on their way.

One base, which must be nameless, was thrown into a furor not so long ago by the report that a transport would arrive soon to disembark 20 American nurses for permanent duty. Only the end of the war would have been better news to the officers and men, who had not seen an American woman in months. There was much laundering and pressing, as Sunday-best uniforms were prepared for the momentous occasion.

The Red-letter Day found virtually the entire base at the landing area, freshly barbered, carefully groomed, and all anticipation. The transport arrived and the nurses came ashore. There were 20 of them. And they were unquestionably American. But they were all male nurses!

Sometimes a plane will fail to reach a base, because of bad weather, faulty navigation, or other causes.

On January 5 this year, a big C-87 was forced down in the snowy wilds of northern Quebec. It was five days before a search



International News

### A Huge Mouth Yawns, and C-47 Swallows Tractor and Driver in One Gulp

At Westover Field, Massachusetts, this Army plane has a double duty. Besides its cabined cargo, it will tow a jeep-laden glider. Under its war paint, C-47 is the DC-3, work horse of the commercial airlines.

plane located the lost aircraft. Then a smaller C-47 was flown to the spot, carrying a small tractor. Repairs were made, a runway cleared in the snow, and the C-87 flew out under her own power, returning to the United States March 8.

Perhaps the epic story is the saga of the B-24, en route to Africa. It was forced down after a tropical thunderstorm deep in a Brazilian jungle. The landing place was the bed of a dried-up lake, thickly overgrown with waist-high scrub. All around was dense, matted jungle, walling in the dried lake and the \$250,000 airplane which rested on it.

The crew fought the jungle for nine days to reach the nearest Army air base and report the loss. ATC faced two problems.

One was to locate the lost plane; the second was to get the plane out. The fact that this called for a 5,000-foot runway in a Brazilian jungle was incidental. The bomber was meant for combat service.

Air search finally located the grounded

plane 71 miles from Belém. A party of engineers and workers was dispatched to the scene. For 165 miles they traveled up a jungle stream in a flotilla of canoes and then hacked their way through dense brush to reach the plane.

The natives were incredulous when they learned what the white men planned to do. The chief engineer noted in his diary: "Put under observation by the native Indians. They actually believe we are crazy to do this."

It was this same diary that carried this terse entry later: "A bushmaster (deadly snake) bit me in the left index finger. Had to shoot end of finger off to keep from dying."

### Snakes a Menace; Monkeys a Pest

Food for the jungle party came in by plane, but their water supply had to be carried two miles from a small creek, then boiled and treated with iodine before it was safe to drink. The native Indians did not believe in going to all that trouble: they cut the mairaque-



AP from Press Ass'n

**Like Criminals in a Patrol Wagon, Japanese Prisoners on a Transport Hide Their Faces**  
As the American M.P. holds machine gun ready, members of the ship's crew peep from the cabin. The captives are Navy and Air Force men taken in the Solomons. Headquarters wants to question them.

teca vines and sucked water from the stems.

Although snakes were a constant menace, monkeys proved the biggest pest, bedeviling the workers in many ways. For revenge, monkey meat appeared on the menu as an experiment. The engineer's diary records: "Monkey meat is plenty tough, but oh the spareribs!"

For 22 days the 104 workers toiled in the jungle heat, hewing a mile-long runway out of the dense *matto*. Then the repaired bomber went roaring down it and into the air again, bound for the African front once more. The plane had used for ninety seconds the strip that took three weeks to complete.

Although plane crashes and casualties are bound to occur, ATC operations have a remarkable record for safety. For example, the four months which ended January 31 saw ATC fly more than 4,000,000 miles in Africa alone, carrying 21,300 passengers without the loss of a single plane or injury to a single passenger. In the whole of 1942, 99.7 per-

cent of all planes accepted for domestic or foreign delivery by ATC reached their destinations safely.

During one recent month—the heaviest to date in ATC records for the delivery of aircraft—the plane losses en route to their destination amounted to only four-hundredths of one percent of the planes flown. Not a single plane has been lost on the hazardous Pacific routes by enemy action, although the Japanese have tried more than once to interfere.

However, ATC flyers are well trained in what to do if they find themselves in trouble, and forced-landing techniques have been worked out for virtually all types of terrain.

For a jungle, the procedure is to come in with gear up and full flaps down, landing nose high in heavy growth for its cushioning effect. For water, it is gear up and no flaps, lest they give the plane a diving motion. Beaches require no special procedure—gears and flaps down as for a normal landing—but belly landings are obligatory in the desert.



John Payne

#### In the Nose of His Plane, a Navigator Cons a NATIONAL GEOGRAPHIC Map of the Caribbean

Army flyers and Navy skippers have found The Society's maps useful in emergencies. A destroyer commander, his Navy charts destroyed by Japanese bombs, used a Pacific Map to navigate from the Java Sea to Australia.

The desert presents many problems. Over the Sahara, for instance, there are no radio beams, and the dust haze can be counted on to make solar navigation very difficult. Moreover, the monotonous terrain offers few landmarks on which a pilot may check his course. It is always welcome to see the snowy barrier of the Atlas Mountains and leave the desert behind.

#### A Form Letter to Arabs

Should a pilot be forced down in the desert, he knows what to do. Before he ever took off from Florida, he was taught to say in Arabic: "American flying officer," and usually he also has mastered the Arab word for "Greetings."

In his wallet, too, he carries a message printed in Arabic, which states:

"To All Arab Peoples: Peace and the mercy of Allah upon you. This man is a United States of America officer. Please feed him and give him to drink, for he is a friend of all Arabs. If you protect him well, and take him to English or United States soldiers, you will be rewarded by the United States Government."

Arabs on the whole have proved very helpful and kindly toward the crews of planes that have been forced down. Indeed, the chief of one nomadic non-Moslem tribe wanted to present his daughter as a gift to the chief officer of one combat-bound plane.

The ship had been forced down close to a water hole in mid-Africa, and tribesmen were not long in appearing. It was evident at once that they were most friendly, and, although the conversation was carried on entirely in sign language, cordial relations

were quickly established. While members of the plane's crew worked on repairing their ship, the Arabs butchered a goat, built a fire, and prepared a meal.

The crew repaid them with gifts of chocolate and chewing gum, and the leader of the tribe got some gold pieces to boot. When nightfall came, the flyers shot off some of the plane's signal flares, to the delight of their hosts.

Perhaps it was the result of the handful of gold coins, but the next morning the chief returned with gifts of goats' milk and also his daughter, whom he tried to bestow on the embarrassed chief officer. No amount of sign language could explain to him why the officer

could not accept the young maiden, and the chief still wore a puzzled look when the plane departed.

ATC men who have come in contact with Arabs have found they live up to their reputation fully when it comes to bartering. In one section, however, prices were reported fairly stabilized, with twenty eggs the accepted value of an Army mattress cover, nine for a shirt, and six for a barracks bag. The latter the Arabs frugally convert into clothes for their children by the simple process of cutting two holes at the bottom for the arms and one for the head.

#### Desert "Radio" Is Jungle Drums

Not only the Arabs, but other African natives have proved friendly and helpful. In the pioneering days along ATC routes, when communication systems were inadequate, the first news of some forced landings came by the age-old African method—the throbbing telegraph of the jungle drums.

In West Africa the natives have shown a childish eagerness to find employment on ATC projects. The pay is good, and the job seems to raise their social status; so they resort to all kinds of devices to get hired. A letter of recommendation is highly prized in these parts; apparently the natives consider one an infallible open-sesame to new employment.

Project officers have seen some strange forged ones, written by natives with a weird conception of English. The prize case on record was an authentic letter, however, which a smiling black proudly presented to prove his qualifications for the job.

The letter said: "This man is lazy, dishonest, and incompetent."



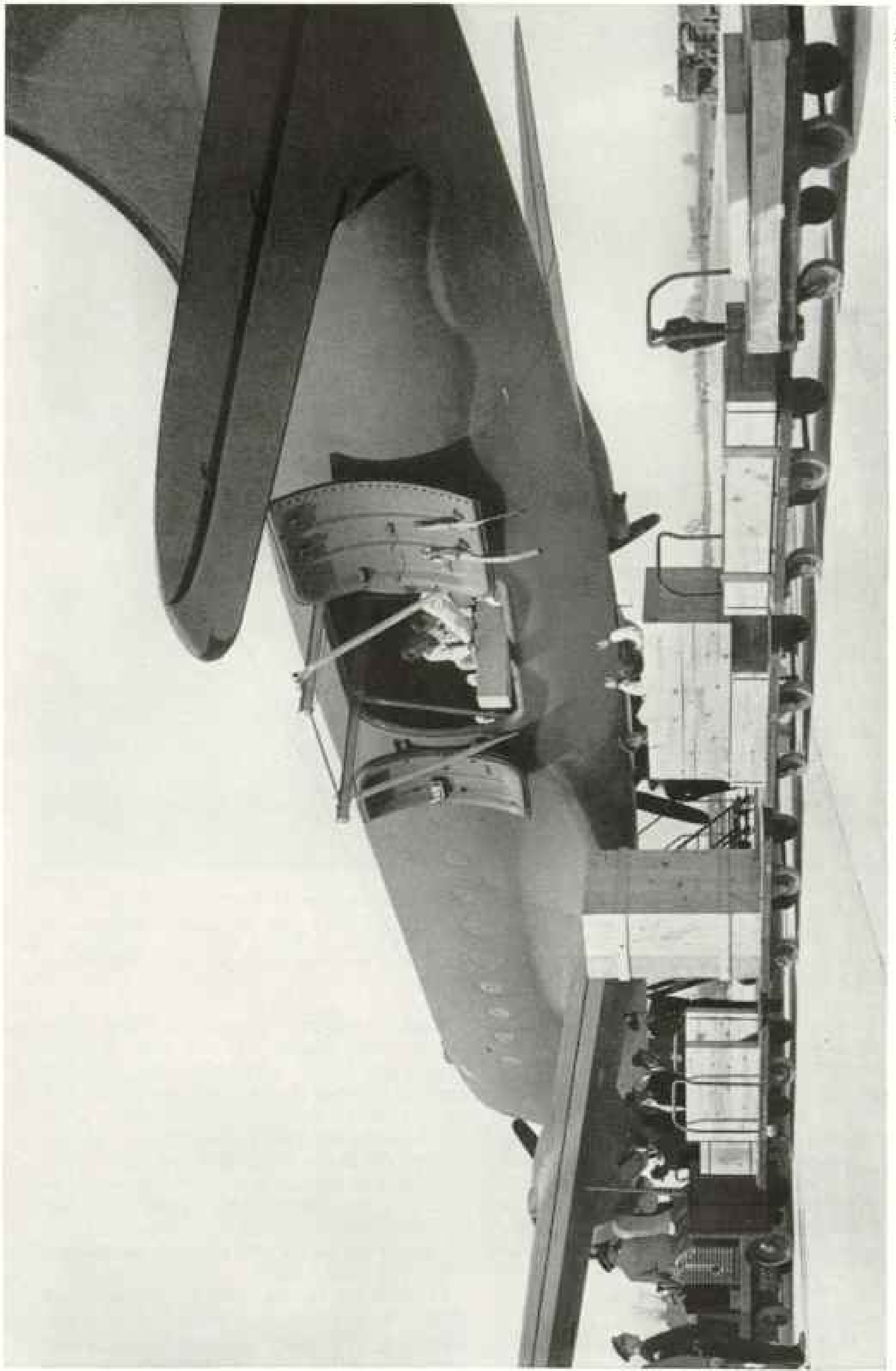
#### With a Smile, Russia Accepts Delivery in Iran

Col. Victor Tashin emerges from the hatch after inspecting a North American B-25 (Mitchell bomber) flown from the United States by Air Transport Command. After a brief lesson at the controls, Soviet pilots will fly the ship to Russia.

Native "honesty" presents a minor problem in some places. At one transshipment base, when freight is being hurried from one plane to another on the kinky heads of black carriers, traffic men station themselves along the route to see that natives do not wander off into the brush with the boxes they carry.

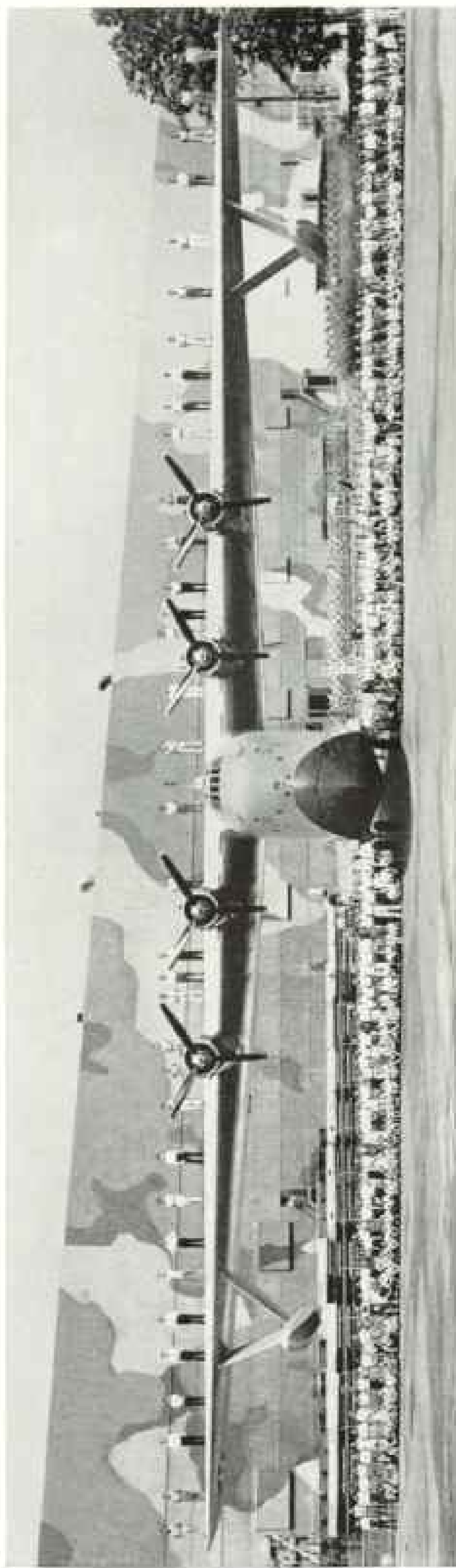
Payday at bases where native labor can be used is a picturesque sight. The natives line up before the paymaster, and solemnly touch the end of the pencil with which an accountant then signs their names.

In addition to the natives, Italians have shown themselves surprisingly cooperative. When an ATC base was being set up in one port of Mussolini's vanished empire, the men



International News

A Douglas Luxury Skymaster, Alias C-54 in Its Army War Paint, Disgorges Tons of Emergency Cargo at Chicago. Fifty fighting men with full gear are an easy load. A sister ship carried President Roosevelt on the overland leg of his Casablanca flight (page 58).



Mars's 200-foot Wings Support 35 of Her Builders and Shelter 215 at Martin's Camouflaged Plant in Baltimore

Mars was built to be a patrol bomber. Now she will haul cargo. The Navy's Air Transport Service, like the Army's, is undergoing tremendous expansion.



John T. Smith

Bound for Alaska, a Curtiss Commando Pauses in Canada—"Dumbo," as Pilots Call Her, Wears Army Star and ATC Insignia

This colossus of twin-engine transports can easily ferry equipment the length of the Aleutians—direct route to Japan.





U. S. Army Air Forces. Official

### Army Nurse and Medical Officer Aid the Wounded in a Flying Ambulance

Three tiers of bunks can be removed quickly for medical cargo destined for field hospitals. Members of ATC's Air Evacuation Group pilot this C-47.

were under a severe handicap because of the lack of proper tools. They had to improvise makeshift substitutes and even make such essential articles as screw drivers because there were not enough to go around.

When Italian prisoners of war, doing non-military work near the base, learned of the trouble, it vanished almost overnight.

There had been an Italian airport a few miles away, and when its capture was imminent, earlier in the war, the airport personnel buried all tools and service equipment to keep them from falling into the hands of the British victors, toward whom they felt very bitter.

With the Americans, it was a different story. If they needed the tools, they could have them. A digging party regained the buried treasure, and the tool problem was solved.

Each Wing has its own particular brand of bad weather.

The Arctic has its fierce gales and treacherous mists which merge expanses of ice and sky in a hazardous haze. Tricky, tropical

thunderstorms are the menace in the South Atlantic Wing, and over the South Atlantic itself lightning has been known to burn holes in wings and fuselages.

Then there are the sandstorms of the Sahara, which can fill the air with a heavy yellow fog and obscure the sun.

But bad weather, so frequently the enemy of ATC, has sometimes proved a friend in disguise. Last summer a big plane was returning to the United States over an Arctic route. Head winds had cut the fuel supply, and when the plane neared the regular base the pilot received radio word that the weather there had closed in.

Following orders, he proceeded to another regular base several hundred miles to the north. By the time he reached that area, however, the weather had closed in there, too, making a landing impossible. He contacted the first base to report his predicament, and was told to return, for the weather had lifted and he could bring the ship in.



#### Ignition Harness, a Spiderweb of Tubes, Is American Airlines' Lesson for the Army

Though they wear civilian work clothes, these students at La Guardia Field, New York, are Army Air Forces men. The conduit of wires conducts electric current from magneto to spark plugs. The "necklace" is strung with metal clamps. Commercial airlines, in addition to turning over hundreds of planes to the Army, have placed their training schools at ATC's disposal.

On the way back, however, it became apparent that the gas supply was not equal to the flight, so an emergency landing would have to be made. Every member of the crew strained his eyes to spy a reasonably level stretch on the jagged, uneven glacier below them, but all they could see was the worst sort of landing terrain.

At virtually the last minute, however, the pilot spotted a well-nigh perfect landing place on a finger of land along the seacoast, and the plane came down safely. Close inspection showed the emergency field ideal as a base point. It was sheltered by neighboring heights from high winds. It had a deep anchorage and there was a fresh mountain lake near by. The marvel was a 6,000-foot runway, with a firm, snowfree surface of crushed rock which the seas had ground up centuries before.

The plane crew lived at this natural airport for four days, subsisting on fried onions,

grapefruit, and kippered herrings (the last item on the menu making everyone ill), until a patrol boat arrived with the gas to fly the plane out.

#### Flying Will Help Map Makers

This spot has since become an alternate airfield, and a major mystery is how it was overlooked in the extensive exploratory surveys made of the region. Many pilots consider it superior in many ways to the regular bases it lies between, and these had to be laboriously constructed on rough, forbidding terrain. Many parts of the world will be geographically better known and better mapped after the war, because of such incidents.

An important secondary phase of ATC operation has been the ferrying of military, diplomatic, and other government personnel to all quarters of the globe. Joseph Stalin is the only one of the United Nations' "Big



Arson

### A Spare Motor, Desperately Needed, Is Loaded in Iraq for Quick Delivery in Egypt

When Rommel had the British backed up to the gates of Alexandria, they sent an SOS for ammunition and vital supplies, which ships would take five months to bring. The Air Transport Command filled their need in less than a week (page 57).

Four" who has not ridden in an ATC plane.

President Roosevelt traveled ATC on some of the legs of his flight to and from the Casablanca Conference (page 58). An ATC pilot was at the controls when Prime Minister Churchill went to Moscow for his August, 1942, conference at the Kremlin. And ATC brought Generalissimo Chiang Kai-shek to India not long ago for talks with United States and British military leaders.

The first ATC flight to Moscow was in September, 1941, when two B-24's carried W. Averell Harriman and his mission there for the series of conferences with Stalin and other Soviet leaders on Lend-Lease supplies. The flight seemed to impress the Russians, for they feted the flight crews with a breakfast of champagne, caviar, Crimean wine, fish, bread and butter, and tomato and onion salad. Then the Americans were asked if they would like some steak!

This particular trip logged some 24,000

miles before Harriman was flown back to the United States, over an undisclosed route, six weeks later.

### Doolittle's Ride Out of China

An Associated Press dispatch told how Maj. Gen. James A. Doolittle rode out of China after his Tokyo raid leaning against the door of a 21-seat plane loaded with 77 persons.

Capt. Moon Chin, veteran Pan American flyer with the China National Aviation Corporation, was the pilot of the Douglas DC-3, which took off on a routine flight from Chungking for India with a normal complement of passengers, including General Doolittle, the Pan American Airways System reported.

Captain Moon, who knew nothing of the Tokyo raid at the time, later described General Doolittle as an unshaven officer wearing torn clothing and carrying a bundle which he never released.

South of Chungking, Captain Moon re-



John Trevillian

### Cargo Has Seating Priority over Passengers on an Alaska-bound Commando

The spare motor wears a transparent dust-proof cover. Two hundred planes like this monster could whisk 10,000 fighting men to England in a day.

ceived a radio message stating the Japs were closing in on Mich'na [Myitkyina], last holding base in Burma, and advising him to depart from his course to pick up the refugees there. He headed for Mich'na. General Doolittle, who was checking the course, noted his probable destination.

On a piece of wrapping paper General Doolittle scribbled and sent forward to Captain Moon the message: "In Chungking this morning American Ambassador told me that the Japs were certain to be in Mich'na before nightfall."

General Doolittle was concerned, because, he told the stewardess, tapping his bundle, he had an important report he had to get to Washington.

Captain Moon landed at the Mich'na airport where 5,000 refugees were crowded. The rattle of rifle and machine-gun fire could be heard over a near-by hill. Refugees crowded in until there were 50 aboard, when General Doolittle shouted to Captain Moon:

"I hope the hell you know what you're doing!"

Captain Moon yelled back that it was not too great an overload, adding:

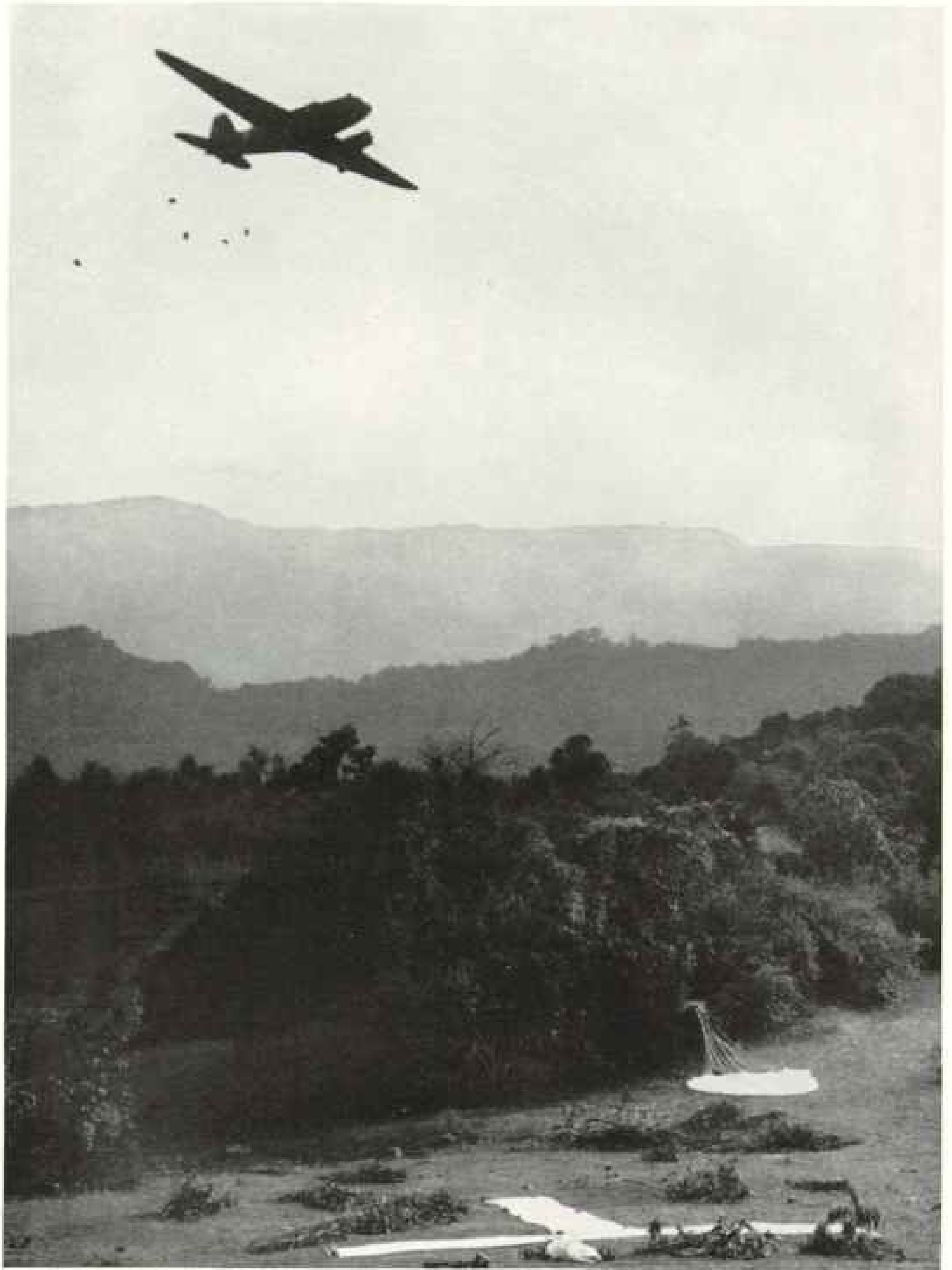
"There is a war going on over here. You do lots of things you wouldn't do at home—when you have to."

General Doolittle gripped his bundle tighter and didn't reply. When 60 persons were aboard, Captain Moon ordered the outside door locked and asked General Doolittle to lean against the cockpit door and keep it closed.

The last he said he heard from General Doolittle was the cryptic statement: "I think I would rather have gone back the way I came."

When the plane landed at Calcutta it was discovered 12 other persons had smuggled themselves in, making a total of 72.

But the vast majority of ATC passengers are not "big names"; yet at times they are important to the immediate prosecution of the



**"T" Is for Target, but the Bombs Are Bundles of Food for a Lonely Army Post**  
Triply bagged to prevent spilling, five packages rain from the plane. A "near miss" lies beside the bull's-eye. The parachuted load has floated close to the mark.

ARMY



U. S. Army Photo Corps, Official.

### Soldiers and a Civilian Unload a Big Tire and Flyers' Oxygen Tanks in Alaska

Years ago Brig. Gen. William Mitchell envisioned Alaska as the key to aerial dominance of the Pacific. Homeward this way came Wendell Wilkie on his trip around the globe.

war effort. Shortly before Easter, an admiral had to give up his seat on a transport to an Army sergeant, because there was quicker and more urgent need for the Army noncom where he was going than there was for the admiral. So the admiral graciously took the next plane.

#### Inventing a Sand Shield

There was never any question about top priority for the expert rushed from an aviation plant in the United States to Libya. Here fighter planes were operating inefficiently because of sand sifting into parts of their mechanism. After studying the problem, the expert designed a sand shield, a device that did not exist before. Two weeks after the first hurry call about the trouble, ATC delivered 2,000 of the new appliances at the front.

Despite their far travels and cosmopolitan careers, the life of ATC flight crews may seem to lack the élan and glamour associated with bomber and fighter airmen. However, many of the crews have been in equally tough spots,

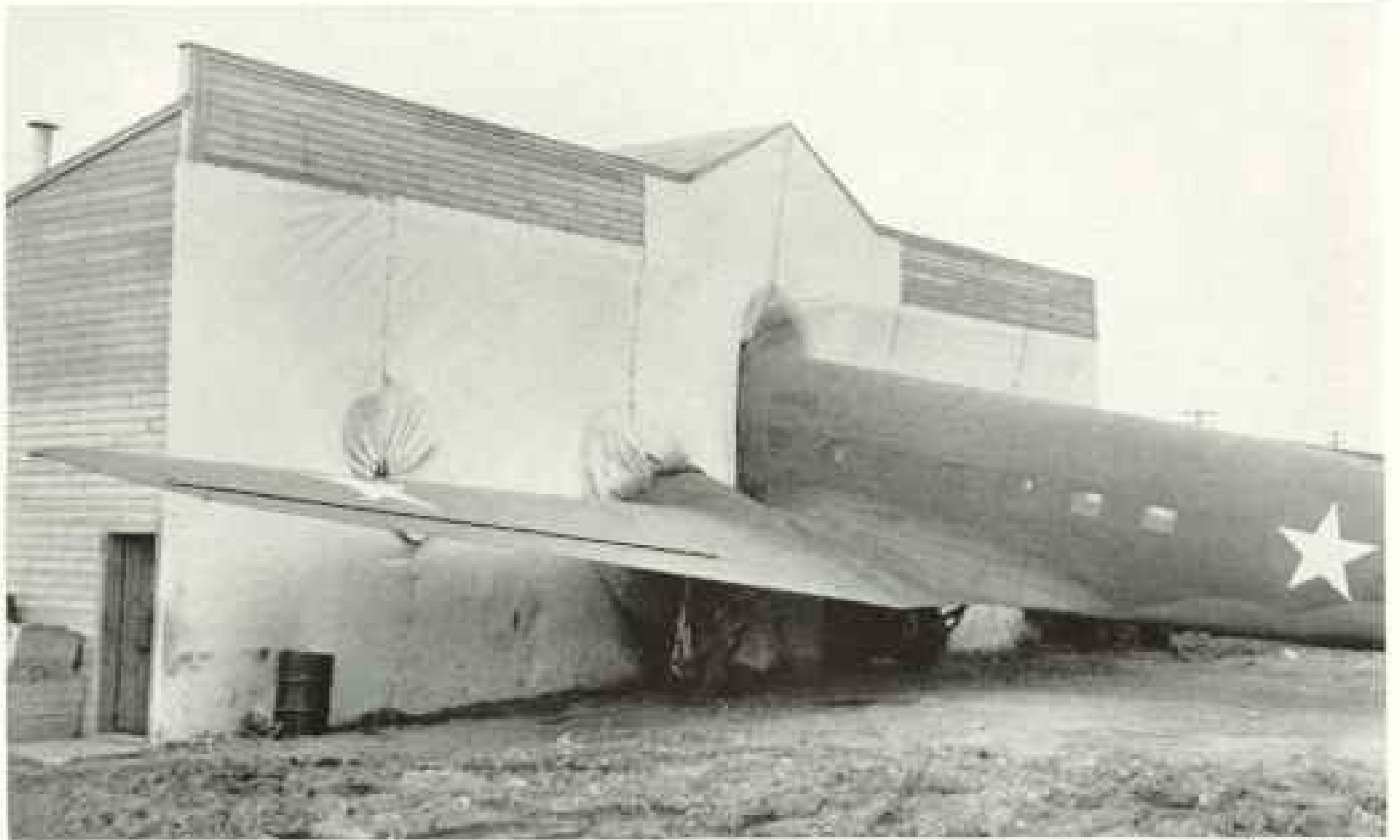
and without the guns to fight back. They've had to dodge long-ranging Nazi planes on the North Atlantic run, and in the South Atlantic they have encountered antiaircraft fire from lurking submarines.

In the Pacific there is the Japanese menace. Moreover, there is always the possibility at some Pacific bases of hit-and-run nocturnal shelling by Japanese submarines.

Even after Bataan fell, transport planes made two perilous trips to the Philippines. They ferried in medicines and other essential supplies, and brought out 25 key personnel the first trip, 37 the second, packing the passengers into the plane like sardines.

They were busy hauling supplies into Java until the bastion of the Netherlands Indies crumbled under Japanese impact. There had been many close calls the days before, when they brought unarmed transport ships through skies where the enemy was supreme.

Again, when disaster became inevitable in Burma a year ago, the prosaic transport planes



John Woodman

### An Army Plane Sticks a Frostbitten Nose into a Heated Hangar for Repairs

At least one motor is thrust through the canvas front of this makeshift shop in Canada. A vacant porthole awaits a four-motor job. Here at 40 degrees below zero, human hands stick to steel, and some synthetic rubber hose shatters like glass.

were called on. In a few days the crews flew out a total of 4,228 persons—casualties and civilians, who might otherwise now be in Japanese prison camps. And the flights were over many miles of mountainous jungles.

A year ago the aerial work horses that were available for such tasks as these were few. Most likely they were ships diverted from domestic United States airlines—big Douglas planes hurriedly stripped of their peacetime chromium and comfortable seats for a grimmer job.

#### Commercial Airlines Pioneered

Today the rapidly expanding fleet of cargo planes ranges from 6-ton Lockheed Lode-stars (C-60's), 12-ton Douglas C-47's (the counterpart of peacetime DC-3's), and the 26-ton four-engined Douglas C-54's (the equivalent of the DC-4's) to twin-engined 25-ton Curtiss C-46 Commandos and 28-ton Consolidated C-87's—the transport twin of the B-24 Liberator heavy bomber.

In building and expanding the Air Transport Command, the Army had at the outset a tremendous advantage in the wealth of experience and trained personnel it could command from the Nation's commercial airlines, both those operating domestic runs and those with service to South America and Europe. In-

deed, besides its own fleet of Army aircraft, ATC has planes of every commercial airline under charter today, and commercial pilots fly the various routes just as ATC pilots do.

General George, the Command's head, is known as one of the Army's best organizers and as an extremely air-minded officer. It is not strange, therefore, that many of the key positions in ATC are filled with officers who in civilian life helped run the Nation's airlines.

General George's Chief of Staff is Brigadier General C. R. Smith, former president of American Airlines. Other top men are Col. Harold R. Harris, former Pan American-Grace Airways executive; Col. Ray W. Ireland, peacetime traffic manager for United Air Lines; Col. Lawrence G. Fritz, who was TWA's operations chief, and Col. Robert J. Smith, previously executive vice president of Braniff Airways.

General Smith believes that the tremendous aerial expansion under war's relentless pressure has put aviation ahead at least a generation, not only in the far-flung extension of routes and bases, but in technical developments of incalculable value in peace.

So the day may not be too remote when the routes now burdened with war supplies and planes will be carrying American travelers to all parts of a much smaller world.

# Aboard a Blimp Hunting U-boats

A Day above the Atlantic Reveals Navy Talk and Navy Ways,  
Creeping Convoys, and Torpedoed Wrecks

BY MASON SUTHERLAND

FROM one of the Navy's ocean-going training blimps, I watched the Battle of the Western Atlantic for a day. The ride was made up and down the New Jersey coast and many miles to sea.

Our ship sighted two wrecks, three convoys, two other blimps, and Navy and Army warplanes. But we saw no submarines.

Airships, planes, and warships, operating in unison, had driven Hitler's undersea boats out of their once happy hunting ground. Lighter-than-air ships, once regarded as the "folly of fanatics," had proved their ability after years of controversy (page 92).

At the U. S. Naval Air Station, Lakehurst, New Jersey, we got word that our ship was waiting. First out of the 200-foot-high hangar came the mooring mast, towed by a tractor. Next appeared the 250-foot silver envelope, a ground crew holding her lines. She was "heavy"—too heavy for her 416,000 cubic feet of noninflammable helium to lift—but her engines would carry the excess weight.

Going aboard, we met pilot and co-pilot, both ensigns; three cadets, future officers out to finish their seven-month course; and three petty officers manning engines and instruments. Counting National Geographic staff photographer Willard R. Culver and myself, ten men were aboard.

The cabin—"longer than a Greyhound bus," as one crewman said—was not unlike an air liner's. On one side of the aisle were lounge seats. On the rear half of the other side was a long settee facing the interior; it was my choice. Other fixtures were instrument panel, radio equipment, mess table, pantry, and navigator's chart table.

Deep windows gave clear visibility in any direction. Up forward in a semienclosed compartment sat pilot and co-pilot.

Now the 550-horsepower engines roared, the ground crew cast off the lines, and we taxied down the field like an airplane. I looked at my watch.

## A Landlubber's Log of a Day in a Blimp

9:30 a. m. We roar into the air at a 40-degree angle and I, lacking a side rest on the couch, sway and clutch for support. I was told that a favorite trick of peacetime lighter-than-air men is to take airplane pilots

up at a steep angle and, 100 feet above ground, kill the motors. Heavier-than-air guests turn pale; such a stall in a plane may mean death. But a blimp continues its climb.

The ship levels off at 500 feet. Our shadow, a fat, black cigar, zips across the scrub oaks. As our motors are throttled down, toy automobiles pace the shadow at their 35-mile-an-hour limit.

Weaving overhead, rudder and elevator cables from pilots' wheels remind us of carrier wires that festooned ceilings of old-fashioned department stores. A sound strangely familiar is the pilot's signal to the mechanic as he rings a bell like the old-time trolley conductor's "go-ahead" to the motorman.

## Food Containers Tied to Table

There is a clatter amidships, and from the opened pantry spill cans of milk, jars of jelly and peanut butter. An enlisted man, already preparing lunch, ties a string of food containers to the mess table.

"Comfortable?" asks our skipper, who has turned over the piloting to another (page 82). "Sorry, but no smoking," he says to the offer of a cigarette.

Just one of his 23 years has been in the Navy. He is from Brooklyn—"the Dodgers, you know." Showing us to the pilots' doorless compartment, he explains their duties.

Like the buoyant submarine which she stalks, the blimp has two directional controls. One, running to the elevator, drives the ship up or down. The other, to the rudder, steers us to port or starboard.

The pilot, using feet as well as hands, may operate both controls. But the effort is fatiguing, and the Navy encourages him to let the co-pilot handle the rudder.

The ship responds as smoothly as an automobile, but winds, nagging the envelope, incessantly drive it off course. An air bubble, a gadget like that in a carpenter's level, keeps a fog-bound pilot on even keel.

"You'll have to put on these." The skipper hands us a pair of yellow life jackets, a sea-going blimp's equivalent of a surface liner's life belts. They are inflatable by lung power, or, in event of sudden crash, by carbon-dioxide cartridges in the linings. This is the same kind of gas bullet which aerates a soda siphon.

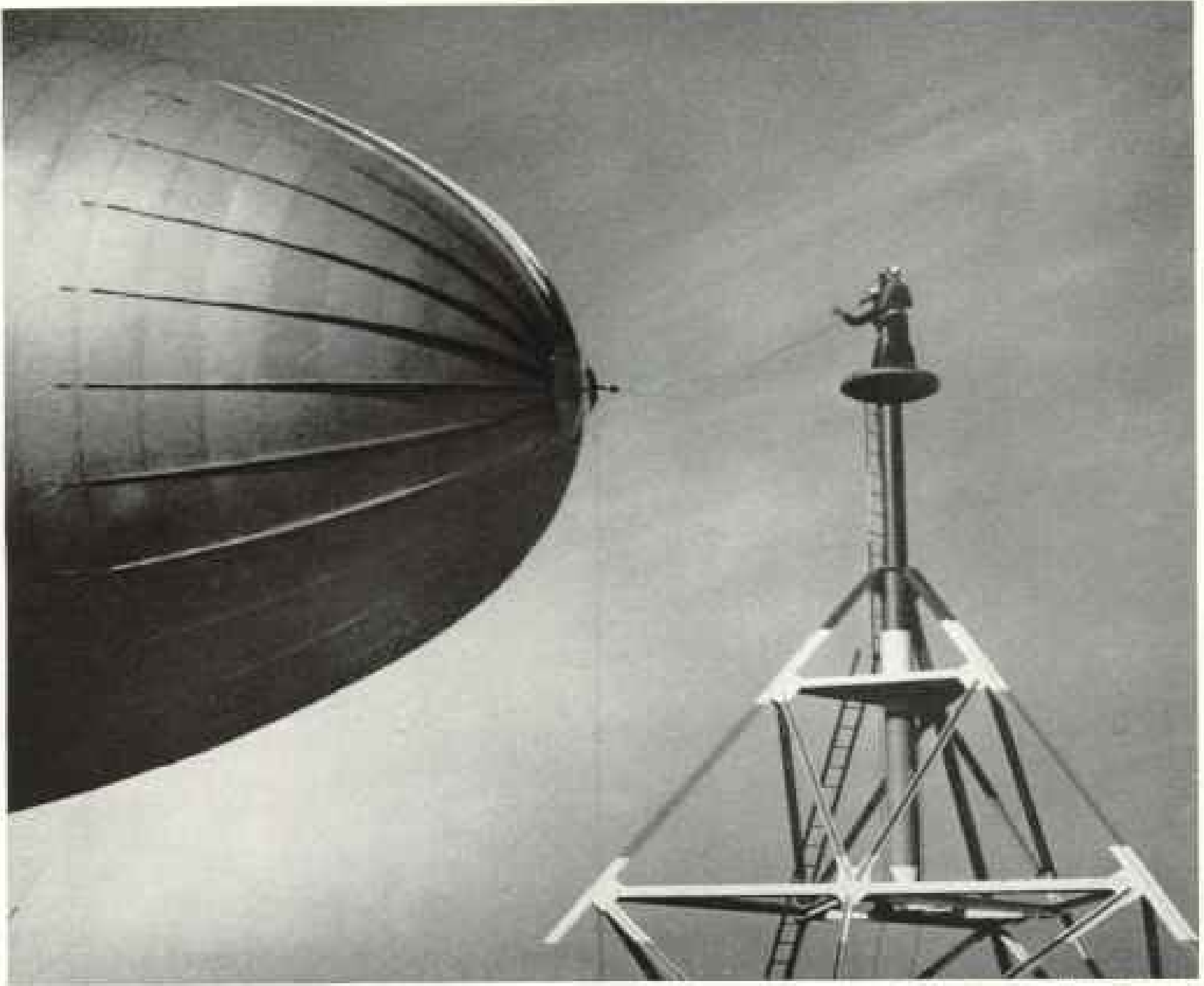




Prof. Photographer Willard R. Carter

### When a Blimp Climbs Steeply into the Sky, There Is No Fear of a Fall

This Lakehurst training ship, using no mooring mast, has just been eased aloft from the shoulders of the "cat party," now scattering. Cadets join enlisted men at the lines, here hanging limp, to "learn the ropes." The white flag is a weather vane to give wind direction to the pilots. The figure in the windbreaker and light trousers is a chief petty officer noted for his ominous voice (page 91). The taxi wheel beneath the cabin allows the blimp to swing with the wind from the mooring mast like a ship at anchor.



Staff Photographer Willard B. Curtis

### A Mobile Mooring Mast Tames a Bucking Bronco of the Air

This handy, squat steel "anchor," developed by the Navy at Lakehurst, has eliminated danger of the ship's blowing away from her ground crew. Mast crew here releases the mooring cable of the ship carrying NATIONAL GEOGRAPHIC men for a day at sea. On mooring, a winch draws the bow snug against the mast.

"Are these 'Mae Wests'?" I ask, pointing to the jackets.

"In the R.A.F. but not in the Navy," the skipper replies.

As for professional cant, there is little or none in this service. Generally it is "just plain Navy talk." Headline writers to the contrary, our ship is not a "rubber cow" or an "air scow."

Goodyear airship men, of whom there are several at Lakehurst, have had to learn "bow" and "stern," "port" and "starboard." Where a Goodyear veteran once ordered, "Pull on that left nose line," he now snaps, "Take a strain on the port bowline!"

9:50. Now we are passing over the surf. Breakers, viewed from our lofty perch, do not seem real; they are tiny ridges of white oil smeared on a painter's canvas.

A cadet, the day's first lookout, unstraps binoculars and goes to the windowed bay between the pilots. His task is to look for mines,

torpedo survivors, suspicious string of bubbles, or feather spray left by a periscope; to peer into the deep if possible. The ocean appears so roiled, however, that he probably could not spot a submerged ship. Under ideal conditions, a submarine may be seen in more than 90 feet of water.

The navigator, having plotted our course on his chart, calls attention to the hangar, dwindling in the distance.

"On a clear day the old barn is a tremendous landmark far out to sea," he says.

In reply to the question, "How far now?" he measures with calipers the map distance from Lakehurst. "Twenty miles."

Hourly the navigator gets a fresh problem: to calculate the minute the ship will arrive over a predetermined spot (page 88). An error of four or five minutes is not considered bad for a cadet.

"We can't get our position from sun or stars," says the navigator, "because the gas



Staff Photographer Willard H. Fisher

"This Will Be the Day," the Captain Prays, "We'll Bag a Sub!"

With binoculars, the skipper searches the sea for suspicious rubbish and for a feather of white that might be a periscope moving against the whitecaps. In front is part of the instrument panel; overhead, the helium envelope,

bag generally hides them. So we use dead reckoning and the radio direction finder. We can tune in on Kate Smith or the Toothpaste Hour and get our position."

If in doubt about our speed, the navigator has only to clock the time it takes for our 250-foot shadow to pass over a whitecap, from bow to stern.

10:20. A lone tanker swings into view. "Want a closer look?" asks the skipper, passing the glasses. By her flag she is a United Nations ship.

#### The Steel Dead Lie Half Buried

Near Barnegat buoy, a dancing blob of red, I catch my first glimpse of war. A tanker, nose strangled in mud, stands stern up above

the swells. Once the pride of an oil fleet, now she is a gaunt, rusting scarecrow, murdered by a U-boat. A quarter-mile away a black smokestack rises above the crests like the periscope of the sub that shot her hulk to the bottom. A gull circles the stack lazily.

10:50. Patrol blimps ahead, our sister K-ships! One is turning home, the other going on duty. Beneath them coastwise vessels plod south.

They are dreary gray and black burden bearers whose crews gallantly share the danger and monotony but none of war's small ration of glamour.

Like shepherd dogs guarding their flock, the escort craft keep pace. One seems to be a corvette, another a Coast Guard cutter. The small patrol ships may be converted yachts, not long ago the playthings of millionaires. We follow the convoy south.

Outrunning her puffing charges, the remaining blimp ziggzags and circles, investigates

every suspicious bit of rubbish for a camouflaged periscope. Motors idling, she can head into the wind, slow down to a standstill, and bomb a submarine from a stationary platform.

Or, if a distant submersible sticks its neck above the surface, the blimp can speed to it up to 67 knots.

She carries submarine-detection devices and her radio can summon help if need be. Off this coast, where there are no Messerschmitts or Zeros, she fears only the deck guns of her prey. She could take perhaps a dozen machine-gun bullets and limp home.

Two Navy scout planes are handicapped in their hunt by their speed. Unlike the airship, they cannot hover like a hummingbird or drift

like a gull. Their life depends upon their motors. If ours fail, our ship becomes a free balloon, with pilots trained to manage one. Fog may keep planes ashore, but pea soup is duck soup to us. We could switch off our motors and drift in fog for days, the radio sending our bearings.

Clouds, which have created spotty photographic conditions, lift a trifle, and Mr. Culver decides to try for pictures of the convoy (page 86). He asks the skipper to edge closer.

"Can't do," replies the latter. "Though we carry bombs and guns, our orders are not to step across a 500-yard limit surrounding the convoy. If we do, they have the right to challenge, then to shoot us."

But our captain, obliging within bounds of duty, writes the message: "We have official permission to take pictures of convoy and you." The radioman flashes the sentence to the other blimp over an electric lamp blinked through a window.

The reply, likewise blinked, says: "Carry on." But the photographer is unable to catch the K-ship hovering over her charges in a course parallel to theirs. So we send another message: "Will you hover over convoy each time you pass south?"

#### Blinkers Flash Insults, Polite and Otherwise

Somehow in our eagerness for a close-up we have trespassed the 500-yard radius. When the blimp's reply dot-dashes in, it reads, "Are you the training ship?"

The enlisted man is manifestly amazed as he writes out the message and hands it to the captain.

The latter explains, "Certainly he knows



U. S. Navy Official

#### He Listens as He Cooks Navy Beans in a Navy Airship

Like the housewife busy at both roast and radio, "Sparks" stirs the meal on an electric stove while keeping ears alert for wireless signals. Blimp crews have many of the comforts of home, and how they do eat! Beans are a winter ration. Note heavy garments.

we're the training ship! He's just being sarcastic. What he means is: 'Keep your distance, Mister.' He is not going to be very obliging. If he should get off position for our sake and a sub should sink one of his ships, it would be his neck."

Meanwhile a cutter, swinging close, has blinked an insult less subtle. We missed a part of it, but the whole might have read, decoded: "\*\*\*\*\* # # #XXX!!!!"

12 noon (mealtime). The odor of coffee fills the cabin. An electric percolator, securely fastened, is spouting merrily. The radio operator—"Sparks" above sea as well as on it—is scrambling eggs on the hot plate; he is wearing earphones lest he miss a signal.



International News

### An American Submarine Teaches a Blimp the Tricks of Hitler's U-boats

One of the airship's motors, suspended from an outrigger, hangs over U. S. S. *Triton* during a 1941 cruise off New Jersey. Today the submarine would scarcely dare to show herself in these waters lest she be bombed. Wartime blimps and surface craft shoot first and ask questions afterward (pages 92, 95).

Loaves of bread, a half-pound of butter, and jars of sweets lie before him. But the eye-catcher is a three-pound joint of cold roast beef. Sliced and sizzled in the hot plate, it is eaten quickly, for appetites flourish in the high sea air. Officers ashore, by the way, say, "Enlisted men feed better than we do. Chicken and steaks, while we get stew."

1:00 p. m. Navy planes ahead, putting on a burst of speed, are skimming low. Tension mounting, we race to follow them. The pilot calls for a smoke bomb, useful in marking a target area. His hand itches for the depth-bomb release.

Then, following the planes, we glide down the trail of a long, narrow oil smear. But presently the pilot, grinning, turns the ship away and remarks: "Same old oil slick. Buried down there is a torpedoed ship oozing oil. But they (pointing to the planes) don't know it yet."

#### Convoys That Pass in the Afternoon

Army, Navy, and Coast Guard planes, like the blimps, investigate every barrel, every crate, every oil smear for signs of an enemy. Together with surface craft, they sweep the sea clean.

We rejoin the southbound convoy and, before long, pass cargo ships heading north. They have an escort, one of which is identifiable by her White Ensign as a British Empire corvette.

2:40. "Want to see an Atlantic convoy?" Skipper hands over the binoculars. Twelve miles out is an inspiring sight.

Scores of ships are beating their way in. By now they have sighted safety. What perils have they braved? What losses have they suffered? As we speed away, they merge into the sea, becoming blue, rectangular humps on the horizon.

Sparks, having a moment off duty, is absorbed in a personal affair. The Battle of the Western Atlantic might be 10,000 miles away as he loses all touch with the monotonous search below.

Right, sailor, can this be war? Or is it make-believe?

Is the sea a colossal stage, with a rehearsal for our benefit? Doubts such as these I communicate to the skipper with the question, "Do you believe you will ever see action out here?"

"Yes," came the answer. "Every morning I say to myself, 'This will be the day. Today our lowly trainer will bag a sub, and we'll laugh in the teeth of the patrol blimps.'"

Sparks, a warship veteran with previous Lakehurst experience, has resumed work. I

ask if he prefers life with the Fleet. "Oh, no," he responds. "This is much better."

4:00. Skipper, bending to speak to the radioman, is warned by a whispered "Sh!" that a message is on the air. The gesture is eloquent of the informality between officers and men. I comment on it.

"That's right," says the captain. "We are in such close quarters, treading on one another's toes, that a strict show of discipline seems silly."

The co-pilot spins the yarn of a cadet's adventure with a bronze powder bomb aboard another blimp.

This bomb, used sometimes in place of the smoke bomb, scatters a shower of shiny metallic dust over an enemy's lurking place. It weighs little and is easy to grip. But the fumbling cadet dropped it in the cabin and its fragile shell broke apart. After the dust had settled, the crew resembled the bronzed "living statues" of a circus tableau.

A second story concerns a masterpiece of understatement in a pilot's log. "Sighted lifeboat containing seven survivors," he wrote. "Stood by until Coast Guard made rescue. Lowered sandwiches and coffee, for which they seemed pleased."

"Were they pleased?" Lakehurst chuckles. "They hadn't tasted coffee in weeks!"

#### Rolling Home to Lakehurst

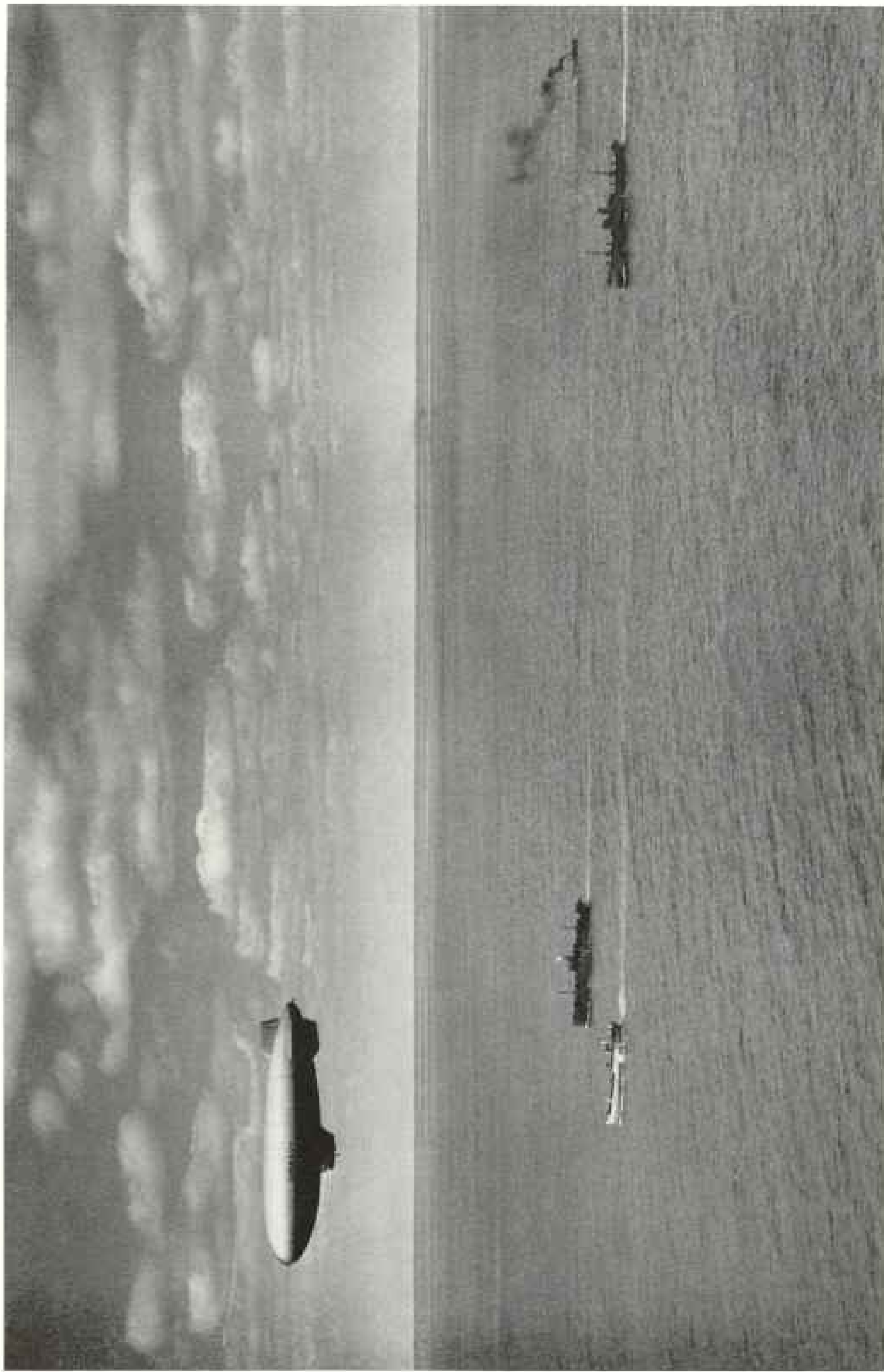
We leave the convoy. Atlantic City's towers appear and fade as we run north. Nearing home, the pilot orders, "Put the motors on full rich." An enlisted man replies, "Aye, aye, sir."

Now we are on a trial run around the field—bearing left as at a standard airport—to get the "feel of the wind." Coming to meet us is a landing party of 60 men, 20 being trainees out for practice. As permission to land has not been given, we circle again.

An enlisted man reports that we are still "heavy." Fuel consumption has not yet carried off excess weight. The ship, therefore, will be easy to nose down. If she were light, we might have to valve helium.

On finishing a third circle, we are ordered to land. The pilot cuts the motors and heads into the wind.

"Stand by the blower!" he shouts. "Open the starboard scoop all the way." He is referring to the small engine amidships which, when our main motors are off, pumps air to ballonets within the helium envelope. They maintain pressure, preventing the bag from collapsing. Unlike the skeletonized rigids, our envelope is a flabby cell, blown up like an inner tube.



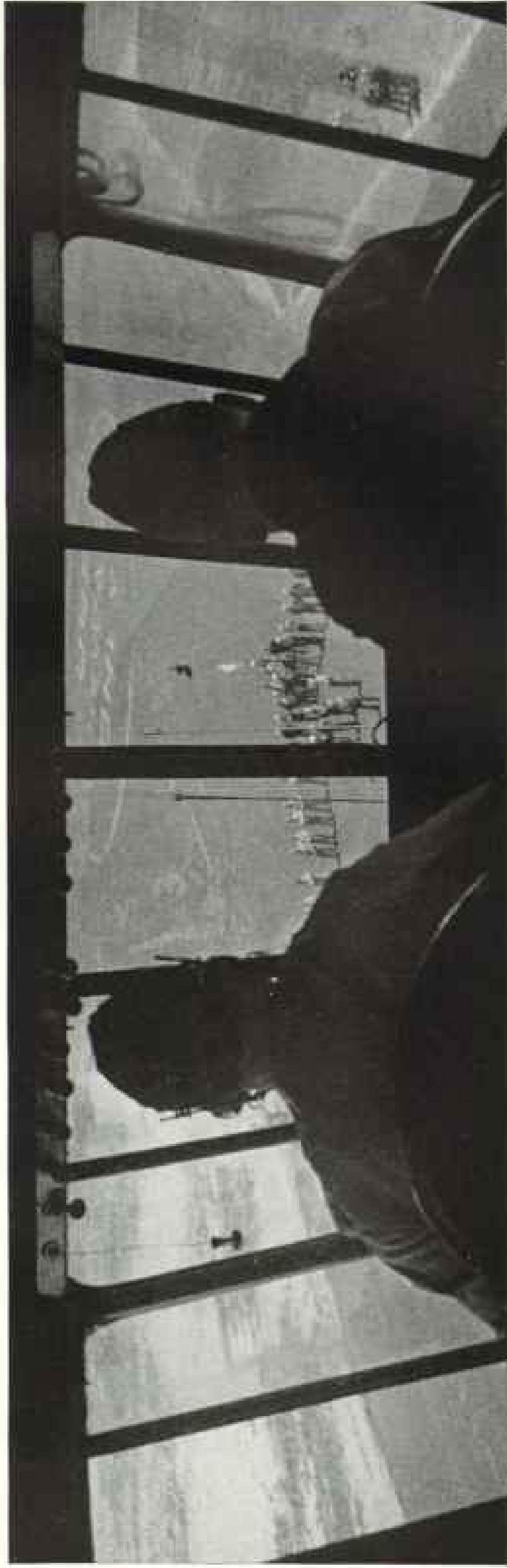
Staff Photographer William H. Carter

### Antidote for U-boats, a Silvery Sentinel Guards Her Flock of Drab Merchantmen in a Coastwise Convoy

Seen from the photographer's blimp, the convoy is proceeding at 10 knots, while the patrol airship hovers overhead. She circles and zigzags to protect her charges. New Jersey's shore line lies in the distance. A fifth cargo ship and four warcraft are just out of sight. When the photographer's blimp crossed a 500-yard limit to get this shot, blinker lights of the patrol craft flashed warnings telling her to keep her distance (page 63).



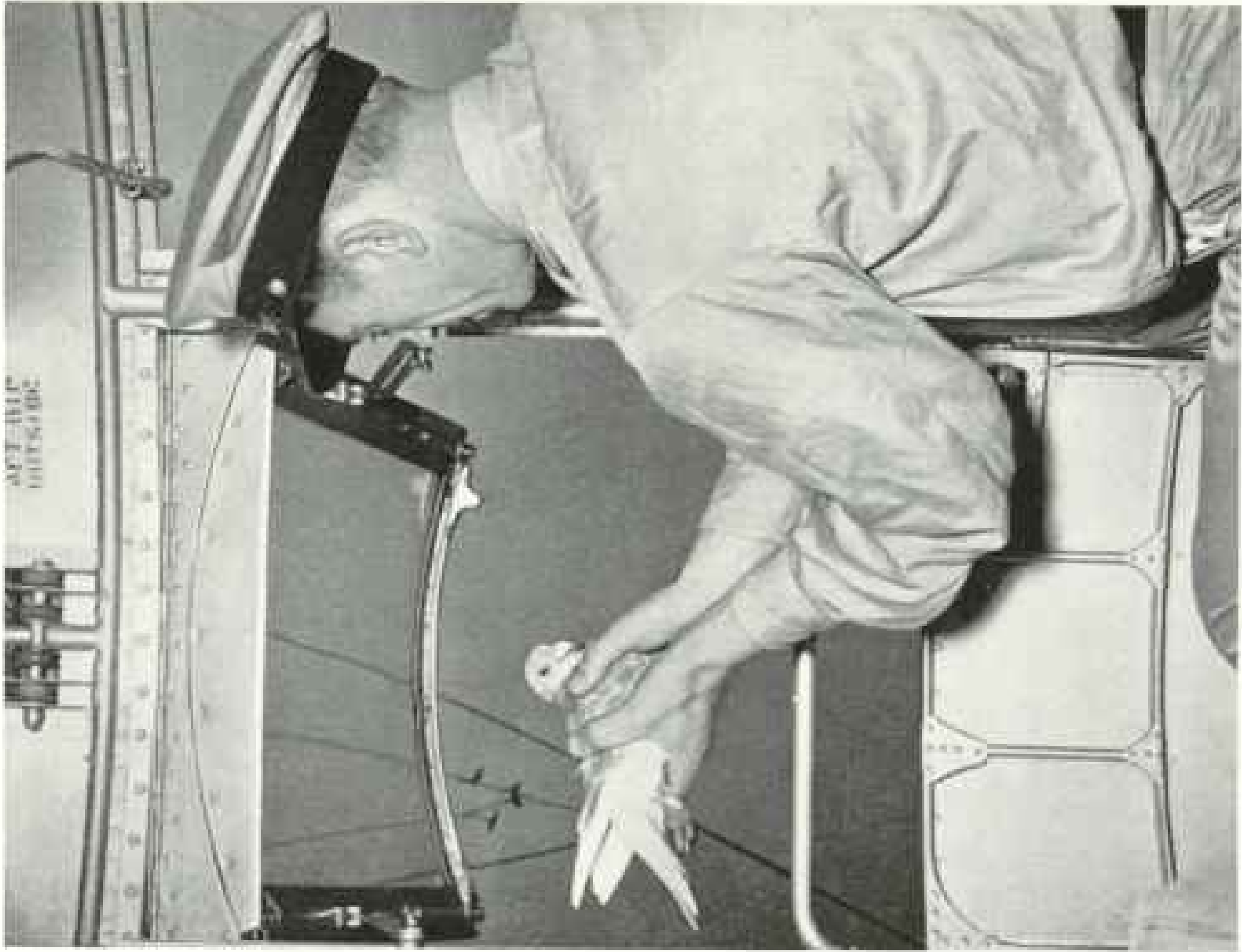
**Having Sighted a Suspicious Oil Smear, the Blimp "Lays an Egg"—a Cascade of Froth Marks the Spot Unable to carry as many depth bombs as a destroyer, an airship boards explosives. This ship, therefore, evidently had reason to use ammunition.**



**H. A. Sarr, (right)**

**Coming in to Land, Pilot and Co-pilot Head the Blimp for the Ground in a Gentle Glide As she approaches the landing party drawn up in a V, sailors will grab her dangling lines and pull her gently to earth (page 91).**





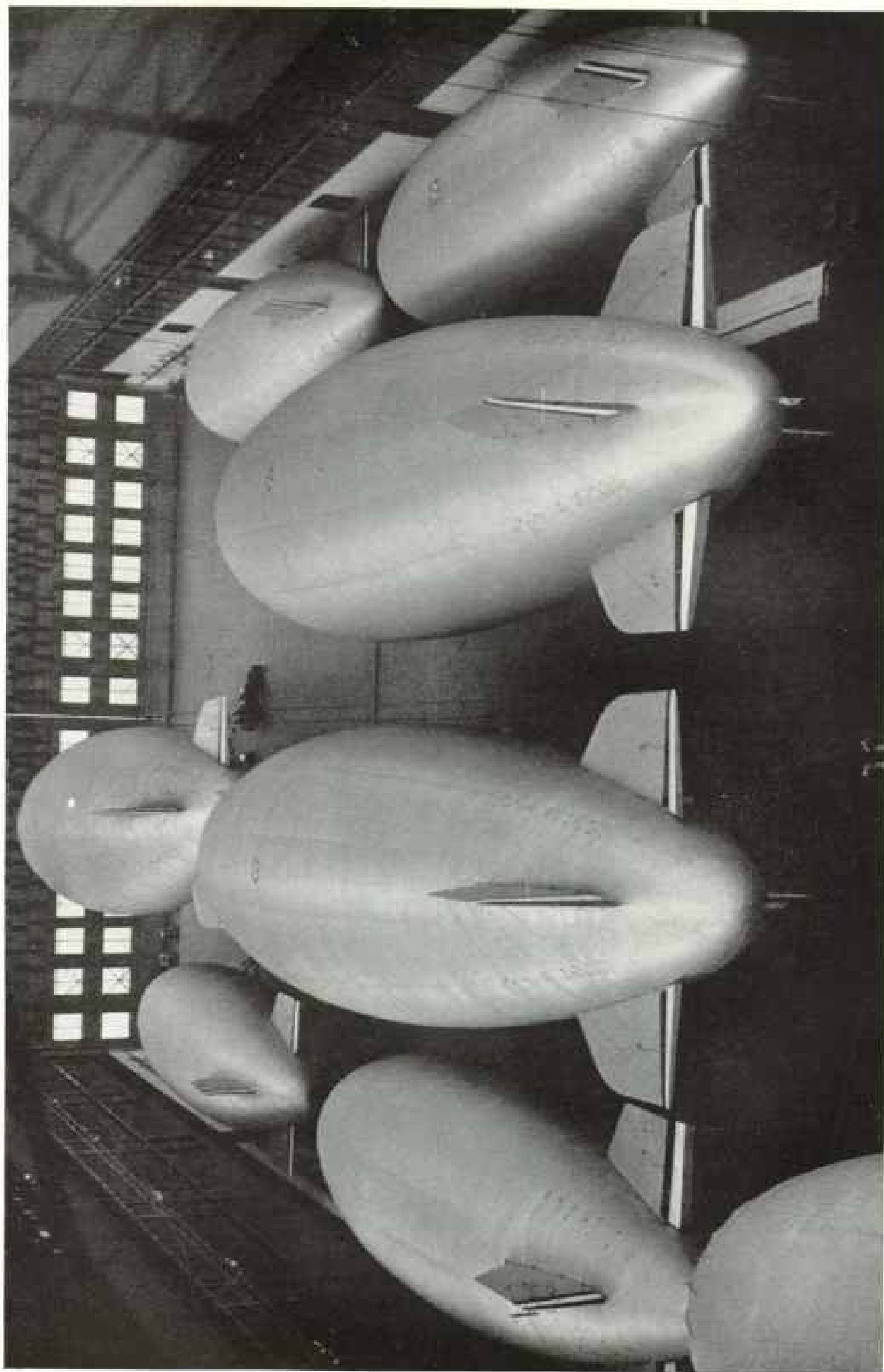
**Aron**  
**Mate and Nest Will Lure This Pigeon Home with a Message**

Each patrol airship takes along a crate of six birds. Four carry routine messages to the loft. Two are reserved for emergencies. Should ship and radio be disabled, they will direct rescue (page 96).



**Chief Plumbeiner Wilbur J., Cruise**  
**With Pencil, Calipers, and Chart, the Navigator Plots Our Course**

This cadet gets a fresh problem every hour calculating the minute the ship will be over a predetermined point (page 81). He wears the inflatable rubber life jacket which all hands must put on as the blimp goes to sea.



Walt Whitliff from Press Photo

### Giant Eggs in a Steel Basket, Eight Blimps Nest by Night in Lakehurst Hangar

In the morning the larger ships will go on sea patrol, while the smaller ones train cadets. Meanwhile, "homeless" ships outside may be riding mooring masts overnight. After disasters had eliminated peacetime rigids, the hangar lost its importance. Today it is bustling as never before (page 92).



Bobby Arnold

### Sailors on Ladders Lace a Blimp's Nose

Strain on the mooring ring, which must withstand tremendous wind tug, is distributed to all sides. Radiating lines from the bow are anchored to finger patches cemented on the envelope. These were named for their resemblance to outstretched strips or fingers fastened to the sides of old-style balloons. So as not to tear the skin, ladder tops are padded.

6:00. The landing party is drawn up in a V. We are driving into its open mouth. Prominent is a sailor bearing a white flag. The traditional token of surrender is here a weather vane to show wind direction (page 87).

Now, with everything in order, the skipper gives the controls to an understudy. We glide earthward, where a landing officer shouts, "Meet the ship!" Some seize the lines to hold us against the wind. Others—human ballast—hurl their weight on the cabin railing. A sailor rushes a ladder to the door.

Out steps the smiling apprentice pilot, expecting plaudits for his 4.0 landing (that's perfect in the Navy). But his ballooning ego deflates as the ground officer inquires, dryly, "What is the idea of gunning your motors, Mister? Do you know you came in at 15 knots? Did you ever grab a line at that speed?"

The ship, moored to her mast, is walked toward her hangar. Out come pipes and cigarettes. The Navy surrounds us, asking questions.

Did we have airsickness? You can get more on a merry-go-round. Any swaying, lurching, or yawing? You get more on a subway train. Cold? We didn't need our heating system, exhaust-operated. Danger? Yes, if you open a door and jump.

But hold on—our log has neglected a casualty. Mr. Culver, backing away to snap a scene amidships, has rammed the percolator, fortunately not head on. He not only made contact with hot metal; he turned the spigot. Boiling coffee ran down a leg.

On the following morning we watched landing operations from a ground crew's viewpoint. Five L-ships, trainers of 125,000 cubic feet pushed by two 145-horsepower motors, were circling the field in a three-mile loop. As each swooped down, the advance party seized the lines; then the car party put its weight on the cabin. No mooring mast was used. After a change of cadet crews, the ship was heaved into the air from the shoulders of the car party. Other cadets, joining enlisted men on the lines, were learning why it is better not to land at 15 knots!

#### A "Tough Cookie" Drills the L-ships

Drillmaster was a chief petty officer with "a stentorian voice that can be heard in seven counties. He is a tough cookie, our equivalent of an Army top sergeant."

The comment was made, with just a note of bitterness, by a commissioned officer whose desk adjoined the field. For hours without end he had unwillingly listened to Mr. Saw-on-Nails' ominous "Meet the ship!" "Another man on that line!" "Steady!" "Wake up over there! Watch me" (gesturing the while). "Slack that line!" and finally, "Up ship!"

Lakehurst will tell you the story of the soloing cadet caught by a windshift kicking up a gusty, 35-knot breeze. Only a veteran could land in such weather; and so a veteran took over the control-tower microphone and coached the pilot, step by step, to a safe landing.

Streaking occasionally across the grounds were men in blue or khaki riding "COMCATS," "EATS," or "OATS." Those were bicycles bearing signs standing for Communications, En-



Three L-ships

#### On Command, "Up Ship!" They'll Toss Her in the Air

Cadets and enlisted men (white hats) line the cabin railing as the co-pilot looks down. An airship may be balanced so delicately that a man can lift her with one hand. The rip cord, which can open the envelope for an emergency landing, hangs on the left side of the cabin.

listed Airship Training School, and Officers' Airship Training School.

Equally prevalent were motor scooters. They make some 70 miles to the gallon, their tanks' capacity. Lakehurst has enjoyed laughs at officers who, running out of gas at a far corner, have had to walk home.

#### "Boots" on Parade

On the drill fields, "boots" were on parade. Boots are raw rookies, so named possibly from their leggings, which no veteran wears. Boot camp, having nothing to do with lighter-than-air, is just an extra job that Lakehurst has taken on. Peering into a classroom, we saw cadets learning theoretical navigation and pi-



HARRY ARNOLD

### A Blimp Tester Holds a Lamp for a Sailor on the Inside Looking Out

If a thin spot has developed in the rubberized envelope, the "inside" man will detect it by observing light; otherwise, he remains in the dark. In this inspection the ship is blown up with air.

loting. There was the blackboard of childhood, but teacher was in uniform, ruler pointing to a chalk blimp.

Passing another room, we paused at the sight of the familiar sewing machine. This was the Parachute Matériel School, where sailors learn to sew chutes for the Navy, Marine Corps, and Coast Guard. Besides silk, there were bolts of other materials for experimental parachutes.

#### A Chute Packer's Exam, Final or Finis

In another room, sailors were packing parachutes on 60-foot tables. At the end of a 16-week course, they are taken up for a brief, but drastic, final examination. The candidate, strapped in a chute of his own packing, is told to jump. If the silk opens, he will pack chutes for others. Many make their first jump in this test.

In a corner of the field stood the balloon shed, but as the wind was blowing to sea that day no bags were up.

Dominating the field was the mammoth hangar to which the hydrogen-filled *Hindenburg* was heading when she burned. The former home of the 6,500,000-cubic-foot *Akron* can house a number of K-type non-rigids (page 89).

So great an expansion—details confidential—was going on that Lakehurst's commanding officer, Capt. W. E. Zimmerman, was a very busy man. I talked with him on the run between offices at his headquarters.

Like Lakehurst's famous Capt. Charles E. Rosendahl (now Rear Admiral), then on one of I.-t.-a. men's periodic tours of duty with the surface fleet, Captain Zimmerman is an air-ship veteran. I asked him how a stepchild of the air-service, buffeted by Congress and ridiculed by h.-t.-a. flyers, felt now that his talents were in such overwhelming demand.

"I wouldn't go so far as to say lighter-than-air was a stepchild," he replied, laughing. "We had tough days, but we felt confident. We knew the nonrigid's value all along. Now there is a cry for blimps and more blimps. We have suddenly become popular."

Relieving his chief of as many details as possible was the station's executive officer, Comdr. John D. Reppy. To him was put the question whether cadets were taught to recognize silhouettes of our own and the enemy's submarines.

"That's right, they are," he answered.

"Does a blimp commander, then, pause to determine the identity of any suspicious submarine?"



International News

**Rescue from the Air Can Be Made by an Airship at Sea**

The *J-4* illustrates a peacetime training feat. The crew cranks a windlass hoisting the rubber raft.



U. S. Navy, Official

**Jury Sail Set and Oars Boated, a Lifeboat Receives First Aid Dangling from a Blimp**

With hands outstretched, a ship's officer awaits the package. He and his companions, sailors from a torpedoed merchantman, were sighted in April, 1942, by Army planes. Flyers notified the patrolling blimp, which stood by until a Coast Guard rescue ship arrived. The package contains food, water, medicine, and cigarettes. It is buoyant and waterproof.



U. S. Navy Official

### Crossing Barnegat Inlet, a Patrol Blimp Convoys Two Training Ships Out to Sea

Barnegat City, a Swedish fishing village of medieval charm, lies just across the narrows. Barnegat Lighthouse, a 175-foot tower painted red on top and white below, has been extinguished for the duration. Long Beach, a ribbon of sand, divides the Atlantic from Barnegat Bay not far from Lakehurst.

"No, indeed! He goes in and blasts. Our submarines have no business off these shores. If one has to make the run, she must do it fully submerged or under escort."

Lakehurst's officers, having waited a good part of their lives for this moment, are not allowed by Navy regulations to discuss results of contact with the enemy.

But one officer remarked: "You can say that analysis of the latest sinkings shows the subs have been driven into waters where there are no blimps. We believe we have had a large part in bringing that about. We have been complimented by the Nazi radio itself on two occasions. While broadcasting excuses for U-boat failures, it has spoken of the airship patrol off our shores."

At Lakehurst, memory was refreshed on an almost-forgotten chapter of the last war. Twenty-five years ago the Kaiser's U-boats appeared off the east coast, destroyed a hundred ships, laid mines that sank the cruiser

*San Diego* and crippled the battleship *Minnesota*.

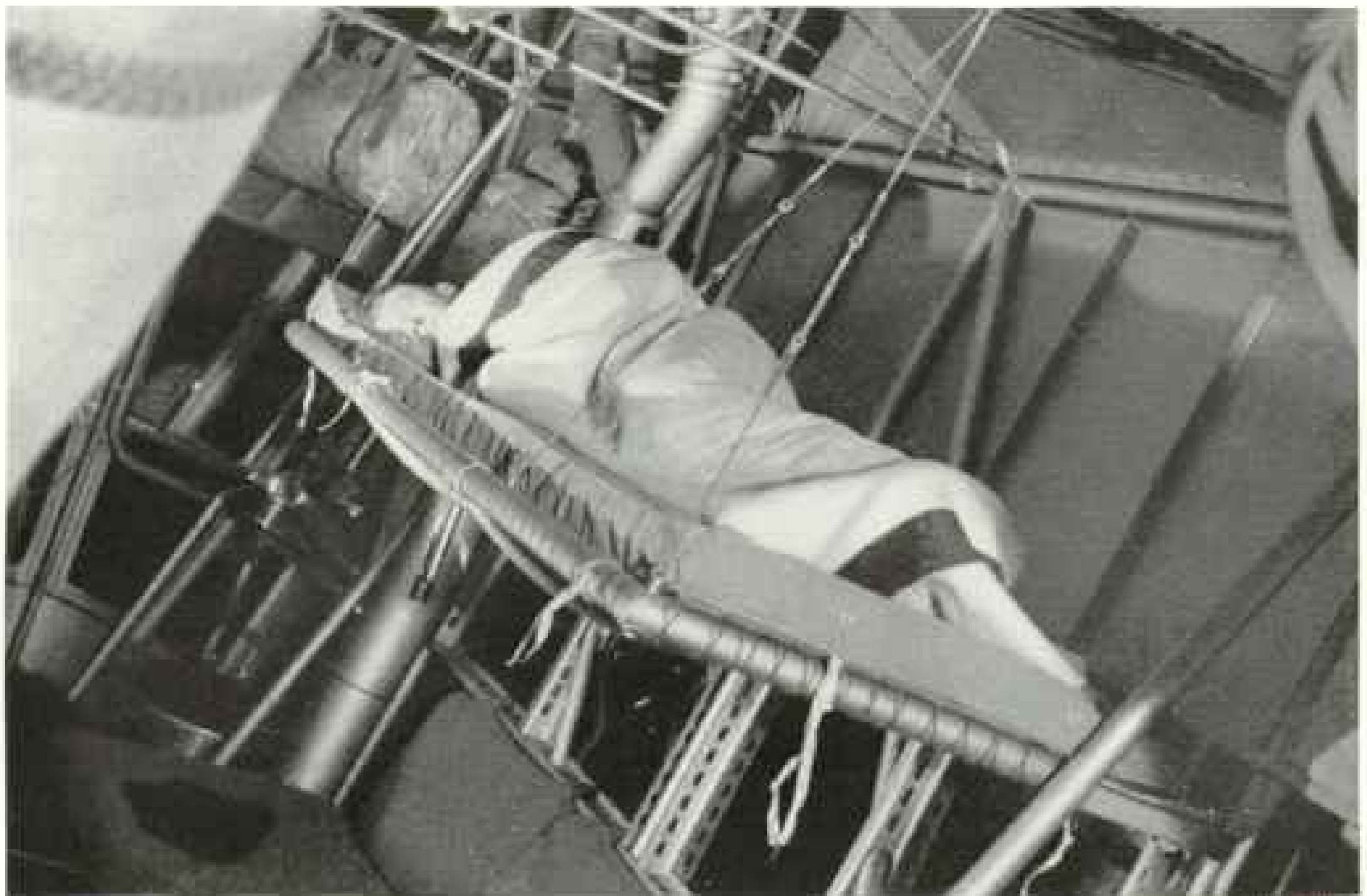
On the other side of the Atlantic, nonrigids served the British well. They received credit for sinking 27 submarines and safely protecting every one of thousands of ships convoyed. In this war, British blimps do not operate because of the wider range of hostile planes.

### British Gave the Blimp Its Name

The British, by the way, gave the blimp its name. Experimenting with a B-type "limp," as they called the nonrigid, they ran the syllables together, creating a word that has been used to describe fat men as often as airships.

Today, Congress also has joined the ranks of lighter-than-air enthusiasts. With the start of trouble it voted 48 K-ships, later boosting the figure to 72. Now the program calls for 200 in all. In addition, airship fields are in operation or are being built all along the





Hadi Arnold

### Catching Forty Winks 500 Feet above the Atlantic

Dawn-to-dusk patrols are exacting. Lest fatigue dull efficiency, the Navy encourages airship men to nap while off watch. Cables support the bunk.

Atlantic, the Gulf, and the Pacific. Lakehurst and Moffett Field, California, train their personnel.

Foremost among the "fanatics" enjoying a belated hour of triumph is Lakehurst's Elmer Leidy, chief petty officer and head of the pigeon loft.

#### If Radio Fails; Pigeons Carry On

As each patrol blimp goes out to sea, she receives six of Chief Leidy's 350 pigeons. Four, bearing white capsules in leg bands, are released for practice flights. Two, with red capsules, are kept for emergency use. In event of radio silence, they carry messages to the station. If the ship is down with wireless out of commission, they will bring word of her position (page 88).

Chief Leidy proudly displayed diplomas his Navy pigeons had won in races against private fanciers' birds. "But now," he said mournfully, "my birds are retired from sport racing for the duration. They have a racing job to do for Uncle Sam."

Asked how long he had been in the service, Leidy replied unhesitatingly, "I've been in the pigeon game 30 years."

Only proved birds are mated. Some are known as 500-milers.

"We don't want deep-keeled birds," said the loft master, stroking the dainty, streamlined breast of one of his pets. They have too much wind resistance."

The female, although lighter, is as sturdy a flyer as the male, Leidy observed. Both share watches over their young.

"What's that? Are they all homing pigeons? Of course they are. And," he added, "don't you call them 'carrier pigeons'? One of the newspaper men did."

Flapping outside the pens was a yellow pennant, signal to a wing of warbirds wheeling aloft that they could exercise a while longer. When the banner was taken down, it was their cue to come in for feeding.

"They eat like fighters," said Chief Leidy, sifting a handful of their food, "and they train like fighters." They get a balanced ration according to the season: heating grains in winter and cooling grains in summer.

Glancing at the instructions written on a pigeon crate about to be loaded on a blimp, I had a vision of our airship's abundant food and her crew's hospitality. Leidy, who doesn't want his birds to break training, evidently had been struck by the same thought. On the crate he had written:

"Notice. Do Not Feed the Birds at All."

# The Heavens Above

On Land, Sea, and in the Air the Stars Serve Modern Man as Map,  
Compass, and Clock

By DONALD H. MENZEL \*

*With 12 charts, designed by the author, showing star positions for each month, and 13 drawings of the constellations by Carlotta Gonzalez Lahey*

**S**INCE Stone Age times the stars have excited man's interest and wonder. During the present war, however, with airplanes and ships navigating over vast areas of land and sea, a knowledge of the heavens is more important than ever before.

Every person in the Army and Navy, or who is likely to be, should know at least a few of the stars used for reference in navigation—the art of locating one's position on the earth's surface.

He never can tell when such knowledge may save his own life or that of a comrade. If he knows the stars, along with even the simplest principles of navigation, he can chart a course for thousands of miles if need be, and safely steer a boat or maneuver a life raft to friendly shores.

The man who knows the stars is never entirely lost on land, sea, or in the air, as long as the sky is partly clear.

## Constellations Help Map the Stars

The best way to find London on a map is first to look for England. Similarly, the best way to learn the stars is first to learn the constellations in which they belong.

The stars are strewn over the sky in a more or less haphazard fashion; any patterns one notices are the result of accident. And yet the human eye may almost automatically recognize outlines or groups of stars that seem to be related, because of their apparent nearness to one another.

These are the constellations, artificial groupings of the infinite variety of patterns of the stars. Of course, two stars that appear to be side by side in a constellation really may not be neighbors at all. One may be many times farther away from the earth than the other.

Men began to notice the various star groups before the dawn of civilization. Later they saw in the constellations fanciful resemblances to animals or human beings, and wove legends about the imaginary figures in the sky. The star groups are named for the legendary characters they are supposed to represent, such as Hercules or Cassiopeia.

These accidental star patterns serve a use-

ful purpose as "guideposts" of the sky. Every airplane pilot and navigator, and every officer of a naval or merchant vessel should know the constellations as tools of his trade. They help him to find the stars he uses in navigation.

For example, Polaris, the North Star, is at the end of the handle of the Little Dipper, or Little Bear (page 100), and the two stars at the front of the bowl of the Big Dipper, or Great Bear, point almost directly toward it.

Navigational stars include all first-magnitude stars and enough of second magnitude to provide a series of reference points well distributed over the sky. The navigator measures the angles above the horizon of two well-separated stars, nearly simultaneously. At the time of observation the stars make these angles with the earth at only one place. Reference tables show what that place is, and that is the navigator's latitude and longitude.

There are 55 stars selected for use in navigation, so that at night wherever you may be on the earth's surface some navigational stars always are visible unless the sky is completely covered by clouds.

## War Turns Men's Eyes to the Skies

War has brought about an increased interest in the stars. Soldiers and sailors on long ocean voyages are encouraged to learn the constellations. The dim-out of coastal cities and towns has had its compensations for sky-gazing amateurs who, for the first time perhaps, are able to see relatively faint stars previously dimmed by brilliant city lights.

Many an air-raid warden, on duty in a blackout, has noticed how bright the stars appear when man-made lights are off.

Even aircraft spotters, on the watch for enemy bombers, might use the constellations in indicating the course of airplanes. If an observer reported a plane moving on a line from Aries to the Pleiades, for example, its course would be accurately fixed if those receiving the report also knew their constellations.

Since earliest times the mariner has used

\* The author is Professor of Astrophysics at Harvard University, and is serving at present as a Lieutenant Commander in the United States Naval Reserve.



### Look on This Map for the Latitude of Where You Are—An Aid to Using the Sky Charts

To use the sky charts shown on pages 117-128 you need to know the latitude of the place where you are observing. Lines drawn across the map are parallels of latitude. Philadelphia and Salt Lake City, for example, are almost exactly at 40 degrees north latitude. If you do not live in one of the cities shown on the map, choose the one nearest to your own town or location and the latitude will be approximately the same. The sky charts are designed for use in the Northern Hemisphere, between latitudes 30 and 50 north, but have some value beyond these limits. The map has been carried farther south than latitude 30 so that land forms may be more easily recognized.

the stars as compass and clock. The explorer uses them as an unfailing sky-mark, to fix his position in jungle or waste of Arctic ice. The archeologist, finding on ancient tablets records of eclipses of the sun or certain positions of the planets, can calculate the exact dates when these events occurred.

#### Men Stargazed Before History Began

Man's interest in the heavens is older than history itself, as old as the sensation of curiosity. Rude carvings by Stone Age men on the walls of caves in Sweden unmistakably represent the constellation of the Great Bear. The mystery of the starlit sky has ever presented a challenge to mankind—a challenge to stretch earth-bound imaginations in an attempt to understand the universe.

There are two types of charts accompanying this article, both designed to help the beginner identify the stars and constellations. The twelve maps of the sky, one for each month, depict the changing aspects of the heavens through the whole year, and show the entire sky visible at any one time from latitudes within the Northern Hemisphere.

The diagrams show the star groups, or constellations, on a larger scale, with a superimposed figure of the animal, person, or thing that each is supposed to suggest (pages 100 to 115). My 13-year-old daughter, Elizabeth, as-

sisted me in outlining these interesting figures.

Accompanying the diagrams are individual descriptions of 53 leading northern constellations, including most of the stars used in navigation which are visible from northern latitudes (pages 102 to 115).

The fanciful constellation figures have been designed after careful research in order to show them as nearly as possible as they originally were conceived by the ancients, who first imagined them in the heavens.

A woman once came to an astronomical observatory with a set of drawings of constellation figures and asked whether a telescope would help her to see the fine lines of the pictures in the sky!

Her mistake seems more understandable when we remember that many constellation pictures show the imaginary figures far more prominently than they do the actual stars that form the "skeletons" of the figures.

#### Sky Was Man's First Picture Book

In the drawings accompanying this article, the stars in each constellation are emphasized and connected with lines to bring out the shape and location of each group. The figures are sketched somewhat vaguely, forming merely a background for the stars, a challenge to your imagination to duplicate the form in your mind's eye as you scan the heavens.



Drawn by Theodor Price

### Fighting Men on Distant Fronts Can Use the Sky Charts with Help of This Map

Soldiers and sailors at remote outposts and stations almost anywhere in the Northern Hemisphere can find their latitudes from the map. The latitude of the place where you are determines what stars and constellations will be visible to you (see directions for using sky charts, page 116). If you live in a large city, the high buildings will make it difficult for you to see the true horizon, and will cut off the view of some stars otherwise visible at your latitude. At sea you will have a perfect horizon. This map was drawn with the Mercator projection especially for this article. Names of countries were omitted to make room for more place names, and meridians of longitude were left off to emphasize the parallels of latitude.

The sky was man's first picture book; even, it might be said, his first "motion picture." We can imagine a group of Chaldean shepherds whiling away the hours of night watching the slowly moving heavenly pageant. One of them points to the constellation we now call Orion and remarks: "Does not that look like the figure of a man?" (Page 112.)

A discussion follows, and out of it a story develops, perhaps based on a legend or hearsay, concerning some mighty hunter who has vanished, never to return. Can it be, say the shepherds, that he has reappeared in the sky, perhaps placed there by the gods? The story is told and retold as the shepherds wander from place to place. In this way, very likely, many of the legends associated with the constellations got their start.

As time went on, the watchers of the skies picked out more groups of stars which seemed to have definite shapes. People perhaps made a sort of game of identifying them with figures of animals or men. More stories were originated to go with the figures.

At first various localities probably had different legends and imaginative figures to go with each constellation. Gradually, however, the better myths and figures became more widely accepted. Eventually, the constellation figures and the legends associated with them became generally established in the forms we know today.

Most of the animals shown among the constellation figures are those familiar to the people of the Old Testament who lived in Mesopotamia. This fact leads us to believe that the figures originated in that part of the world.

Probably most of the constellation figures and legends were developed about 2000 B. C., although it is difficult to fix the date exactly. Some may have been formed considerably later.

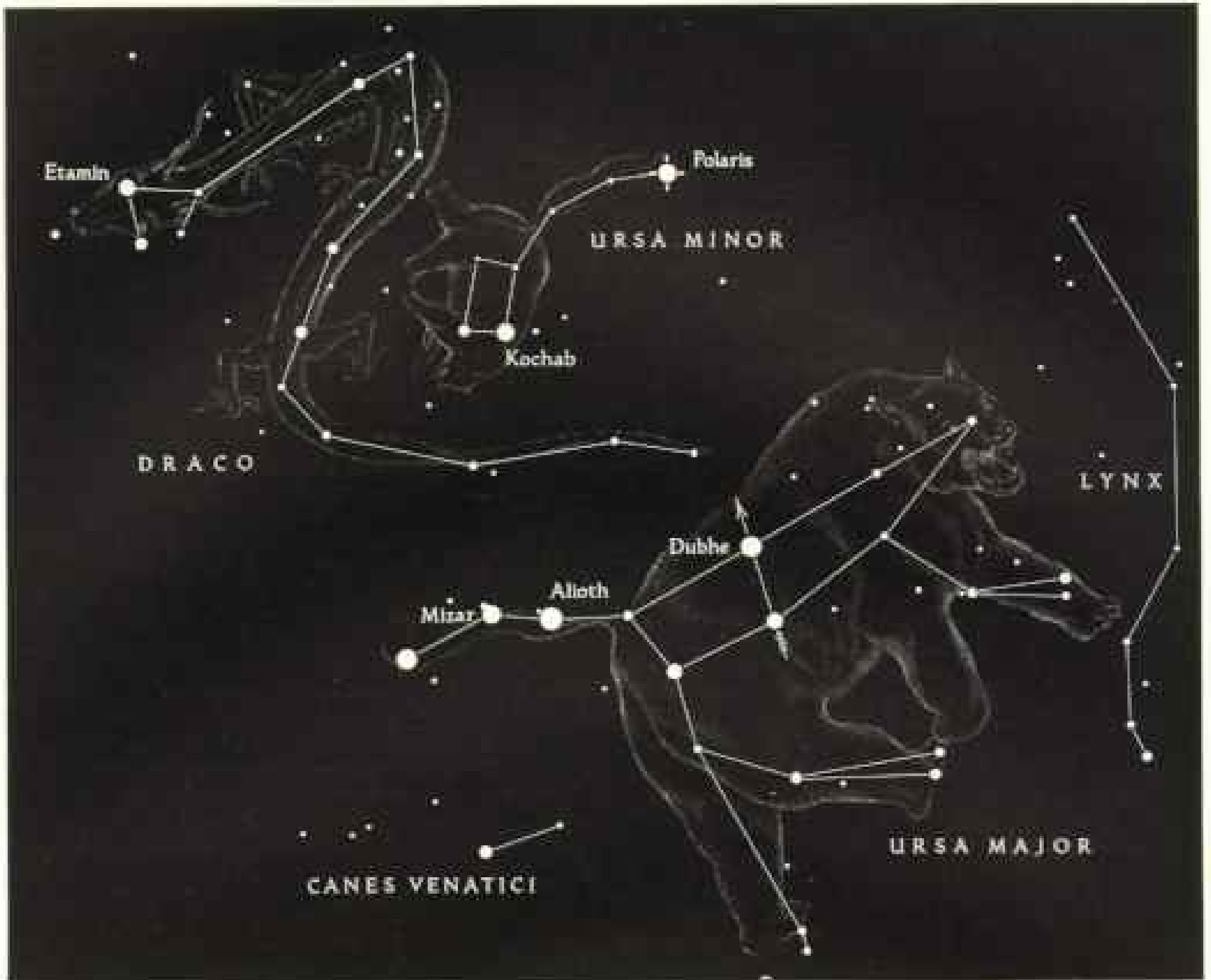
When you are observing the stars, keep always in mind the fact that they are suns—hot, glowing spheres of gas like our own sun.\*

Most of the stars visible to the naked eye really are much brighter than our sun. They appear as faint pinpoints of light only because they are so far away. Light, traveling at 186,000 miles per second, takes eight minutes to reach us from the sun. From the nearest star it takes more than four years.

### The Scene Changes—100,000 Years from Now

The stars we see in the sky are only a few of the estimated 100,000 million or so that make up the Milky Way, or Galaxy, a great disk-shaped aggregation of stars which is our "home" in the universe. The bright band of

\* See "News of the Universe," by F. Barrows Colton, NATIONAL GEOGRAPHIC MAGAZINE for July, 1939.



### Best-known Constellation Is the Great Bear, of Which the Big Dipper Is a Part

Ursa Major (page 101) is one of the most easily recognized star groups. The arrow connecting the two stars in the front of the Big Dipper's bowl shows how they serve as "Pointers" to locate Polaris, the North Star, in the end of the tail of Ursa Minor, the Little Bear (page 102). Draco (the Dragon) curls around the Little Dipper. All constellation pictures in this series are drawn to the same scale. Capital letters designate constellations and small letters the stars.

the Milky Way, circling the sky like a ring, is formed by the concentrated light of countless stars that lie between us and the outer rim of our huge star "wheel."

The sun, carrying all the planets along, is speeding through space at about twelve miles per second. Other stars, too, are moving, and the Milky Way itself is rotating. As a result, the stars are changing their positions in relation to one another. In a mere 10,000 years the star groups still will appear very much as they do today, but in 100,000 years they will have moved so that they no longer form the patterns and shapes that we now see in the sky. Astronomers will eventually have to conceive new figures to go with the constellations and give them new names, because their appearances will have changed completely.

In the dim future, our present "North Star" will deviate more and more widely from the pole—a result not of changes in the stars

but of a shift in the position of the earth's axis. Think of a small sailboat wallowing in a stormy sea. As it rolls and pitches, the top of its mast marks out an imaginary circle in the sky above. The earth wobbles somewhat similarly, its North Pole describing one complete circle in a little less than 26,000 years.

Polaris is our present North Star because the earth's North Pole points approximately toward it. But in 14,000 A. D., the pole will have moved farther around its circle and will point toward Vega, which then will be the North Star. As the pole describes its circle, it points toward different stars in succession, each one in turn serving for a time as the North Star, or Pole Star.

#### Origin of the Zodiac

The ancients noticed very early that the sun seemed to move across the heavens in a regu-

lar path, which today we call the "ecliptic." (It is marked on the sky charts.) They did not realize that the earth actually was moving around the sun instead. The moon and planets move in paths close to the ecliptic. This narrow area of the sky is known as the Zodiac, or "animal circle."

The Assyrians divided the Zodiac into twelve parts, with a constellation in each. They were named primarily for animals, and most of the names still are in use today. They are: Ram, Bull, Heavenly Twins, Crab, Lion, Maiden, Scales, Scorpion, Archer, Sea Goat, Water Pourer, Fishes. The sun was supposed to visit one constellation each month as it moved across the sky.

The old Babylonians, noting that the seasons followed one another as the sun changed its position in the sky, came to worship the sun itself as the cause of the changes. Torrential rains always fell in their country about January, when the sun entered the region where Pisces (the Fishes), Cetus (the Sea Monster), Eridanus (the River), and Capricornus (the Sea Goat) are located.

Undoubtedly, the choice of aquatic animals for this region of the sky was associated with the type of weather they seemed to produce with solar assistance.

These superstitious ideas led to the rise of the pseudo science of astrology, the belief that the stars and planets somehow influence affairs of men. Astrology developed about 1,200 B. C., and came into vogue only because the people of those times were ignorant of how the universe really operated.

It survives today as a strange relic of the Dark Ages, though thousands of people continue to waste time and money trying to learn their "fate" from it. Astrology never should be confused with the true and proved science of astronomy.

The constellations have suffered many revisions and changes from the earliest times. Lost in prehistory are the origins of most of them and we can only conjecture their evolution and development. The legendry and pictures have been passed on from generation to generation, chiefly by word of mouth. Fragmentary records show, however, that many of the constellations known today were recognized 3,500 and perhaps 4,000 years ago.

About 400 B. C., Eudoxus, an astronomer who lived in Asia Minor, prepared a globe that depicted the constellation figures of his time. The globe has long since crumbled, but a verbal description of it by the Macedonian poet Aratos is still extant. This description is, perhaps, our best means of revisualizing the ancient constellation figures, but even the ac-

count by Aratos leaves room for many questions.

The observations of Hipparchus, 129 B. C., and of Ptolemy, about 125 A. D., are among the most important of the earlier records that have come down to us through the Arabs. During the centuries of ignorance that prevailed in Europe during the Dark Ages, the Arabs kept alive the flickering torch of learning. They alone, of all the civilized world, continued to observe and record the positions of the stars and planets. That is why, today, many of the stars have Arabic names, such as Denebola, "Tail of the Lion," Markab, "the Saddle," etc.

### The Constellations

The best way to learn the constellations is to start with the Big Dipper (Ursa Major), and the Pole Star, which are the most easily recognized, and proceed southward and eastward until the accessible portion of the sky is covered. Do not try to learn too many constellations in one night; instead, learn a few well and review your knowledge of them frequently.

In the descriptions of individual constellations later in this article you will be shown how to set up and recognize important reference points in portions of the sky other than the north, which will help you pick out the lesser constellations.

Remember that if you get up before dawn occasionally, you will see stars not visible in the earlier part of the night, and in this way you can cover the entire sky in much less than one year.

### The "Naked-eye" Planets

The planets change their positions from day to day and month to month. They are shown on the charts in the positions they will occupy on the 15th of the designated month, from July, 1943, to June, 1944.

Only three of the planets visible to the naked eye thus appear, Mars, Jupiter, and Saturn. The other two naked-eye planets, Mercury and Venus, have already set, because of the lateness of the hour (10:30). The former is rarely seen, although it may occasionally shine through the twilight sky, low on the horizon.

Venus, however, dominates the western heavens during July and August. By early September it will have swung to the morning sky and remain there until about the middle of 1944.

Mars will be a spectacular object during December and January, with Saturn a near but less brilliant neighbor. Jupiter, inferior

only to Venus in brightness, will be a conspicuous winter object.

Binoculars, or even opera glasses, will enable you to see far more than is possible with the naked eye, and open new and marvelous vistas in the heavens. A small telescope will reveal still greater wonders. Many star groups, including the Milky Way, actually look more beautiful in a low-power instrument than they would in the as yet uncompleted 200-inch telescope of Palomar.

### Ursa Major: The Great Bear

In summer the seven bright stars of the Big Dipper, standing high in the evening sky, form the most conspicuous and easily recognized star group (page 100). The Dipper, forming part of Ursa Major, the Great Bear, provides a sky mark for locating most of the other constellations. In the latitudes of the United States it never sets.

Every 24 hours all the stars, including the Dipper, make a complete circuit of the sky, plus a little extra, so that they gain a little each day. In a year they gain a full day, so that they make 366 circuits of the sky while the sun is making 365. It is because of this slight daily gain that the Dipper's position in the sky slowly changes from night to night and from season to season.

Actually the stars and sun do not move across the sky, but only appear to do so because the earth rotates on its axis every 24 hours. The earth, however, also is revolving around the sun, taking a year to make the circuit, so that the sun appears to travel across the skies. Thus, each night we see the stars in slightly different positions from those they occupied the night before.

The Great Bear probably was the first star group to be noticed and singled out when primitive men began taking an interest in the sky. Peoples as widely separated as the Phoenicians, Persians, Greeks, and Romans on the one hand, and Eskimos and North American Indians on the other, all called it a bear, even though it has little resemblance to that animal.

This coincidence suggests that there must have been some way for ideas to be exchanged between the Old and New Worlds, and very likely it was by way of Bering Strait. The Arabs, however, called this constellation a gazelle; the Egyptians, a bull's leg.

Four thousand years ago the bear was much nearer the celestial pole than now, and much more prominent. In those days, in the fall and early winter, when it stood upright, its feet and legs were visible, but today they are below the northern horizon at that time of year.

Everyone wonders why the bear has such an abnormally long tail. Mythology tells us that the bear originally was supposed to have been the beautiful nymph, Callisto. When Juno, jealous of Callisto's beauty, threatened her, Jupiter transformed the nymph into a bear and flung her into the sky. Such a tremendous heave may have stretched the tail!

The North American Indians visualized the three "tail stars" as three hunters who were stalking the bear.

The Dipper also has long been known as the Plow, and the English still so term it. The Dipper handle is considered to be the plow handle, or sometimes a team of three oxen.

Most famous star in Ursa Major is Mizar, with the faint star, Alcor, hovering near, an excellent test for good eyes. A two-inch telescope shows Mizar to be really a double star, the two components very close together. The pair slowly revolves about each other, requiring many thousand years for a complete circuit.

The seven stars of the Big Dipper are, in order: Dubhe (the Bear and one of the 55 stars selected for navigational purposes); Mirak (the Loin); Phekda (the Thigh); Megrez (Root of the Tail); Alioth (meaning unknown, and a navigational star); Mizar (incorrectly called "Waist Cloth" and also used for navigation); Benetnasch (Chief of the Mourners).

Dubhe and Mirak, at the front of the Dipper, are the "Pointers" for the North Star (see Ursa Minor).

### Ursa Minor: The Little Bear

The Little Bear, or Little Dipper, is noted chiefly because Polaris, the "North Star," lies at the end of the dipper handle (page 100). A line from Dubhe and Mirak (the stars at the front of the Big Dipper) points almost directly to Polaris. These Pointers also are often used to locate other stars and constellations.

The two Pointer stars also provide a rough but handy "foot rule" for navigators. The navigator calculates his latitude by measuring the elevation of a star (or the sun in the daytime) above the horizon. This distance is measured in degrees.

Fortunately the two Pointer stars are almost exactly five degrees apart. Therefore, if a navigator has no instruments, he can sight off the distance between the two stars on a pencil or even on his finger, and measure roughly how many multiples of five degrees any star stands above the horizon.

Kochab, the brightest star in the Little Dipper's bowl, is Arabic for "Pole Star." In 500 B. C. it was closer to the true pole than was our present Polaris. The Pointers indicate the true pole more accurately than they do Polaris, which is about one and a quarter degrees from the true pole. The pole lies approximately on a line drawn from Polaris to Mizar.

You may notice that the light of Polaris fluctuates, because of pulsations which change the size of the star at intervals, just as a beating heart expands and contracts.

### Draco: The Dragon

The Dragon definitely suggests the object for which it is named (page 100). The tail starts northwest of the bowl of the Big Dipper, and the tail and body form a crude S-shaped double curve, enveloping Ursa Minor in one fold and then

abruptly bending south to the conspicuous lozenge-shaped head.

Etamin, signifying "Dragon's Head," is the brightest star of the lozenge, at the right eye. It is a navigational star. The faintest star of the head is a beautiful double, easy to separate with a small glass.

To the Babylonians, Draco signified primeval chaos and the destructive forces of the elements. The Greeks thought of him as the monster that guarded the golden apples in the Garden of Hesperides. Juno is said to have accorded the creature immortality in the skies because of his faithfulness.

### The Lynx

The astronomer Hevelius (1611-1687) conceived this constellation from the faint stars forming a sort of wall in front of Ursa Major (page 100). He remarked that one needs the eyes of a lynx to see any stars at all in this nearly barren expanse of sky.

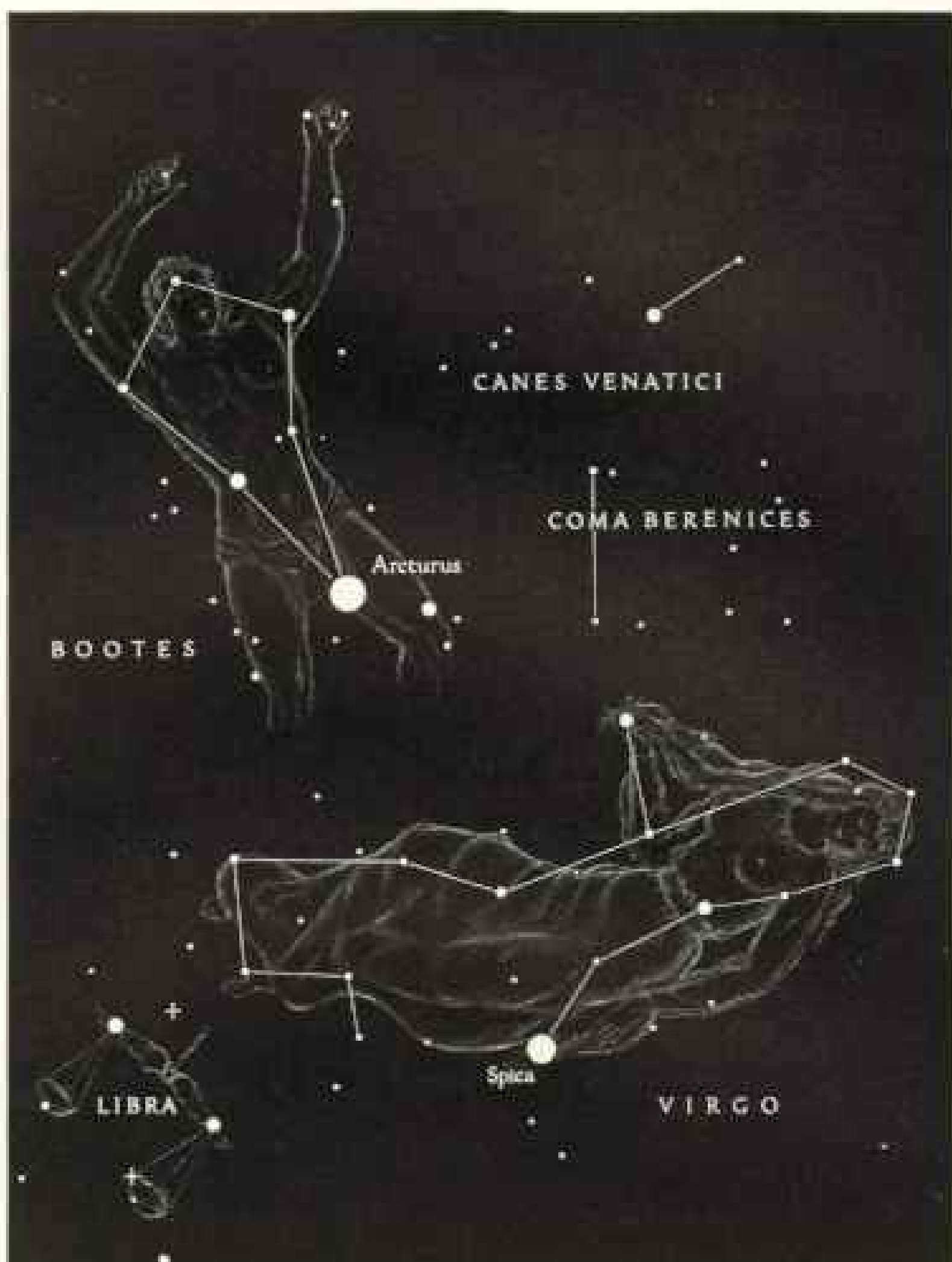
### Canes Venatici: The Hunting Dogs

The Hunting Dogs also were conceived by Hevelius (above). The stars suggest no animal form, though the idea of a pair of dogs yapping at the heels of the bear is appropriate.

Cor Caroli, brightest star in the constellation, is an interesting double, separable with a small telescope or binoculars. On a line joining the Canes Venatici pair with Mizar, and about one fourth of the way along it, lies a faint reddish variable star which amateur astronomers have named "La Superba."

### Boötes

Follow the curving *arc* of the Big Dipper handle to *Arcturus*, an orange first-magnitude navigational star, brightest of the constellation. The main figure is shaped much like a kite, with *Arcturus* at the junction of the tail (above). Boötes (pronounce each "o" as in go over) is



### Virgo (the Maiden) and Boötes Are Conspicuous Star Groups

Note the ear of wheat held in Virgo's left hand, represented by the bright star *Spica*, a "sky mark" in the celestial navigator's notebook. *Arcturus*, also often used for star sights by seamen, helps identify the kite-shaped figure of Boötes. *Libra* (the Scales) is at lower left (page 106).

conventionally pictured as the driver of the Bear.

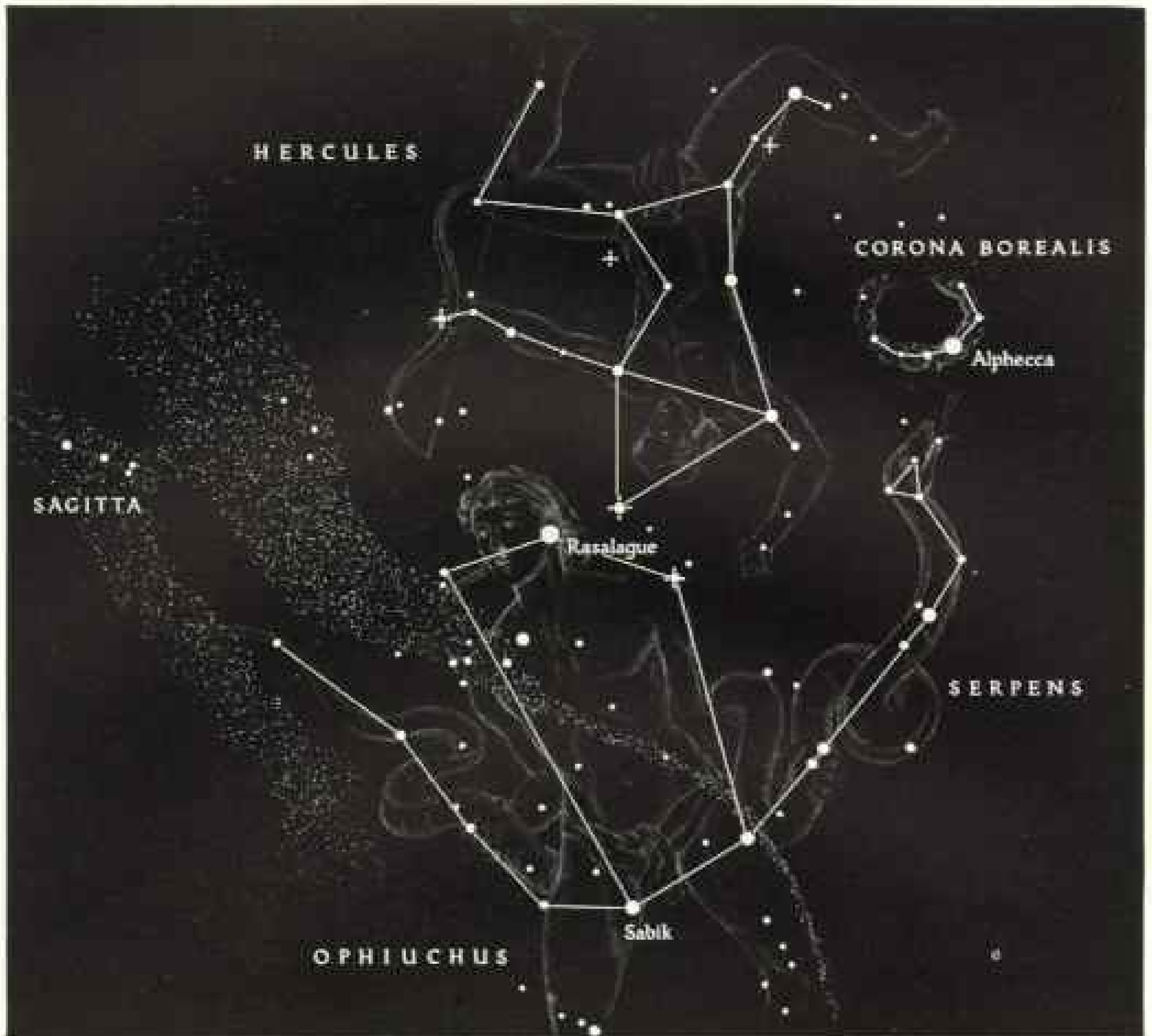
He sometimes is represented also as the Plowman, holding the Plow (the Big Dipper). The star above the right hip of Boötes has a faint, close companion whose greenish tint contrasts beautifully with the orange-yellow of the primary, but you will need a three-inch telescope to see it.

### Virgo: The Maiden

Again from the curve of the Big Dipper handle follow a curved *spike* to *Spica*. (The puns may aid your memory!) *Spica*, a navigational star, is represented as an ear of wheat held in Virgo's left hand (above).

Virgo, one of the zodiacal constellations, is shown as a maiden in a half-reclining position.





### Hercules Stands Almost Squarely on the Head of Ophiuchus, His Fellow Giant

Hercules has just shot his bow, and to the left you can see the Arrow (Sagitta), though it is somewhat out of line. Ophiuchus (page 105) grasps the coils of Serpens (the Serpent). Corona Borealis (the Northern Crown) is at upper right.

She is identified with the goddess of justice, Astraea, who dwelt on earth during the golden age.

The star in the left armpit is a beautiful double, visible with a fairly powerful glass. The two components revolve about each other once every 100 years.

#### Coma Berenices: Hair of Berenice

This group lies just to the south of Canes Venatici (page 105). We have not attempted to draw a figure, for two reasons. First, any chart showing stars down only to the fifth magnitude, such as this one, cannot possibly do justice to the constellation, for the greatest number of its stars lie just beyond that limit.

Second, even when the fainter stars are included, the delicate beauty of the clustering stars themselves portrays its object far more graphically than any artist could.

The constellation represents the shorn locks

of beautiful Berenice, an Egyptian queen, placed in the Temple of Venus as an offering in gratitude for the safe return of her husband. Some thief stole the tresses, however, and consternation reigned until the royal astronomer remarked that Jupiter himself had placed them in the sky.

Opera glasses will greatly enhance your view of this beautiful group. In this region of the sky we can look entirely through our own great galaxy of stars into outer space. There, with powerful telescopes, we can photograph other galaxies, millions of light years distant, each containing billions of stars (see Andromeda, page 109).

#### Hercules

East of Corona lies Hercules (above) with his left foot planted on the head of the Dragon. The identification of this constellation with Hercules, the national Greek deity, dates only from about 470 B. C.

From very early times the constellation was

known as "the Kneeler." The right knee is bent, and the foot stretches out behind. Six stars arranged roughly like an hour-glass mark the broad-shouldered body. The left arm is well marked and stretched straight out from the body. The right arm is raised. The two shoulder stars and Ras Algehi (Head of the Kneeler) form a conspicuous equilateral triangle.

There has been much controversy about the constellation, but I think the following picture the most acceptable. Kneeling for stability, Hercules holds a bow in his left hand, and his right hand, empty, has snapped back in reaction from the shot. Just ahead, bearing out this idea, we see the ancient constellation Sagitta, the Arrow, flying toward the Swan and Eagle.

Ras Algehi, mentioned above, is a beautiful double star, the fainter green component contrasting well with the red-hued primary, although a two-inch glass or larger is required to show them as separate stars.

Approximately one-third of the way from the star in the groin to the one in the waist lies the famous globular star cluster M 13, faintly visible to the naked eye as a speck of haze. Here more than 50,000 stars are crowded together in a compact swarm condensed toward the center, forming an object of great beauty when seen in a large telescope. Amateurs sometimes mistake it for a comet.

### Corona Borealis: The Northern Crown

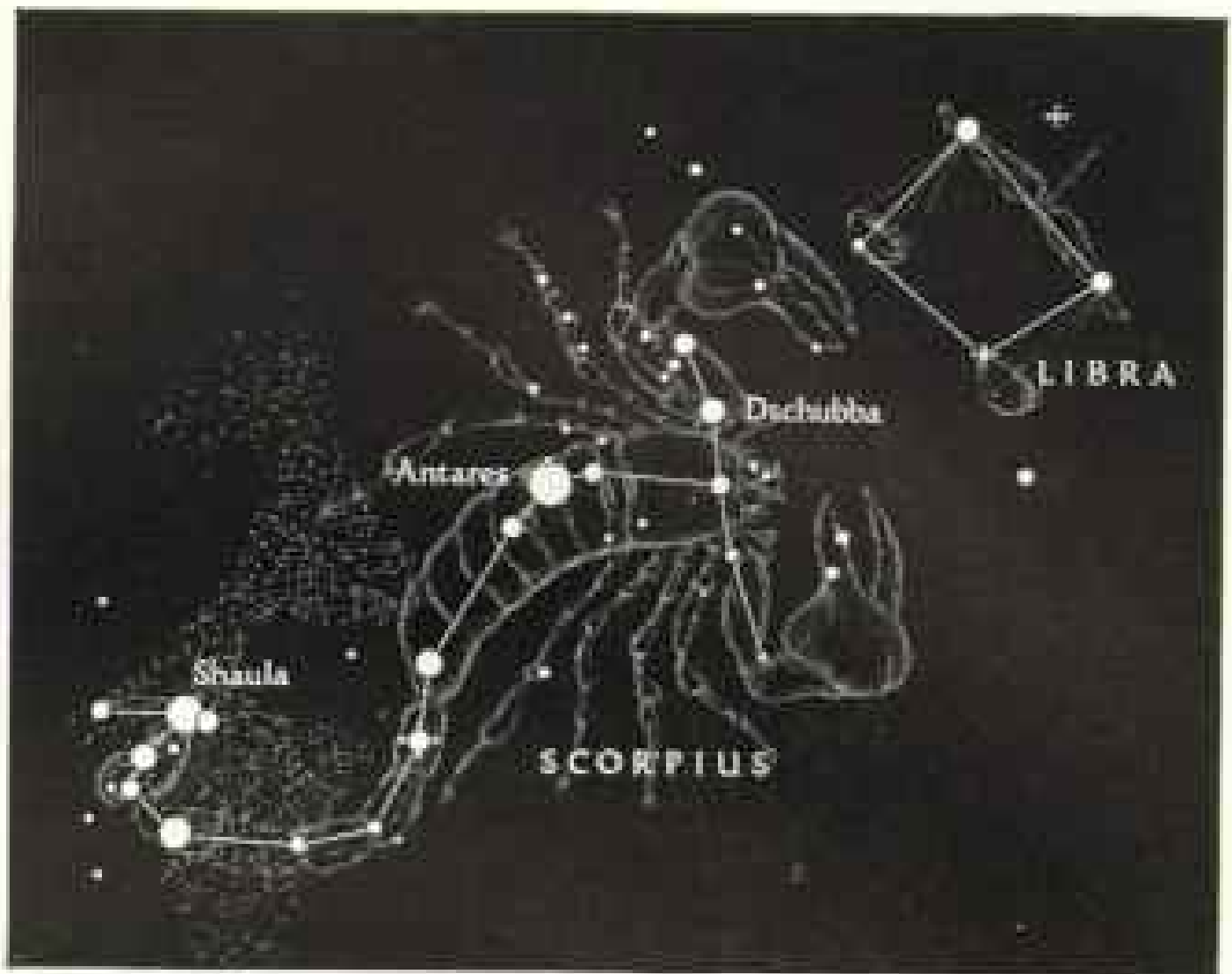
Between Hercules and Boötes is a beautiful arc—almost a closed circle—of stars, known as the Northern Crown (page 104). Its most prominent star is called by the Arabic name Alphecca (the Bright One of the Dish) for navigational purposes, although I prefer the Latin form, Gemma (the Gem). The Arabs thought of the group as a dish, chipped where the circle is broken. Australian natives pictured it as a boomerang.

Corona Borealis seems to be connected with the legend of the Cretan Minotaur, which Theseus slew with the aid of Ariadne, who laid a thread to guide him through the labyrinth. One version of the legend says Theseus gave the crown, a wreath, to Ariadne; another, that the crown was the gift of Bacchus, her second husband.

### Ophiuchus, and Serpens: The Serpent

Here is represented a powerful giant, wrestling with a snake (page 104). Ophiuchus lies close to Hercules—two giants with heads almost touching.

Ophiuchus means Bearer of the Serpent, though some have called him the Serpent Charmer. The



### Stars in Scorpius Truly Outline a Scorpion

This constellation was recognized in the Stone Age, as shown by carvings of that era. Libra (the Scales) is shown also on page 103. Both constellations are in the Zodiac, an imaginary belt through which the sun, planets, and moon travel across the sky. Navigators frequently take sights on bright, red Antares.

giant is marked by an elongated five-sided figure, partially embedded in the Milky Way. The upper star, Rasalogue (Head of the Serpent Charmer), is a navigational star, as is also Sahik (the Driver), in the right thigh.

Serpens, though considered as a separate constellation, has its stars closely intermingled with those of the giant. A small but conspicuous triangle lying equidistant from Corona Borealis and Hercules' right shoulder indicates the snake's head. Several bright stars follow the twisting coils of the snake around Ophiuchus.

The constellation as a whole represents Aesculapius, the god of healing. So expert did Aesculapius, a mere mortal, become in his art that he lost not a single patient and even brought the dead back to life. Pluto, faced with a serious labor shortage in Hades as a result, appealed to Jove. The latter struck Aesculapius with a thunderbolt and placed him in the sky.

Serpents traditionally were supposed to possess great healing power. A staff with serpents entwined about it is in use today as the caduceus insignia of the medical profession.

### Sagitta: The Arrow

The Arrow, as already stated, flies from the bow of Hercules (page 104). Two stars mark the feathers, one the shaft, and one the point. It lies directly north of Aquila in the Milky Way. The stellar fields are magnificent, and several of the fainter stars, close to the arrow, are wide doubles or triples.

### Scorpius: The Scorpion

The Scorpion, just below the feet of Ophiuchus, is one of the most beautiful constella-



### Sagittarius (the Archer) Is a Centaur, Half Man, Half Horse

Above flies Aquila (the Eagle) with Altair, a navigational star, its brightest jewel. At the left are four figures that belong in the "heavenly sea" (page 110): Capricornus (the Sea Goat); Aquarius (the Water Pourer, shown in full on page 110); Equuleus (the Sea Horse) and Delphinus (the Dolphin). Sagitta and the tail of Serpens show that this plate overlaps with that on page 104.

tions, and truly suggests the object it represents (page 105). It is prominent in the Zodiac. The bright star Antares is dominant. Antares signifies "Rival of Mars" because its reddish hue resembles that of the planet.

The back of the Scorpion curves downward toward the horizon and then upward, ending in an arrow-shaped formation that denotes the sting, poised to strike the right foot of Ophiuchus. Antares, Dschubba (the Forehead), and Shaula (the Sting) are of interest as navigational stars.

Scorpius is shown in some Stone Age carvings. In mythology, Scorpius stung Orion to death, and the giant is represented as ever fleeing from the Scorpion.

The Milky Way in the region of Scorpius and its southern neighbor, Centaurus, is well worth examining with opera or field glasses, which will reveal many double stars. The two bright stars in the back of Scorpius, just before the tail begins to curve, are exciting doubles. The colors of the lower pair, red and blue, present a striking contrast.

### Libra: The Scales

Libra, one of the zodiacal constellations, is a feeble star group just east of the bright claws of Scorpius (page 105). The Babylonians originated the concept of a scales, or balance, perhaps held originally in the hand of Virgo, nearby, who sometimes was identified with the goddess of justice. Later the group was regarded as an altar, held between the Scorpion's claws. The ancient Greeks even called it "the Claws," suggesting they thought of the group as part of Scorpius.

The Scales idea probably was revived in Julius Caesar's time, when he himself was transferred to the sky and represented as holding the scales of justice. Finally Caesar's figure was eliminated, and only the scales remained.

Both stars in the beam, and the one in the right or western scale pan

are doubles. The last is a variable star, its brilliance sometimes falling to fifth magnitude. When this star is faint, the figure may be difficult to locate.

### Sagittarius: The Archer

East of Scorpius lies another zodiacal constellation, Sagittarius, the Archer (above). The major position of the group lies directly in the Milky Way. Its most prominent feature is a star group commonly called "the Milk Dipper." The figure, composed of five bright stars, is inverted, the handle pointing slightly upward and to the west. Just below the handle is a large, well-marked triangle of stars.

Nunki (Proclamation of the Sea) and Kaus Australis (Southern Part of the Bow) are navigational stars. The former is the uppermost and brightest star of the Milk Dipper; the latter is the lowermost and brightest star of the aforementioned triangle.

In mythology, Sagittarius represents the learned centaur, Chiron, tutor of Aesculapius and other Grecian heroes. Just behind and slightly above the centaur's head lie three objects that appear hazy in a low-power glass. The lowest is a star cluster; the other two are clouds of gas, excited to luminescence by the hot, blue stars embedded in them. The center object is the famous Horseshoe nebula.

The splendor of this region of the sky arises from the fact that in its direction lies the center of our own vast disk-shaped Milky Way star system, where billions of stars are concentrated as in the hub of a wheel (page 99).

### Aquila: The Eagle

From Sagittarius look northward along the Milky Way, on the eastern side of the great black rift that divides it into distinct parts. You will see the first-magnitude navigational star, Altair, (Pure White), flanked on either side by two somewhat fainter bodyguards (page 106). The tail of Serpens points to it, and tiny Sagitta, the Arrow, lies just to the north.

The constellation outline somewhat resembles an Indian arrowhead. It is supposed to depict an eagle. In mythology, the eagle belonged to Jupiter, who sent him to fetch Ganymede, a beautiful youth whom Jupiter desired to have as cupbearer.

### Scutum Sobieski: Shield of Sobieski

This is the only constellation with any claim to a Christian background (page 106). It was named for Sobieski, king of Poland in the late 1600's, who successfully resisted the Turks. The figure represents Sobieski's shield, emblazoned with his coat of arms, the cross. "Scutum," as it is usually called, lies in the Milky Way just south of Aquila.

### Vulpecula: Fox with the Goose

This modern Hevelius constellation (see The Lynx, page 103) lies between Sagitta and the head of Cygnus, and its full title is Vulpecula cum Anser, "the Fox with the Goose" (page 106). It is noted chiefly for containing the famous



### Cygnus, the Swan, Flies Past the Bright Star Vega

Its five major stars form a figure also called the Northern Cross. Although Lyra, at the right, means Lyre, a musical instrument, it is drawn as a tortoise. This representation, described on this page, conforms with the legend that Mercury made the first lyre by placing strings across a turtle shell, which served as the sound box.

Dumbbell nebula, one of the so-called "planetary nebulae," which are extremely hot stars surrounded by clouds of luminous gas. The nebula can be found midway along a line joining Albireo in the Swan with the tip of the Arrow, Sagitta.

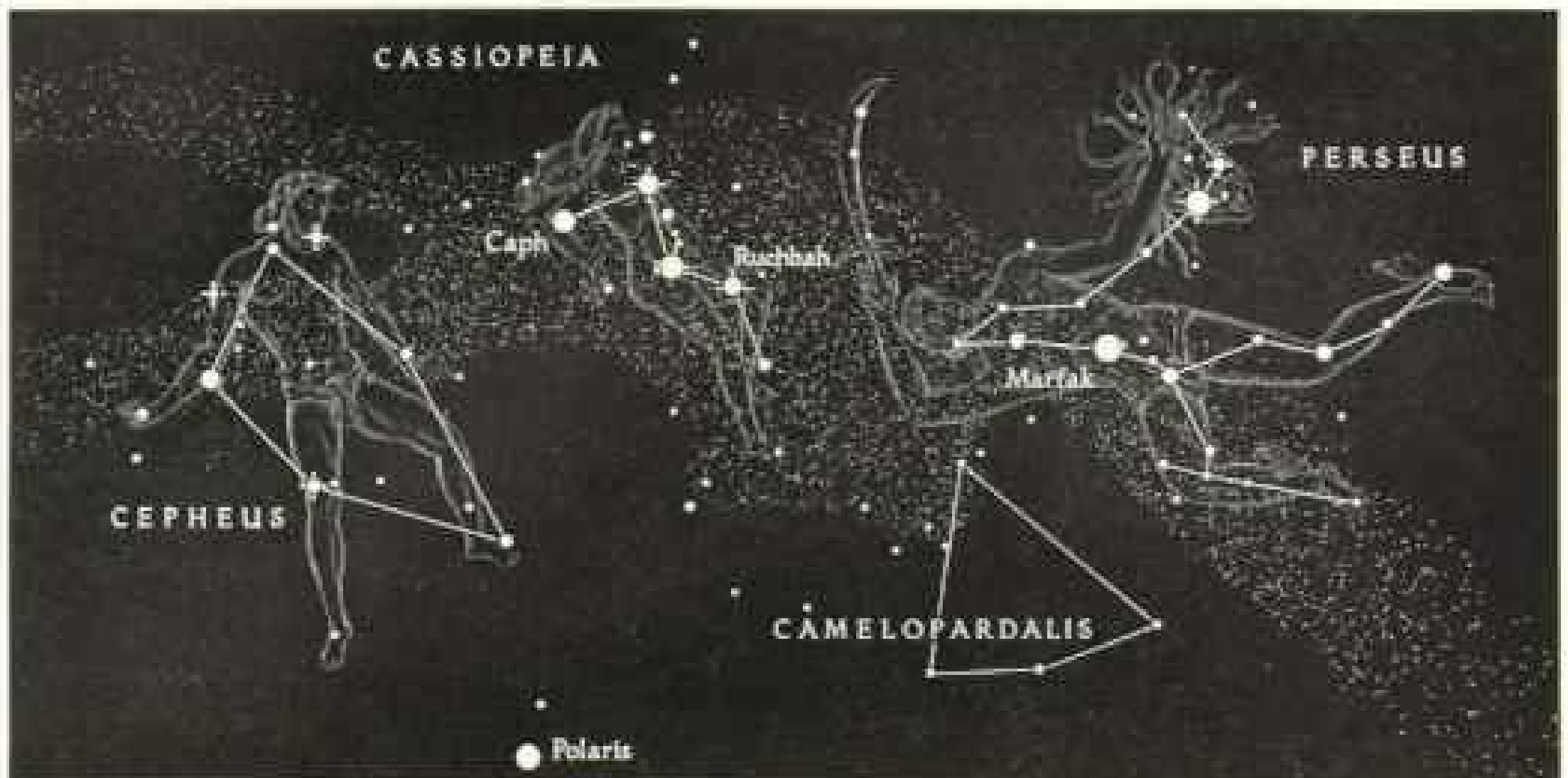
### Lyra: The Lyre

The heavenly Lyre lies just west of Hercules' left knee and south of Draco's head (above). To locate it more exactly, set the hands of a watch to read 5:48; hold the watch toward you with the face centered at Polaris and the hour hand toward the Pointers. Then the minute hand will indicate the direction of Lyra.

Vega, most brilliant star in this section of the sky, lies on the western edge of the Milky Way, shining like a blue diamond. It is used in navigation. Two faint stars to the east form, with Vega, an almost perfect equilateral triangle.

The figure has no resemblance to a lyre as we know it, but the discrepancy is explained by the mythological story of the lyre's invention. Mercury, says the legend, made the first lyre by piercing a turtle shell and adding strings, the resonant shell forming the sound box. The ancient Greek word for turtle is the same as that for lyre. Thus we conclude that the constellation was originally conceived as a turtle, and not as the harplike lyre. The star group actually somewhat resembles a tortoise seen in profile, with the head opposite that of the Swan and with Vega marking the eye.

The star in the tip of the turtle's nose, Epsilon Lyrae, is double even when seen with the naked eye, if one's vision is good enough. Each of these stars is double again, as a three- or four-inch telescope reveals.



### Cassiopeia, a W-shaped Formation of Stars, Is Prominent in the Northern Sky

This constellation often is called "Cassiopeia's Chair" since the five "W" stars suggest it. Only the lady, however, has been drawn, because there are not enough stars for both her and the chair. To the left stands Cepheus, her husband. Perseus, her son-in-law, is at the right, holding a sword and the head of Medusa, which he has just cut off. Below him is the kite-shaped constellation Camelopardalis (the Giraffe).

#### Cygnus: The Swan

To the east of Lyra, in the center of the Milky Way, lies Cygnus, the Swan (page 107). The major five stars of the constellation form a group popularly known as the Northern Cross. The bright star, Deneb, lies in the head of the cross and in the tail of the swan.

This constellation probably is one of the few definitely originated by the Greeks. There are several legends in which the hero, in one case Jupiter, became transformed into a swan. The star Albireo, in the head of the swan, is a magnificent double of beautifully contrasting colors, gold and blue.

#### Lacerta: The Lizard

North of Cygnus and lying about midway between that constellation and Andromeda, you will find a few unimpressive faint stars (page 107). Hevelius formed them into Lacerta, the Lizard, remarking that the name was fitting because it was the only animal small enough to fit into the limited space available!

#### Cassiopeia

Swinging north once more, we come to Cassiopeia, the famed Lady of the Chair (above). You will readily locate the W-shaped figure by drawing a line from Mizar, in the head of the Dipper handle, through Polaris and extending it approximately an equal distance on the other side.

The constellation often is called "Cassiopeia's Chair" because the five "W" stars, plus a sixth fainter one, suggest it. Most old maps accordingly show the queen seated on a throne, but since there are not enough stars to depict both

queen and chair, we have shown Cassiopeia resting on her elbows.

Cassiopeia was the wife of Cepheus and mother of Andromeda. Conscious of her beauty, she boasted that she was fairer than the sea nymphs. Her vanity brought the wrath of the gods upon her, the ravaging of her seacoast by a monster, and a demand from Neptune for the sacrifice of Andromeda.

Cassiopeia contains two navigational stars: Ruchbah (the Knee), and Caph (the Camel's Hump, from an Arabic representation of the figure as a kneeling camel), which lies at the queen's elbow in our drawing.

#### Cepheus

Cepheus lies between Cassiopeia and Draco, with his feet toward the Pole Star (above). In Greek mythology he was Cassiopeia's consort. Probably the constellation goes back to earlier Babylonian times, however, when Cepheus was thought of as a shepherd.

Two bright, pulsating, variable stars, Beta and Delta Cephei, are the most interesting features of Cepheus. They lie respectively in the right thigh and chin. The Cepheid variable class of stars, so called because of its fluctuating brightness, is named for Delta Cephei.

#### Camelopardalis: The Giraffe

Between Cassiopeia and Perseus, on the edge of the Milky Way, lies the kite-shaped constellation Camelopardalis, the Giraffe (above). Bartschius, who conceived the group in 1614, said that it represented the camel that brought Rebecca to Isaac. It may have been given the name of giraffe through confusion of the Latin words, *camelus* (camel) and *camelopardalis*,



### Pegasus Flies Upside Down, While Andromeda, Near by, Languishes in Chains

Andromeda, daughter of Cassiopeia, is chained to the rocks to atone for her mother's vanity. Pegasus, the Winged Horse, usually is drawn in an inverted position. Aries (the Ram) is the leading sign of the Zodiac (page 110), having originally signified the beginning of spring.

#### Perseus

The hero of many well-known legends stands in a brilliant part of the Milky Way, just east of Cassiopeia, his mother-in-law, whom he dutifully follows in her circle about the heavens (page 105). The curved arc of stars, called "the Segment of Perseus," is very distinctive.

In our drawing the navigational star, Marfak, is in the center of Perseus' body, despite its Arabic meaning of "Elbow." The upraised right hand holds a curved blade. The left clasps the snaky locks of the severed head of Medusa, whose glance turned people to stone.

Perseus is rescuing Andromeda, daughter of Cassiopeia, who is chained to the rocks, atoning for her mother's vanity. He holds out the head of Medusa and turns to stone the sea monster, Cetus, that is about to devour her.

Both of Medusa's eyes are variable stars. The one in the right eye is Algol (the Demon Star). Most of the time it is of second magnitude, but is eclipsed every two days, 20 hours, and 48 minutes by a darker star revolving about it. During the eclipse, which lasts about six hours and 45 minutes, its brightness drops to fourth magnitude and then returns to normal.

#### Andromeda

It is best to locate Andromeda and Pegasus at the same time (above). A line drawn from Polaris to Caph in Cassiopeia's elbow and extended beyond to about one and one-half times this distance will indicate Alpheratz, a navigational star shared by both figures. Alpheratz is

in the corner of the conspicuous "Great Square" of Pegasus.

From the square toward Perseus extends a line of several bright stars which, with the square, outline a huge saucer, larger even than the Big Dipper. Although Alpheratz means "Horse's Navel," it is usually assigned to Andromeda because the maiden needs a head.

In Andromeda it is possible to see farther with the naked eye than in any other part of the heavens. If you look just above Andromeda's waist, on the side opposite from Triangulum, midway between her bent knee and armpit, you can easily see a faint hazy object.

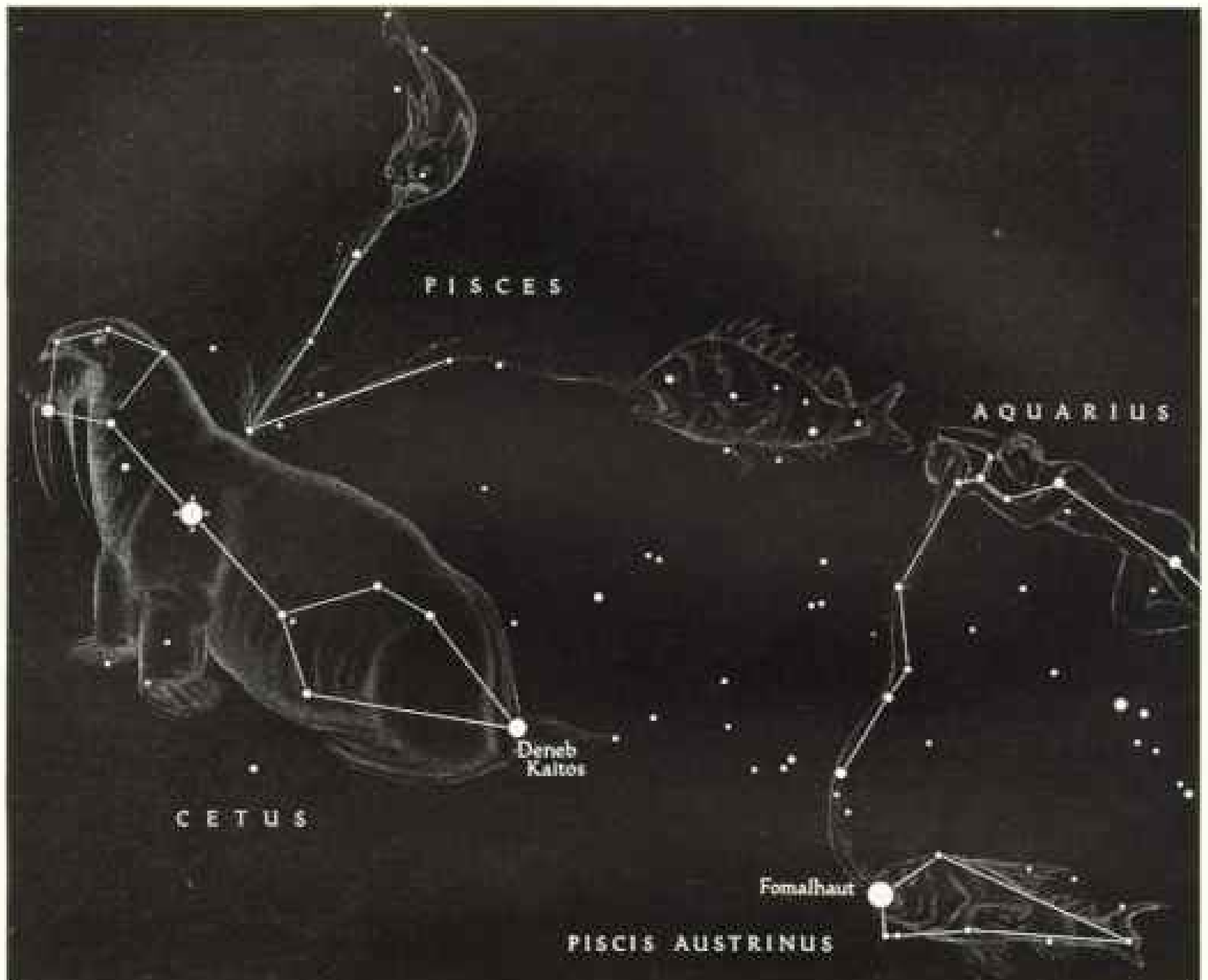
This is the famous Great Spiral Nebula in Andromeda, one of the great separate galaxies of stars outside our own Milky Way galaxy. It is one of the nearest; yet the light from it that enters your eye left the nebula 900,000 years ago!

There are millions of such objects known to astronomers, most of them more distant and fainter than the Andromeda nebula. Great telescopes resolve the hazy masses of the nearer ones into hundreds of millions of stars. Many of them display the characteristic "pinwheel" form; indeed, like our galaxy, each one is slowly rotating.

#### Pegasus

We have drawn Pegasus upside down in the sky, as he is usually shown, probably because the line of stars assigned to the head is brighter than those in the forefeet (above).

Only half of the horse is included in most drawings, and there are no stars to represent the



### Fish, a Sea Monster, and Aquarius (the Water Pourer) Inhabit the "Heavenly Sea"

This part of the sky was associated with water in Babylonian times because rain fell when the sun entered the region. Aquarius pours water from his jar down into the mouth of Piscis Austrinus (the Southern Fish). Fomalhaut, marking its mouth, is a prominent navigator's star. More water squirts from the mouths of Pisces (the Fishes) above. Cetus, in mythology, was a sea monster, here represented as a walrus. More of the "heavenly sea" is included on page 106.

wings, though we have shown them, since many ancient Babylonian boundary stones depict a winged horse. Markab, the Saddle, awkwardly set at the base of the neck, is a navigational star.

If Pegasus were drawn right side up, his hoofs would come close to the spring of Aquarius. This inversion would fit into the ancient legend of the Fount of Hippocrene, which gushed forth at the blows of Pegasus' hoofs.

Pegasus is said to have sprung full grown from the blood of Medusa, the monster slain by Perseus. The Phoenicians frequently used a horse as a figurehead for a ship. Quite possibly Pegasus lies on the edge of the "heavenly sea" as the symbol of a ship, or he may represent a sea horse, the steed of Neptune.

### Triangulum: The Triangle

Behind (to the south of) Andromeda's extended foot lies a thin, well-defined right-angled triangle of stars, Triangulum (page 109). The Greeks said Jupiter placed there the Greek letter delta, signifying "deos," or god.

### Aries: The Ram

The obtuse-shaped triangle, the Ram, lies at about two of Andromeda's "arm-lengths" below her body and roughly indicated by the curve of her lowered forearm (page 109). Aries is the leading sign of the Zodiac in astrology, and is one of the oldest constellations, probably dating back to Babylonian times. In mythology Aries represents the ram with the Golden Fleece, sought by Jason and his Argonauts.

Even on ancient coins and tablets Aries is shown with his head turned back, as in our drawing; this pose apparently seeming most natural to fit the arrangement of the stars. The bright star Hamal (the Ram), in the nose, is used for navigation.

### Capricornus: The Sea Goat

In our swing north from Sagittarius and back to Aries we have passed over three important zodiacal constellations, Capricornus (page 106), Aquarius, and Pisces. All are related to water and located in the great "heavenly sea." Capricornus is a sea goat, located east of Sagittarius and the

southern Milky Way. Its outline resembles an odd-shaped boat.

According to one legend, Capricornus was once Pan, who jumped into the Nile to escape from the hundred-headed monster, Typhon. The half of Pan immersed in the river became a fish's body, and Jupiter commemorated the event by placing Pan in the sky.

### **Aquarius: The Water Pourer. Piscis Austrinus: The Southern Fish**

Midway between Capricornus and the "Great Square" of stars in Pegasus, just below the horse's head, are four stars arranged like a Y (page 110). This is the Urn or Jar of Aquarius, the Water Pourer. The Pourer himself is not clearly indicated.

Water flows out of the jar southward in a glittering shower of stars directly to Fomalhaut (the Fish's Mouth) in Piscis Austrinus, the Southern Fish. Fomalhaut (pronounced "foam-al-o") stands bright and lonely in this region of the sky, and it is an important navigational star. A faint oval of stars west of Fomalhaut suggests the body of the fish.

### **Delphinus: The Dolphin**

Due north of Capricornus and forming a rough equilateral triangle with Altair (of Aquila) and the tip of the Arrow (Sagitta) is a small diamond of four stars (page 106). This is Delphinus, the Dolphin, also called "Job's Coffin."

### **Equuleus: The Lesser Horse**

About halfway between Delphinus and the fore-hoof of Pegasus lies a straggling group of four or five faint stars, Equuleus, the Lesser Horse or Demi-horse (page 106). It probably was originated by the Babylonians, and because it lies in the area of the "heavenly sea" we have shown it as a sea horse.

In Greek mythology there is a story of Venus and Cupid being suddenly frightened by the terrible Typhon (see Capricornus, page 110). To escape, they transformed themselves into fishes, and Minerva placed the pair in the sky to commemorate the occurrence. Equuleus and the Dolphin seem to fit into this legend.

### **Pisces: The Fishes**

The zodiacal constellation of the Fishes lies between Aries and Aquarius (page 110). Its most distinctive feature is a V-shaped pattern with the point on the neck of Cetus.

From ancient times the fish usually have been drawn with their tails toward the point of the V, with a ribbon around both tails, flowing down to El Rischa, the Knot, or Cord Star, where they join in a bow. In some old drawings, however, the ribbons are replaced by wavy lines indicating flowing water, and I believe this was the original conception.

Several thousand years ago, at the season when the sun entered the region of Aquarius in December and January, instead of in February and

March as at present, there was a season of heavy rains in Babylonia; hence these constellations were associated with production of rain. In our drawing, therefore, the fish are reversed, with water flowing from their mouths.

### **Cetus: The Sea Monster**

The Sea Monster is an enormous constellation of striking form (page 110). The head is a well-shaped pentagon of stars, one quite faint. It lies just south of Aries, and I usually locate it from the V-shaped Hyades cluster in Taurus, which points directly toward it. Well to the south and west lies an irregular five-sided figure, forming the body. Deneb Kaitos (the Monster's Tail) is used for navigation.

The variable star Mira, the Wonderful, in the creature's neck, is the brightest in the entire constellation, shining with a deep red hue. It slowly fades until too faint to be seen with the naked eye, then gradually returns to its former brightness, completing the cycle in about 330 days, on the average. Do not be surprised, therefore, if you fail to see it.

Cetus, according to mythology, is the monster sent by Neptune to devour Andromeda. It is often called a whale, but we have represented it as a walrus, which the star outline most closely resembles. The Babylonians, who originated the constellation, probably had no knowledge of the walrus, but had they known it, I believe they would have selected it for Cetus.

### **Orion**

Most magnificent of all the constellations in the sky is Orion (page 112). The three bright stars in his belt are easy to find. Betelgeuse (pronounced Bet-el-gerz), one of the largest stars known, 100 times the diameter of the sun, is the red star in the right shoulder. It means "Armpit."

Bellatrix (incongruously translated as "The Female Warrior") is in the left shoulder, and Rigel in the left leg. Center star of the belt is Anilam (one of "the String of Pearls"). All four are used in navigation.

Orion's right arm swings a club, to attack the threatening bull, Taurus, while his left holds a shield, supposedly of lion's hide. From his belt hangs a dagger, also sometimes regarded as the handle of Venus' Mirror, a diamond-shaped group formed in conjunction with the belt and the star in the left hip.

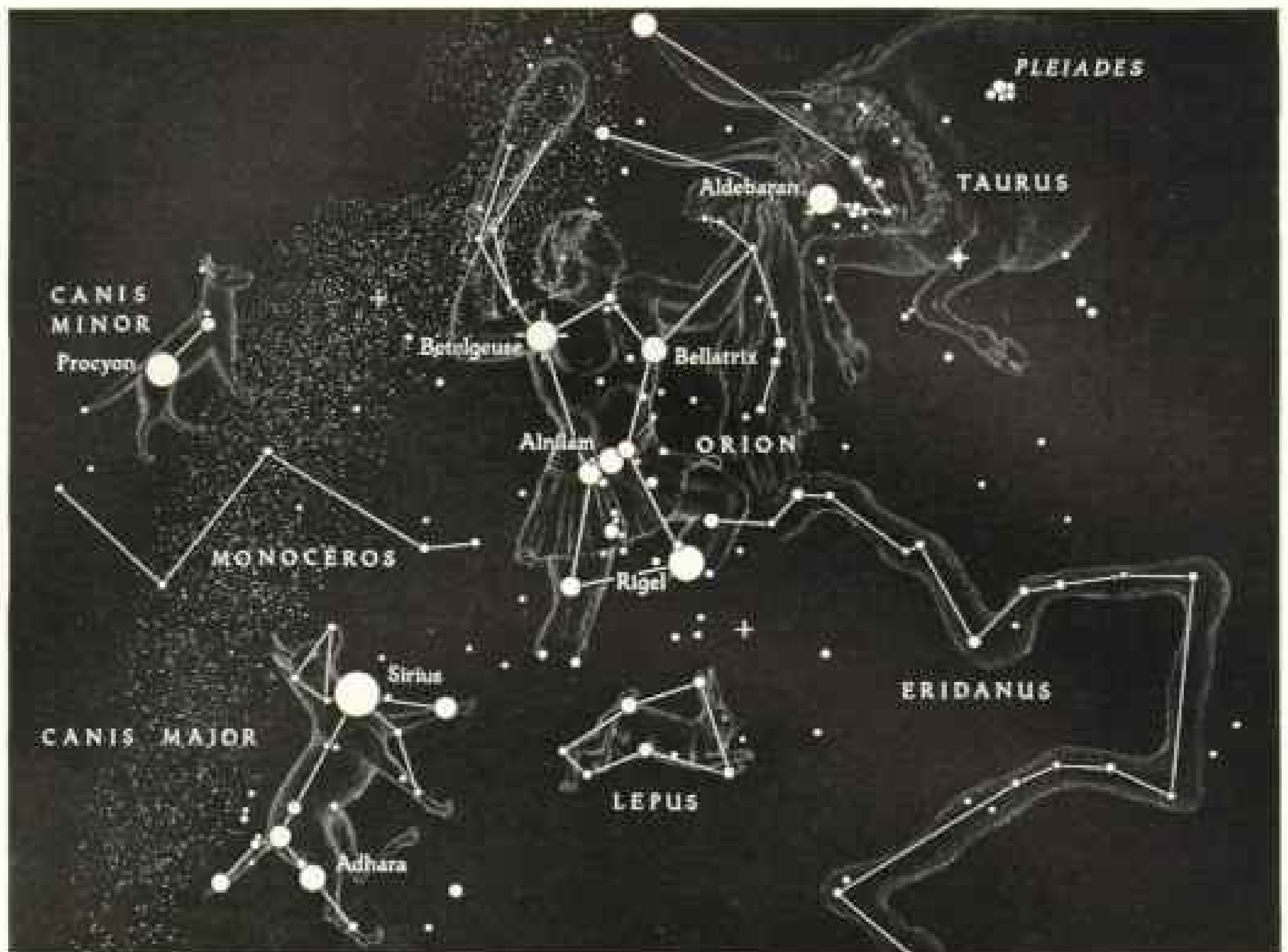
In mythology Orion is the mighty hunter who boasted that no animal on earth could conquer him. The Scorpion therefore stung him on the foot as punishment for his vanity.

A background of faint stars runs through the constellation, and any glass will reveal beautiful patterns. The central star of the dagger is the famous Orion Nebula, a patch of mixed dark and luminous material.

### **Taurus: The Bull**

Taurus, the Bull, a zodiacal constellation, is formed of two groups of stars (page 112). One





### An Assembly of Bright Navigational Stars Shines in This Section of the Sky

Generally considered most magnificent of all the constellations, Orion contains many famous stars (page 111). The three in his belt are especially noticeable. The giant raises his mighty club to attack Taurus, the threatening bull. Eridanus, the Heavenly River, flows from Orion's left knee far down to the south. Lepus (Hare) flees eternally from Canis Major (Greater Dog), in which Sirius, the Dog Star, shines brilliantly.

is the Hyades, a V-shaped cluster above and west of Orion, with the red star Aldebaran at the upper left. The second, the famous Pleiades, lies farther west, and is composed of six stars arranged in the form of a tiny dipper. Aldebaran, the Follower, so named because he follows the Pleiades in their westward course, is used by navigators.

The V of the Hyades forms the Bull's head, with fiery Aldebaran in the eye. The long horns extend northeast to Auriga. The Pleiades (the Clusterers), once regarded as a constellation, now rate only as a star group, or asterism, in the Bull's shoulder. Taurus is supposed to be the snow-white form assumed by Jupiter when he abducted the beautiful Europa, according to mythology.

#### Eridanus

This constellation, representing the great River Po of mythology, lies at the eastern boundary of the "heavenly sea" (above). To trace it, look just above Rigel, in Orion's left leg, where in the knee you will see a bright star, the first of a long, straggling line that swings westward toward Cetus. From there it curves to the south and east, then continues far to the south, terminating in the

bright star Achernar (the River's End). Achernar, a first-magnitude navigational star, is not visible from any point north of latitude 30 degrees.

#### Canis Major: The Greater Dog

The stars of Orion's belt point southward approximately in the direction of Sirius (the Dog Star) in the constellation of Canis Major, the Greater Dog (above). The oldest legends make him the hound of Orion.

Sirius is the brightest star in the sky, shining with a clear blue-white light. The planets Jupiter, Venus, and occasionally Mars may surpass it in brilliance. It is one of the nearest stars to Earth, being only about nine light years distant. Sirius is also a double, its companion being one of the densest stars known. A teaspoonful of matter from the companion would weigh about a ton.

#### Canis Minor: The Lesser Dog

Northeast of Sirius is another first-magnitude star, forming an equilateral triangle with Sirius and Betelgeuse. This is Procyon, Precursor of the Dog, so called because its appearance above the horizon showed that Sirius would rise soon

after. The Greeks named it the Lesser Dog (page 112).

The name "Procyon" is applicable only at the rising, because Sirius, being farther to the south, sets first.

### Lepus: The Hare

Directly below Orion is a conspicuous group of stars comprising the constellation Lepus, the Hare, fleeing from the hound of Orion (page 112). Viewed with field glasses, Lepus is as splendid in appearance as Orion to the naked eye.

The race between Canis Major and Lepus is the greatest and perhaps the most futile chase in history. For the dog has even less chance of catching the rabbit than has a greyhound at a dog race track of reaching the mechanical hare that always keeps one jump ahead.

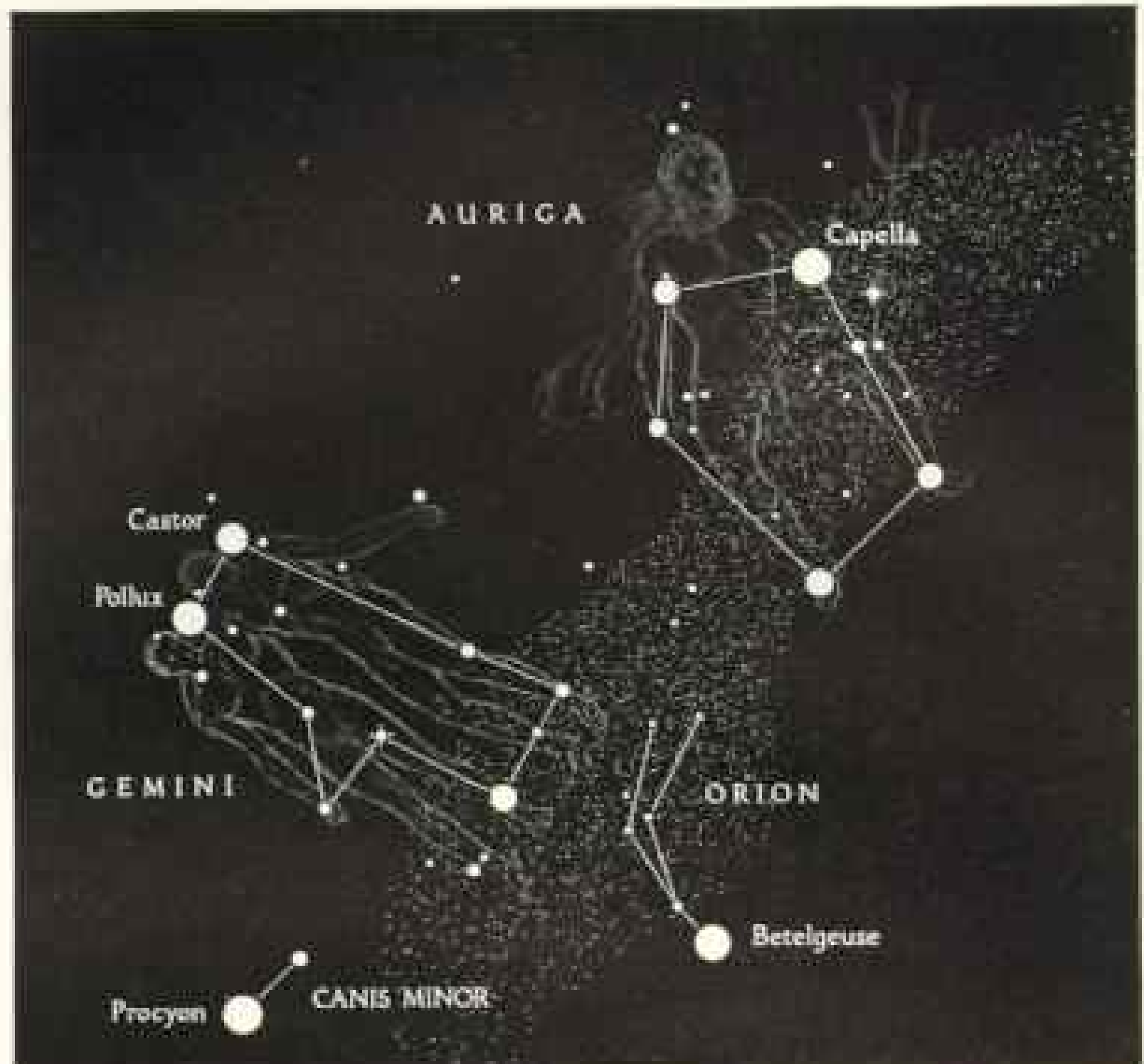
### Monoceros: The Unicorn

We have not shown the figure of Monoceros, the Unicorn, because of the faintness of the stars, but on a dark night you may be able to discern the outline of a delicate, animal-shaped figure (page 112). Old records lead to the belief that a unicorn may have been pictured in the neighborhood of Monoceros even in Assyrian times. Pictures on an Assyrian cylinder indicate that the legend of the hostility of the Lion and the Unicorn existed even then, symbolizing the supposed enmity of the sun and moon.

### Auriga: The Charioteer

Auriga stands above Orion and Taurus, in the northern part of the sky (above). To locate Capella, its brightest star, proceed from the Pointers of the Dipper to Polaris and thence at right angles along the direction that the bear is facing. Auriga is directly in the Milky Way, just east of Perseus, and its pentagonal figure stands out clearly. Three fainter stars, in an isosceles triangle, close to Capella, provide an additional identification.

We have represented Auriga as Neptune, god of the sea and of storms, which seems most logical of all the confusing mythological ideas associated with this constellation. Greek legend says the chariot was invented by the god Erichtheus, and that this event was immortalized in the sky



Auriga, the Charioteer, Dashes across the Sky near Gemini, the Heavenly Twins

A bright pentagon of stars marks Auriga, represented here as Neptune, god of the sea, with his trident. The star outline of the twins, Castor and Pollux (Gemini), resembles an upright piano.

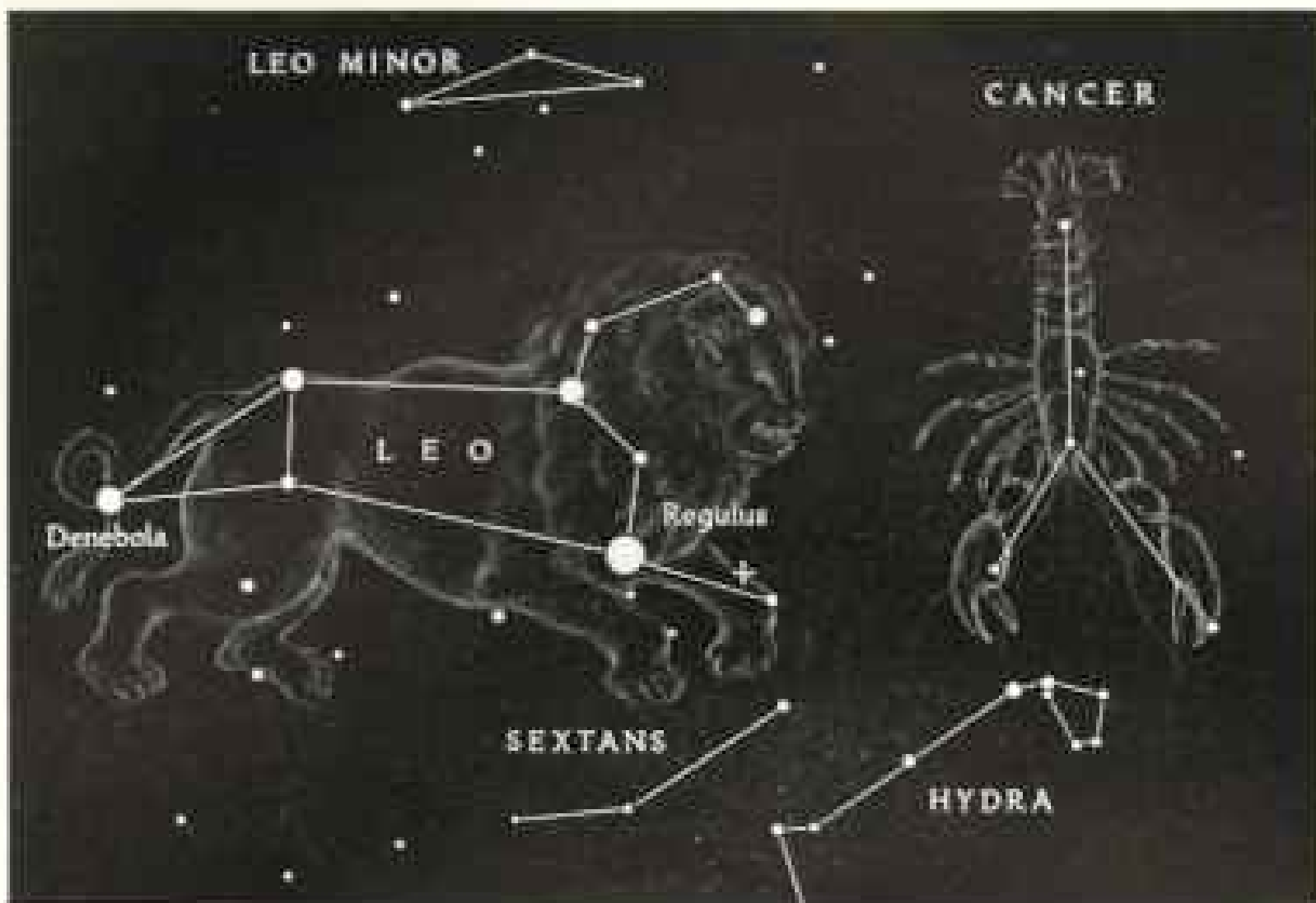
by the constellation Auriga. In mythology he was Gê, "Son of the Earth," producer of earthquakes, and so closely allied to Neptune that it is quite likely the two gods may have been the same.

Capella, brightest luminary in Auriga, was often called "the Storm Star" by sailors, for it hung low in the east at the season when storms were due. This is another reason for associating Neptune, the god of storms, with the constellation. Capella is a navigational star.

Literal translation of Auriga is "Wagon Driver," or sometimes "Charioteer," and the earliest Babylonians imagined a wagon or chariot in this position. Most star maps, however, show it as a sort of goatherd with a she-goat, Capella, draped over his left shoulder and two or three kids (the stars in the isosceles triangle) on his left arm and wrist. Probably Capella and the Kids really were a special star group within the main constellation. Capella came to be called the "Goat Star" because its appearance above the horizon heralded the rising of Capricornus, the Sea Goat, held most responsible for the weather.

### Gemini: The Twins

Due north of Procyon lies a pair of almost equally luminous stars, the Twins, Castor and Pollux, the latter a trifle more brilliant (above). The constellation looks something like a



### Star Patterns Fit Well in Leo (the Lion) and Cancer (the Crab)

Regulus, the brightest star in Leo also serves as the handle of the group known as "the Sickle," which forms the lion's head. Cancer is depicted as a lobster, which fits the star outline more precisely than does a crab. Below is the head of Hydra.

profile view of an upright plane, with the twin stars at the top. The body of the instrument swings down diagonally toward Orion's shoulder, and the keyboard projects to the left. Gemini is one of the zodiacal group.

Castor and Pollux seem the most logical of the twins of mythology to be represented by this constellation. The legend says that Pollux, who was immortal, grieved at the death of his mortal brother and asked Jupiter for the blessing of death, so that he might join Castor. Jupiter compromised by releasing Castor from Hades provided Pollux would take his place, and the brothers took turns above and below.

About 2000 B. C. and earlier, the twin stars were roughly parallel to the Equator, with Castor on top from the rising of the constellation until it reached its highest point, and Pollux above the other half of the time, from then until it set. This behavior would fit the legend, although of course today the shifting pole has altered the orientation of the stars, so that Pollux is on top considerably more than half the time.

Star fields in Gemini are among the most gorgeous of the sky, and even a field glass will reveal the floor of the Milky Way as inlaid with myriads of diamonds. Castor actually is one of the most complicated systems of multiple stars so far discovered. Pollux is a navigational star.

#### Leo: The Lion

Well to the east of Gemini is another magnificent zodiacal constellation, Leo, the Lion (above). To locate its first-magnitude navigational star, Regulus, draw a line through the Pointers of the Big Dipper, southward away from Polaris, and it will come close to Regulus.

This star forms the handle of a group called "the Sickle," which it resembles, and which also forms the lion's head. Regulus is in the upper fore leg. A small triangle to the east forms the haunches, with Denebola, a navigational star, in the right position for its name, "Tail of the Lion." Denebola, Arcturus, and Spica form a great equilateral triangle.

Leo represents the Nemean lion slain by Hercules as the first of his twelve great labors. In 2000 B. C., summer began at the moment when the sun reached the region of Regulus, which may account for the fact that Leo is a symbol of the sun, although the shaggy yellow mane, symbolic of solar rays,

is an additional reason. Regulus is closer to the ecliptic (path of the sun through the sky) than any other star of first magnitude. These circumstances may account for its name, "Little Ruler," for astrologists considered it one of the most "powerful" stars.

#### Cancer: The Crab

Between Regulus and Pollux lies Cancer, the Crab, another zodiacal figure (above). The faint stars form a rough Y outline around which a crustacean is usually drawn, though the Egyptians placed their sacred beetle there. A crab is more conventional, but a lobster seems to fit the stellar pattern more precisely, and many old maps have so depicted the group. Cancer, in mythology, was the crab sent by Juno to harass Hercules during his second labor, the fight with the Lernaean Hydra.

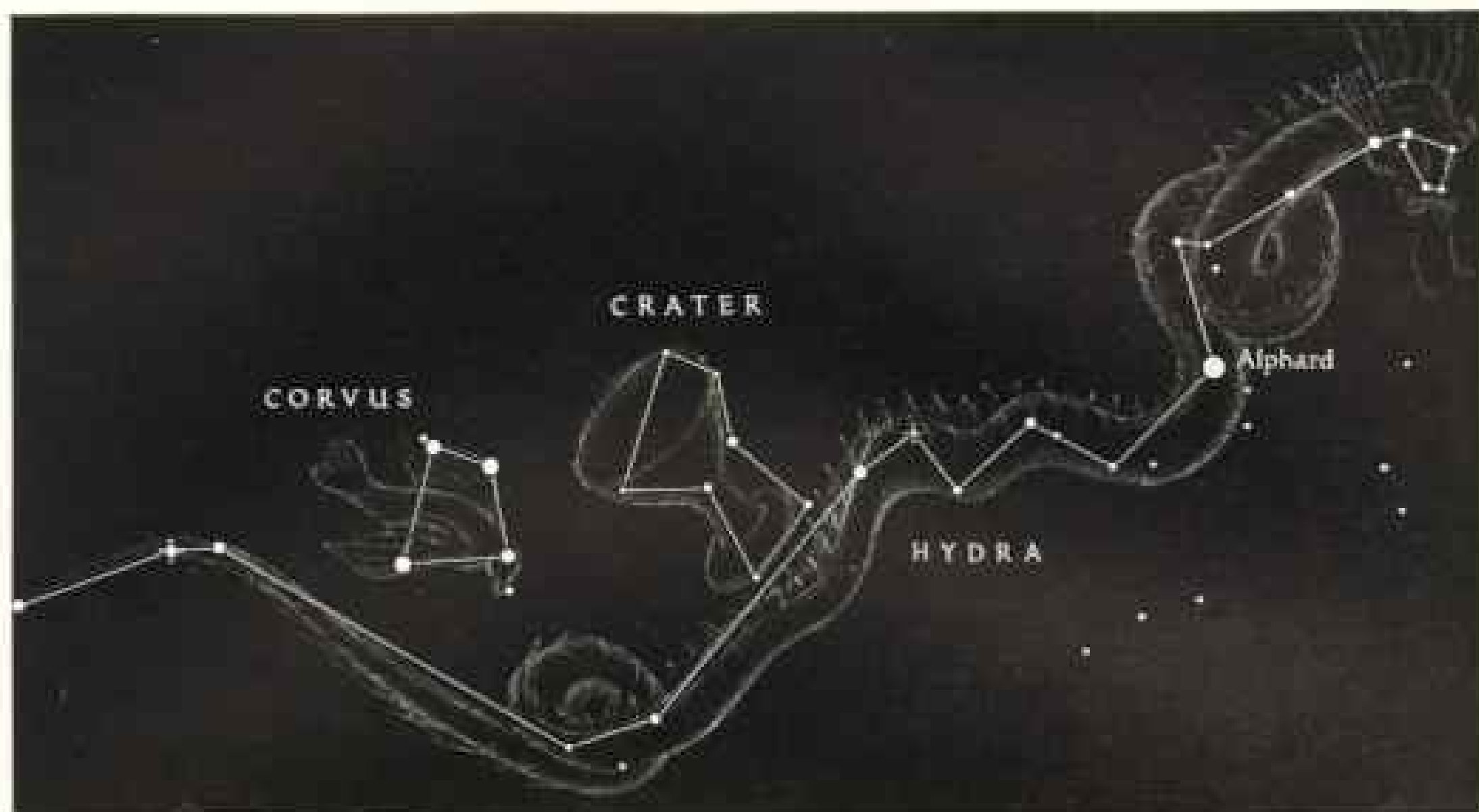
In the center of Cancer is a hazy object, the Beehive, or Praesepe, a magnificent cluster of faint stars. In another popular representation of Cancer, known as the Asses and Manger, the Beehive forms the crib from which the asses, two faint stars, are supposed to be feeding.

#### Leo Minor: The Lesser Lion

Between the hind feet of Ursa Major, and a little to the fore, is a small oblique triangle of faint stars surrounded by a few scattered, still fainter ones (above). Hevelius formed the group from outlying stars of the Lion and Bear and named it the Lesser Lion.

#### Sextans: The Sextant

Sextans, the Sextant, between Leo and Hydra, is a modern constellation with only a whimsical



### Coils of the Monster, Hydra, Stretch Far across the Heavens

Though legend gives many heads to Hydra, there are enough stars for only one in the drawing. The stars outlining Crater (the Cup) give it a rather lopsided appearance. The figure of Corvus (the Crow) is formed by four fairly bright stars.

background (page 114). It was created by Hevelius to immortalize, facetiously, his favorite sextant, lost when his house burned in 1679.

This act led to what I regard as a catastrophe. In 1752 Lacaille, an able, though unimaginative French astronomer, decided there were too many vacant spaces in the southern sky and proceeded to clutter them with constellations representing scientific instruments, such as a telescope, microscope, clock, etc. They have no mythological significance, but unfortunately many of them came to be adopted, primarily because they are so far south as to be out of range for northern observers.

### Hydra: The Sea Serpent

Directly below Cancer you can see the head of the Lernaean Hydra, slain by Hercules (above). The available stars provide for only one head, though legend gives it a varying number. The head is a distinct group of five stars, with a sixth close by in the neck. Well south and east is the navigational star Alphard, "the Solitary One in the Serpent," also called Cor Hydrae, "Heart of the Snake." It forms a right triangle with Regulus and Procyon, with itself at the right angle. From Alphard the snake straggles south and eastward across the sky below Virgo.

### Crater: The Cup

On the back of Hydra, between it and Virgo, lies a group of faint stars resembling a battered golf trophy. This is Crater, the fabled cup of Bacchus, god of wine. An opera glass reveals the presence of several star fields of delicate beauty.

### Corvus: The Crow

Farther east than Crater, just southwest of Spica, flies Corvus, the Crow, above Hydra's back. Four fairly bright stars form a striking four-sided figure. Corvus seems to have represented a storm bird in mythology. The constellation may have some solar significance, possibly suggested by the fact that large, black sunspot groups, occasionally visible to the naked eye, resemble flying crows. The star nearest Spica in Corvus has a companion that can be seen with the naked eye.

### Southern Constellations

In addition to the 53 northern constellations just described there are 35 southern groups, inconspicuous or completely invisible from the United States.

A few of the more northerly were known to the ancients: Corona Austrina, Southern Crown; Centaurus, Centaur; Lupus, Wolf; Ara, Altar; and Argo Navis, the Ship Argo, divided into Carina, Keel; Puppis, Stern; Vela, Sail.

In 1603 Bayer named 13 southern constellations: Apus, Bird of Paradise; Chamæleon, Chameleon; Columba, Dove; Dorado, Goldfish; Grus, Crane; Hydrus, Water Snake; Indus, Indian; Musca, Fly; Pavo, Peacock; Phoenix, Phoenix Bird; Triangulum Australe, Southern Triangle; Tucana, Toucan; and Volans, Flying Fish. There is also Crux, the Southern Cross.

Lacaille added 14 more, mostly a clutter of astronomical equipment. In Octans, the Octant, lies the South celestial pole, its fifth-magnitude star Sigma being the nearest substitute available for a "South Star," southern equivalent of Polaris (page 100).

## How to Use the Star Charts

THE monthly sky maps presented on pages 117 through 128 were especially designed by the author to show the appearance of the sky over a range of latitudes. They represent the interior of the "bowl" of the sky overhead, as if it had been sawed through on an east-west line and the southern half folded back upon the northern. The narrow part of the hourglass figures is the zenith, directly overhead. One half of the hourglass represents the northern half of the sky, the other the southern half.

If you were to fold one of the maps over on itself, drawing the corners together, it would form a rough bowl shape, like the real sky. The curved edges of the upper and lower halves of the hourglass would come together. Imagining this procedure may help you to understand the maps better.

The straight top and bottom edges of the hourglass figures form the northern and southern horizons. To locate stars in the northern half of the sky, face north, and hold the map so that the horizon marked "north" is at the bottom. To locate stars in the southern sky, face south, and hold the map with the horizon marked "south" at the bottom. Be sure to note the positions of the bright planets, for they will help you to identify the zodiacal constellations (page 101).

When you use the charts for the morning skies, remember that any planets showing will have moved, though the star positions are the same.

### Latitude Where You Observe Determines What Stars You Can See

The stars visible to you depend upon your latitude. If you were to sail south, the stars in the north would sink gradually below the horizon behind you, and southern stars would rise over the curved surface of the earth in front. If you were to go north, the opposite would take place.

Find your own approximate latitude from the map on pages 98 and 99. Then draw straight lines across the top and bottom of the sky maps corresponding to this latitude.

For example, if you live in Philadelphia or Salt Lake City your latitude is about 40 degrees. Draw lines connecting the 40-degree marks at the top and bottom of the sky map. The stars between these two lines will be visible to you; all others will be below the horizon. The crosses near the "stem" of the hourglass indicate the zeniths for various latitudes.

Look at the dates and times shown on the left-hand side of each map, and select the one nearest the day and hour when you plan to

observe. The time given on the maps is standard time, one hour later than your local "war time." For example, 9:30 p. m. on the map is 10:30 p. m. by war time.

Find a place where you have a clear view of the sky, if possible away from city lights, and on a moonless night, and compare your chart with the actual stars in the heavens. Use a flashlight, preferably dimmed, to help you read the chart.

The different sizes of the circles representing the stars on the charts show how they differ in brightness, or magnitude, as the astronomers call it. On the right of each chart is a table showing the sizes of circles for the various magnitudes, ranging downward from Sirius, brightest star in the sky, whose magnitude is minus 1.6. (For Sirius see Charts, pp. 121-6).

### Planets Are Not Stars

Magnitudes go in reverse; that is, the brightest stars we can see are of zero or first magnitude, or minus 1.6 in the case of Sirius. Some planets are even brighter than Sirius, but they are not stars.

The planets, revolving around the sun, shine only by its reflected light, and are conspicuous only because they are so much nearer the earth.

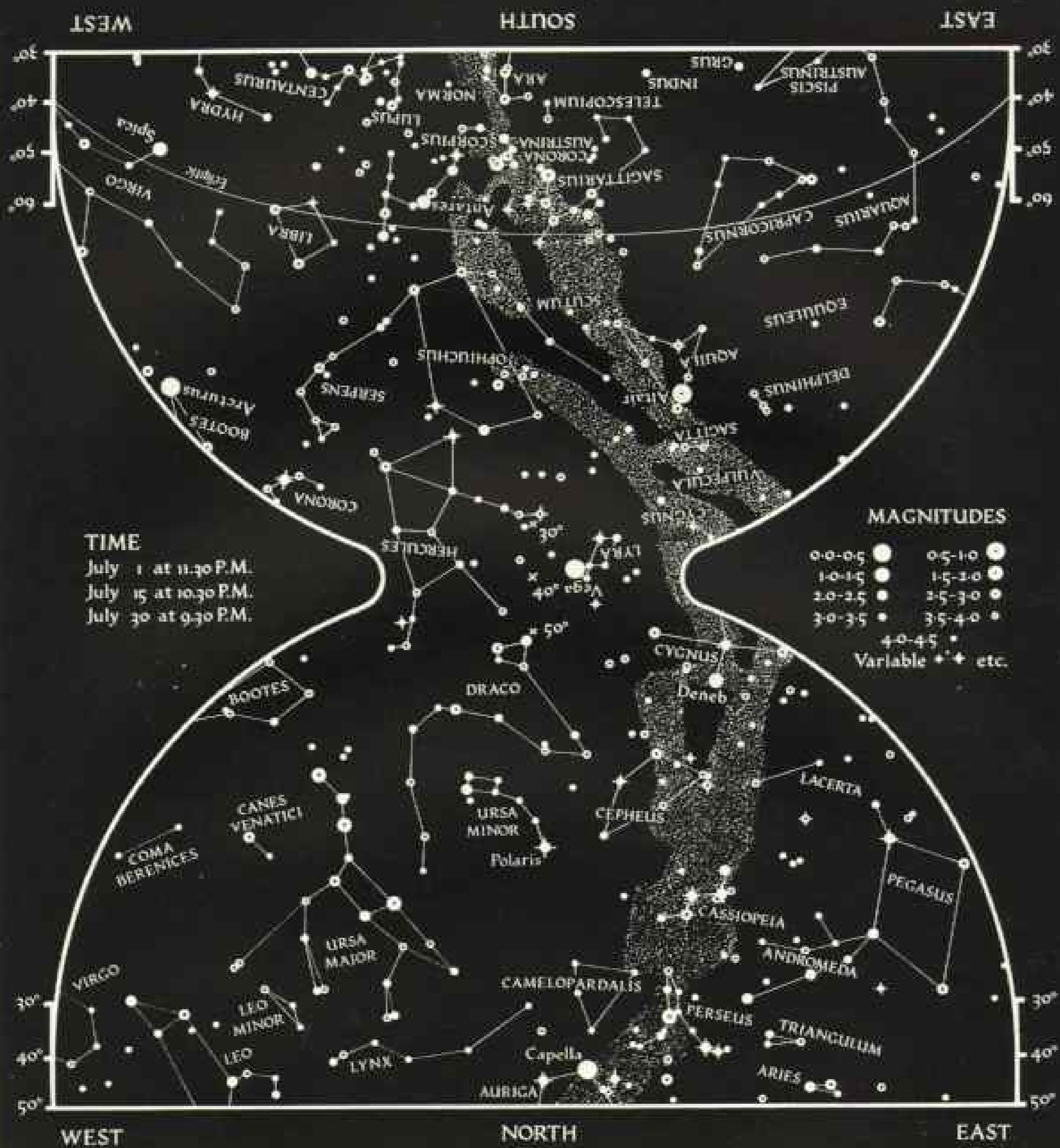
Sixth-magnitude stars are barely visible to the naked eye under the best conditions. A star of fifth magnitude is about two and one-half times brighter than one of sixth magnitude; a star of fourth magnitude is two and one-half times brighter than one of fifth magnitude; etc. Thus a star of first magnitude is 100 times as bright as one of sixth magnitude.

On the charts, a cross superimposed on a star circle indicates a variable star, one that fluctuates in brightness. Some stars vary so much in brightness from time to time that you would be confused in locating some constellations if you did not keep this in mind.

You will find it interesting to follow the fluctuations in brightness of some variable stars, and the most significant are mentioned in the constellation descriptions.

The monthly sky maps show all the stars down to magnitude four and one half (4.5), although a few slightly fainter stars, essential to the recognition of the constellations, have been included.

The diagrams of the constellations have been drawn in greater detail and are complete to magnitude 5.0, although they also include a few fainter stars. Lines connecting the individual stars in the constellations are put in to assist in recognizing the patterns.



### Around Polaris, the North Star, Swings the Familiar Big Dipper, in Ursa Major

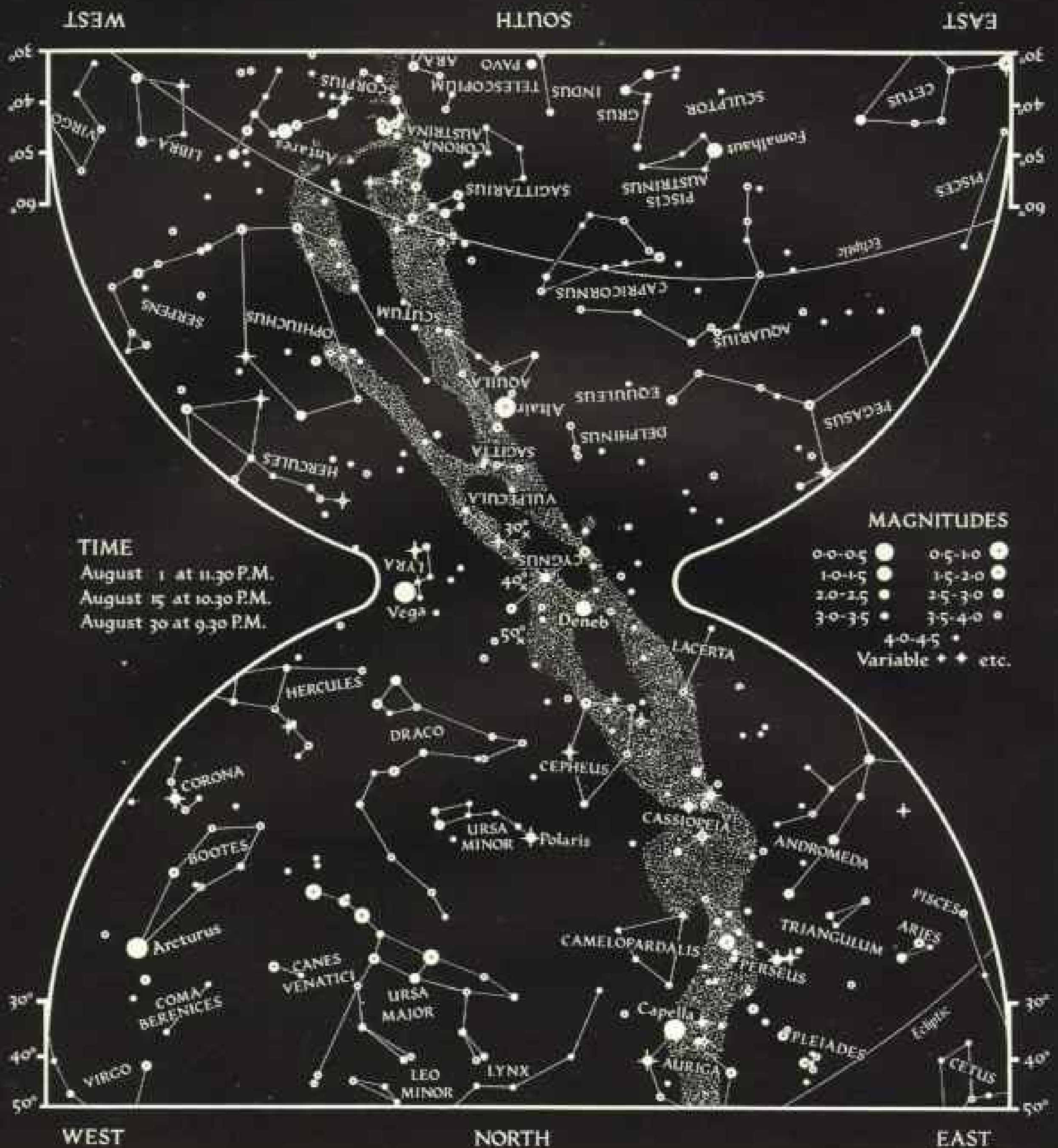
THE DIPPER, with all the other stars and constellations, rotates once every 24 hours around Polaris, in the center of the northern sky.

Now turn the chart upside down and look at the southern sky (see directions on opposite page). Near the zenith overhead you will see the bright blue star Vega, shining in the constellation Lyra (the Lyre), a prominent object in the July heavens. Vega is used as a star sight by navigators. Time is standard, not war time.

The planet Venus shines brightly in the early-evening sky in July, but will have sunk below the western horizon before the times designated for this chart to be used (see table at left of chart).

The hourglass charts depict the evening sky for each month, but they can also be used for the early-morning sky (after midnight). For example, the reader who desires the chart for 2:30 a. m. of July 15 will calculate as follows:

Although the stars always hold the same relative positions as they progress around the sky in the course of a year, each day they reach their original positions four minutes earlier. Hence, every month the stars rise for us two hours earlier. The star picture at 2:30 a. m. will be the same as that at 10:30 p. m., two months later. For 2:30 a. m. of July 15, see chart for 10:30 p. m. September 15 (page 119).



### Crosslike Cygnus (the Swan) and Aquila (the Eagle) Are Conspicuous in the August Sky

CYGNUS is at the zenith and Aquila south of it (pages 106-107). Be sure to look also for the small but beautiful constellation Delphinus (the Dolphin). Notice the black patches in the Milky Way in or near Cepheus, Cygnus, and especially Aquila. They are vast clouds of cosmic dust which dim the light of the distant stars behind them.

Venus attains its greatest brilliance on July 31, though it still appears too early in the evening to show on this chart. Thereafter it moves rapidly toward the sun and by the end of August is invisible to the naked eye.

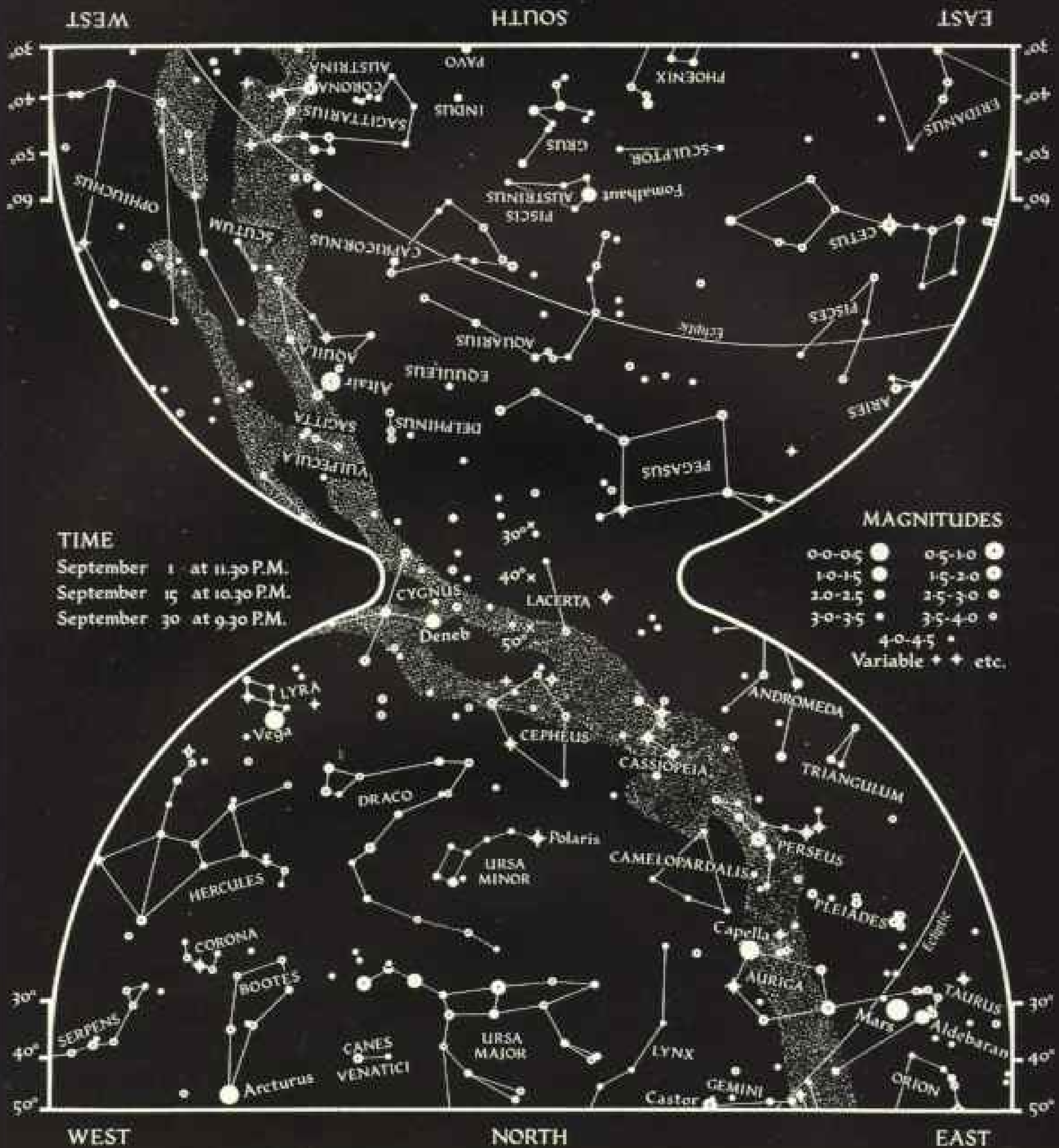
The ecliptic, or apparent path of the sun and

planets through the heavens, is shown as a curved line on each chart, in most months divided between the northern and southern skies.

Sagittarius (the Archer) and Scorpius (the Scorpion) are conspicuous in the south (pp. 105-6).

Just above the southern horizon (top of page) in lower latitudes you can see the minor constellations Corona Austrina (the Southern Crown), a delicate oval of stars; Telescopium (the Telescope); and one or two stars in Indus (the American Indian) and Pavo (the Peacock).

The August chart also shows the appearance of the early-morning sky for May 15 at 4:30 a.m.; May 30, 3:30 a.m.; June 15, 2:30 a.m.



**In September Cassiopeia, the W-shaped Group of Stars, Is Prominent in the North**

**T**HE BIG DIPPER here lies just below the North Star. It forms part of the Great Bear, Ursa Major, probably the best known of all constellations in the Northern Hemisphere (page 100). The "Great Square" of Pegasus is just east of the zenith, with the double line of stars that forms Andromeda extending to the north (page 109).

Mars shines brightly in Taurus, toward the east of the northern horizon, in September. Saturn rises soon after midnight, too late to show on this chart, but is a conspicuous object in the heavens for the rest of the night.

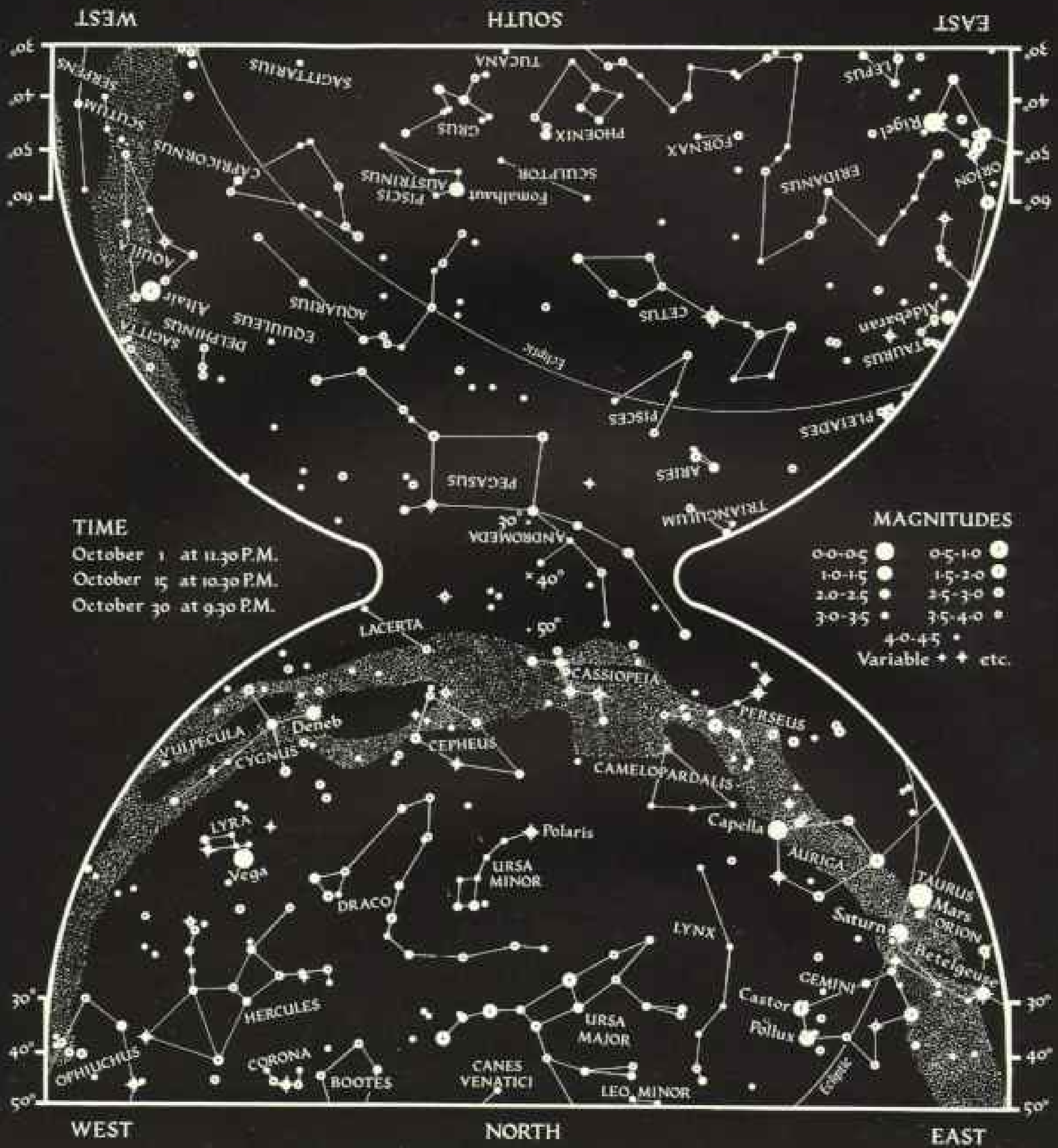
It may help you to remember the locations of

some of the constellations in the northern Milky Way if you note that Camelopardalis (the Giraffe), Cassiopeia (page 108), Cepheus, and Cygnus lie almost in a straight line and are also arranged in alphabetical order, their names all beginning with "C."

Near the southern horizon in low latitudes you can see Grus (the Crane) and Sculptor (the Sculptor's Studio), both unimportant constellations.

The September chart also can be used to depict the appearance of the sky for early morning on June 15 at 4:30 a.m.; July 1, 3:30 a.m.; July 15, 2:30 a.m.





### Mars and Saturn Shine Brilliantly in the Eastern Heavens during October

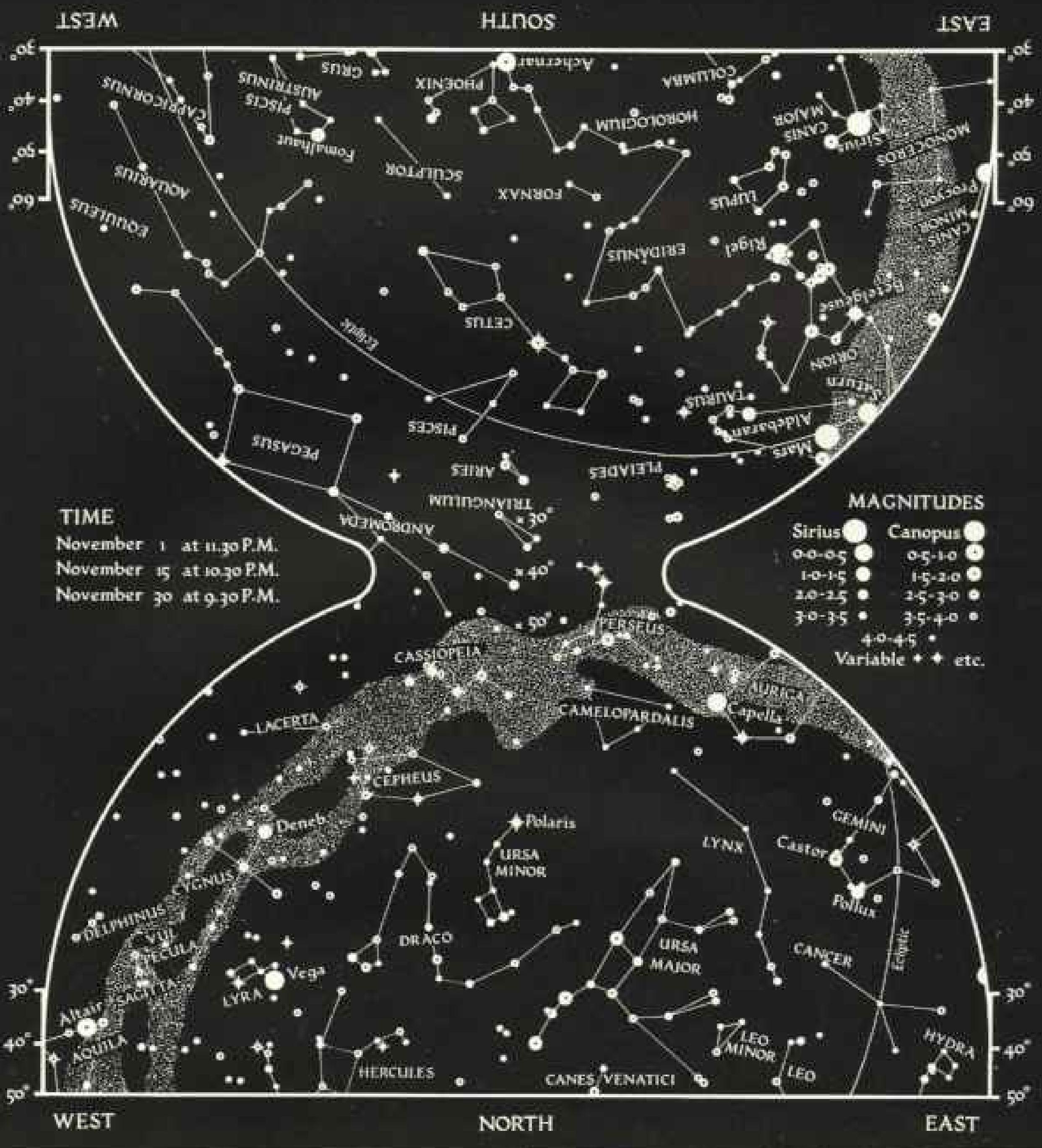
**T**HE TWO planets swing well into view during this month. They can be seen almost exactly due east and a trifle to the north at the times indicated for observation. Mars is unmistakable; its brilliance and reddish color make it a distinctive object in the sky.

The constellation Pegasus, the Winged Horse, (page 109) flies upside down in the southern sky just below the zenith. Beneath Pegasus lies the great area known as the "heavenly sea" (p. 110). It extends from Capricornus (the Sea Goat) on the west, to Eridanus, the Heavenly River, on the east. The most conspicuous star in all this region is Fomalhaut, in the constellation Piscis Austrinus

(the Southern Fish). It is used by navigators, and its brilliance is all the more enhanced by the fact that this section of the sky does not contain many bright stars.

The Milky Way revolves around Polaris as do the constellations. This accounts for its changing position on the charts from month to month; sometimes the Milky Way passes diagonally through the center of the hourglass, at other times it is divided between the two halves.

The October sky map also shows the appearance of the heavens in the early morning of July 15 at 4:30 a.m.; July 30, 3:30 a.m.; August 15, 2:30 a.m.



**Cetus (the Sea Monster) Is the Dominant Southern Constellation in November**

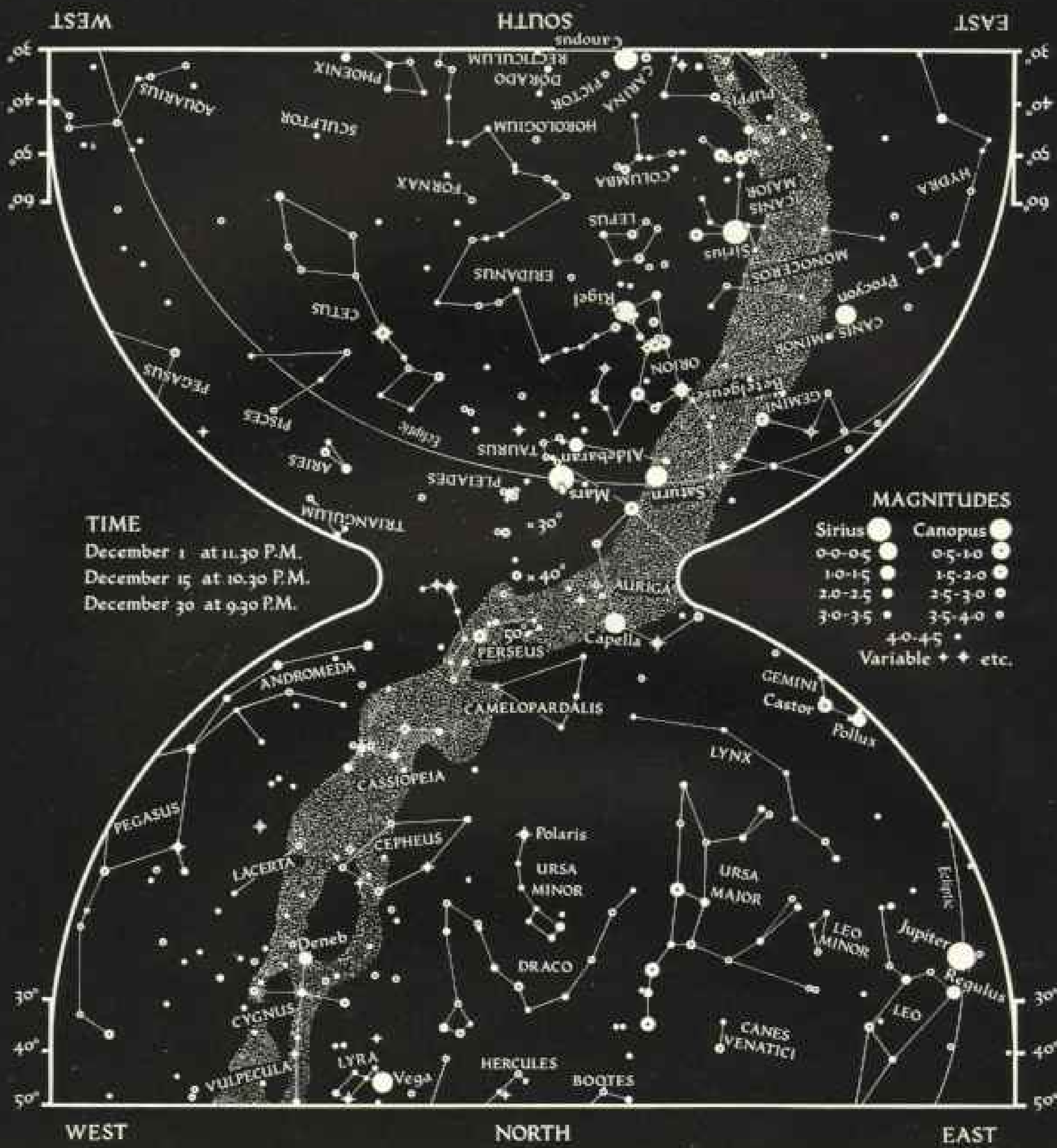
**B**RIGHTEST of the stars in this group is Mira in the center, shining with a deep red hue (page 110). It is a variable star, waxing and waning in brilliance through a cycle of about 330 days, but in November it is invisible to the naked eye. In January, however, it begins to brighten.

In the north, Cassiopeia and Cepheus have swept past the meridian and are descending toward the west. The small triangular groups of stars which form Aries (the Ram) and Triangulum lie close to Andromeda, just south of the zenith. The zodiacal constellation Pisces (the Fishes) is still farther south, with the V pointing toward Mira in Cetus.

Mars increases rapidly in brightness all through November. Both Mars and Saturn lie between the horns of Taurus. Venus, a brilliant morning object, will be conspicuous through the winter and early spring.

If you live in southern Florida or Texas you can see, just above the southern horizon, the first-magnitude star Acheron (the River's End), which marks the southern terminus of Eridanus, the Heavenly River (page 112). Well above it is Fornax (the Chemical Furnace).

The November chart can be used also for the early-morning skies of August 15 at 4:30 a.m.; September 1, 3:30 a.m.; September 15, 2:30 a.m.



### Jupiter Joins the Brilliant Parade of Planets across December's Wintry Sky

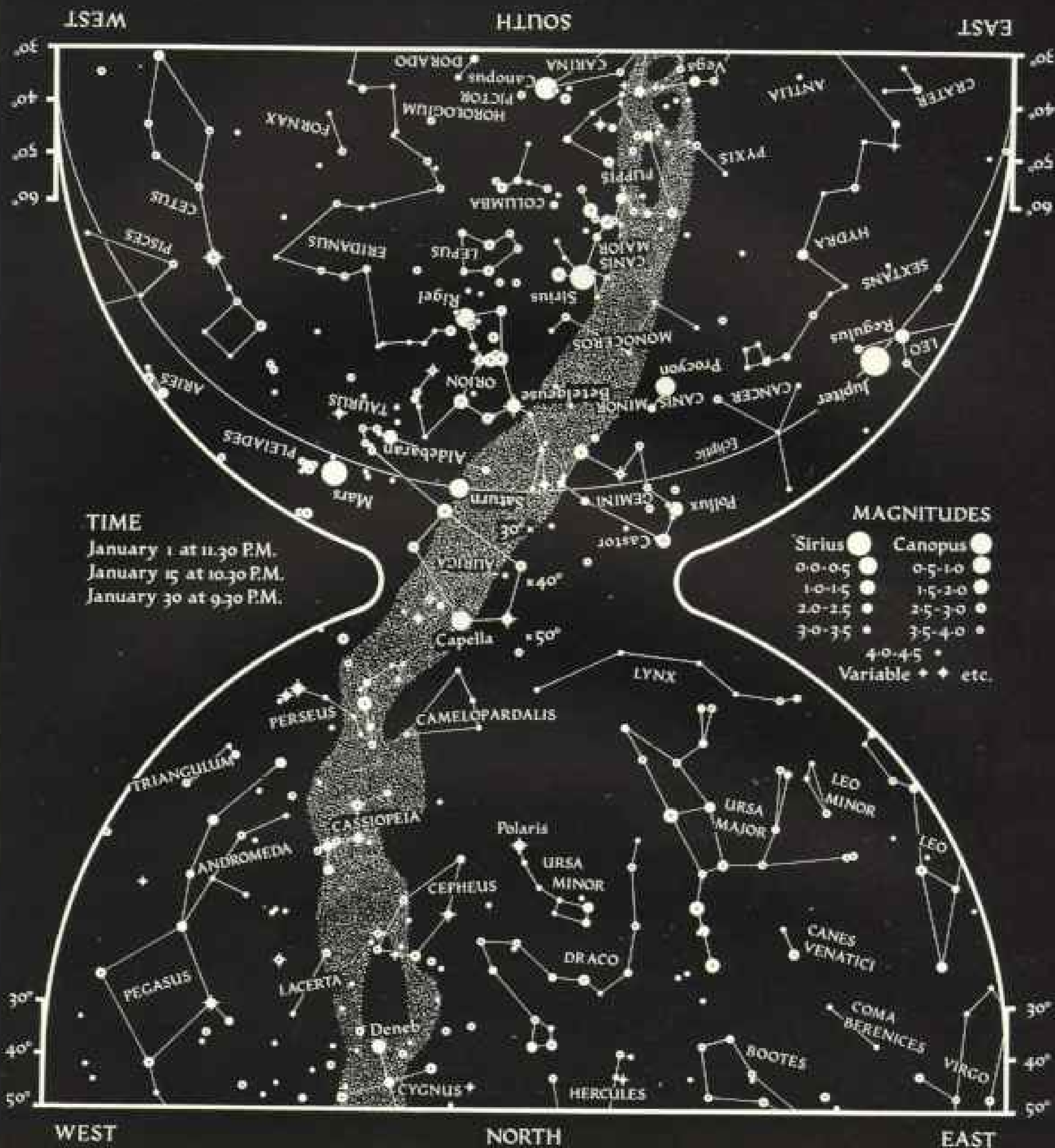
THE PLANET appears in the constellation Leo (the Lion) in the east. Mars reaches its greatest brilliance in December, but comes nearest to the earth just before the beginning of the month, on November 28. In the north, almost touching the zenith, the constellation Perseus is the most conspicuous object.

Unfortunately one may not expect to see, near Christmas, anything in the sky suggestive of the Star of Bethlehem. Various persons have theorized about the probable nature of the "Star of Wonder."

Was it, perhaps, a nova, or "new star," flashing out in temporary brilliance, a cosmic explosion?

Was it a comet, or possibly a peculiar arrangement of bright planets? All have been suggested. The Biblical story of the movement of the miraculous object, however, traveling before the Wise Men and finally guiding them to the Manger of Bethlehem indicates that it could not have been a true astronomical body. One may prefer to interpret the legend of the Star of Bethlehem in symbolic rather than scientific terms.

The December sky chart also depicts the appearance of the morning skies for September 1 at 5:30 a.m.; September 15, 4:30 a.m.; October 1, 3:30 a.m.; October 15, 2:30 a.m.



**Orion, the Mighty Hunter, Is the Central Feature of the January Heavens**

**M**ANY BRIGHT stars form the figure in the southern sky, standing with club upraised, driving Taurus, the Bull, before him (page 112). Betelgeuse, in Orion's right shoulder, and Aldebaran, in the eye of the bull, are brilliant red stars. They seem pale in contrast, however, to the ruddy splendor of near-by Mars. In the bull's shoulder lies the cluster of the Pleiades, whose beauty is greatly enhanced with the aid of opera glasses.

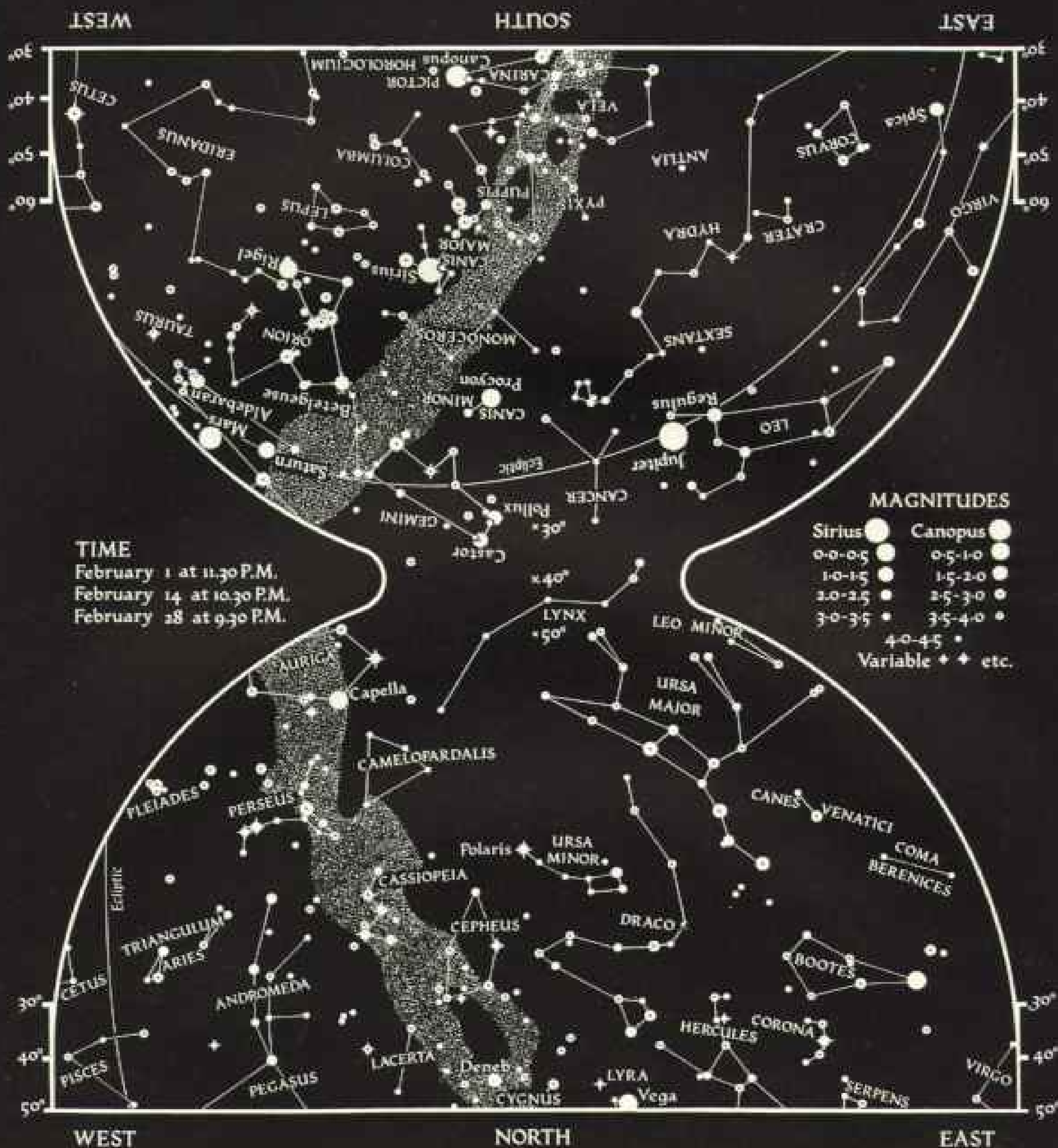
Rigel, whose blue color contrasts splendidly with the reddish hues of its bright neighbors, is in Orion's left leg. The three belt stars in Orion are almost as prominent as the first-magni-

tude stars of the constellation. Be sure to notice the faint, hazy object in the dagger, the famous Orion Nebula.

Jupiter, Mars, and Saturn all are conspicuous in January, with the first decidedly the brightest-appearing object in the sky.

Three minor constellations are visible near the southern horizon in low latitudes, Horologium (the Clock), Dorado (the Goldfish), and Pictor (the Painter's Studio). Above them is Columba (the Dove), just under Lepus (the Hare).

The sky chart for January also will serve for October 1 at 5:30 a.m.; October 15, 4:30 a.m.; November 1, 3:30 a.m.; November 15, 2:30 a.m.



### Auriga (the Charioteer) Drives Westward through the Northern Sky in February

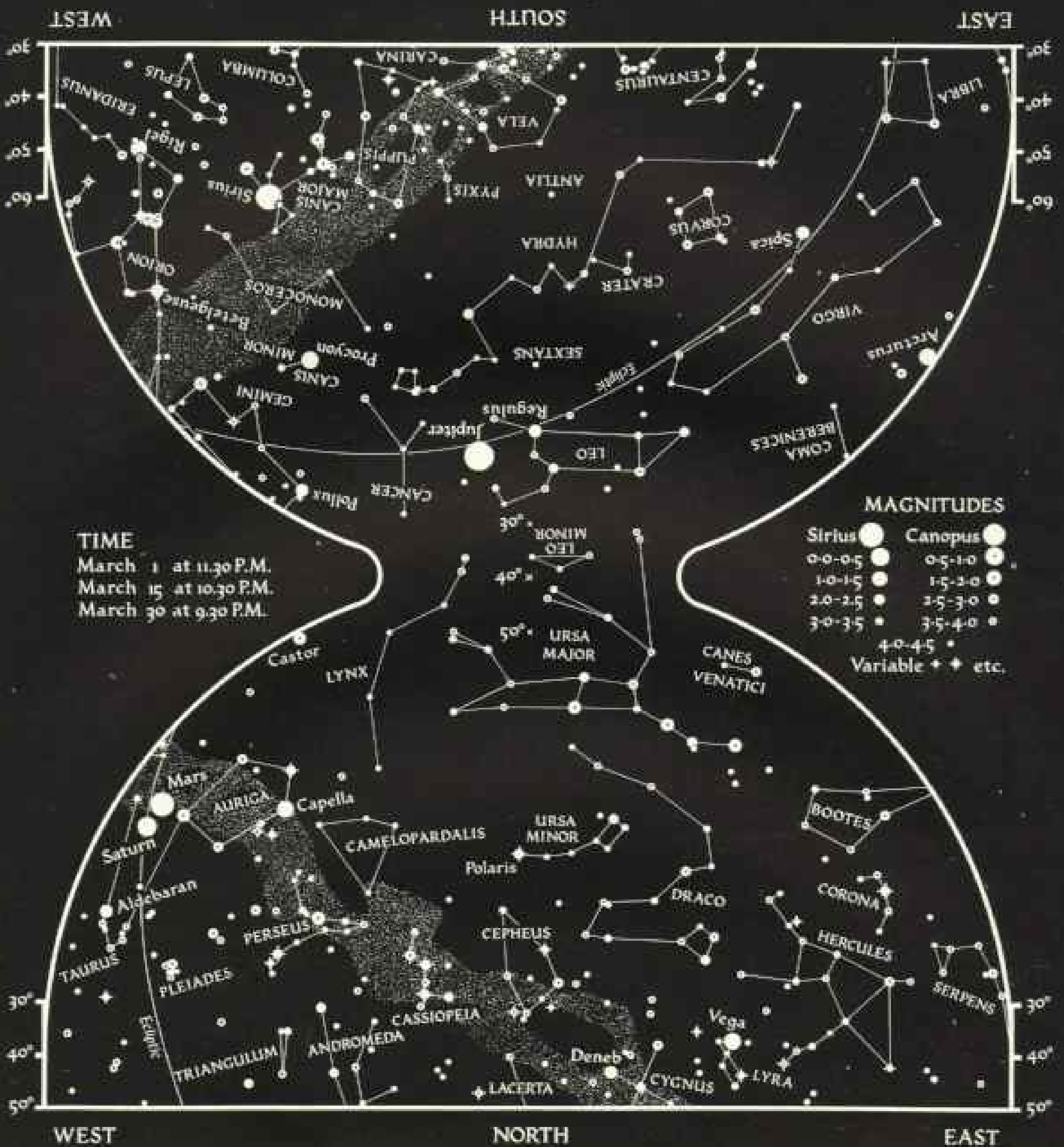
WITH ITS first-magnitude star, Capella, shining brilliantly, it is a conspicuous constellation throughout the winter months. The zodiacal constellation Gemini, with the twin stars Castor and Pollux, lies just south of the zenith. Farther south are Procyon, the Lesser Dog Star, and brilliant Sirius, the Dog Star, used by navigators.

Saturn, Jupiter, and Mars still are visible in February's evening sky. It is interesting to note that the first two have been moving very slowly, while Mars has changed its position rapidly. During the previous few months Mars has been moving apparently backwards among the stars, because of the fact that the earth, traveling faster,

was overtaking and passing it in its orbit. But during February Mars regains its normal direction of motion as its brightness begins to fade.

The star Canopus shines brightly just below Sirius on the southern horizon. It is visible, however, only from the southern part of the United States. Canopus is in the constellation Carina (the Keel), which is associated with Vela (the Sail) and Puppis (the Stern) to form a group known as Argo Navis (the Ship Argo). Near by also is Pyxis (the Compass).

The February chart can be used for November 1 at 5:30 a.m.; November 15, 4:30 a.m.; December 1, 3:30 a.m.; December 15, 2:30 a.m.



**Leo (the Lion), with Jupiter Almost in His Mouth, Is Conspicuous in March**

JUST BELOW the zenith, Leo is easily identified by a sickle-shaped formation of stars with the bright star Regulus at the end of the "handle" (page 114). Below Leo, Hydra, the Sea Serpent, sprawls across the whole center of the southern sky (page 115). A curious pentagon of stars forms its head, and the lonely bright star Alphard is its heart.

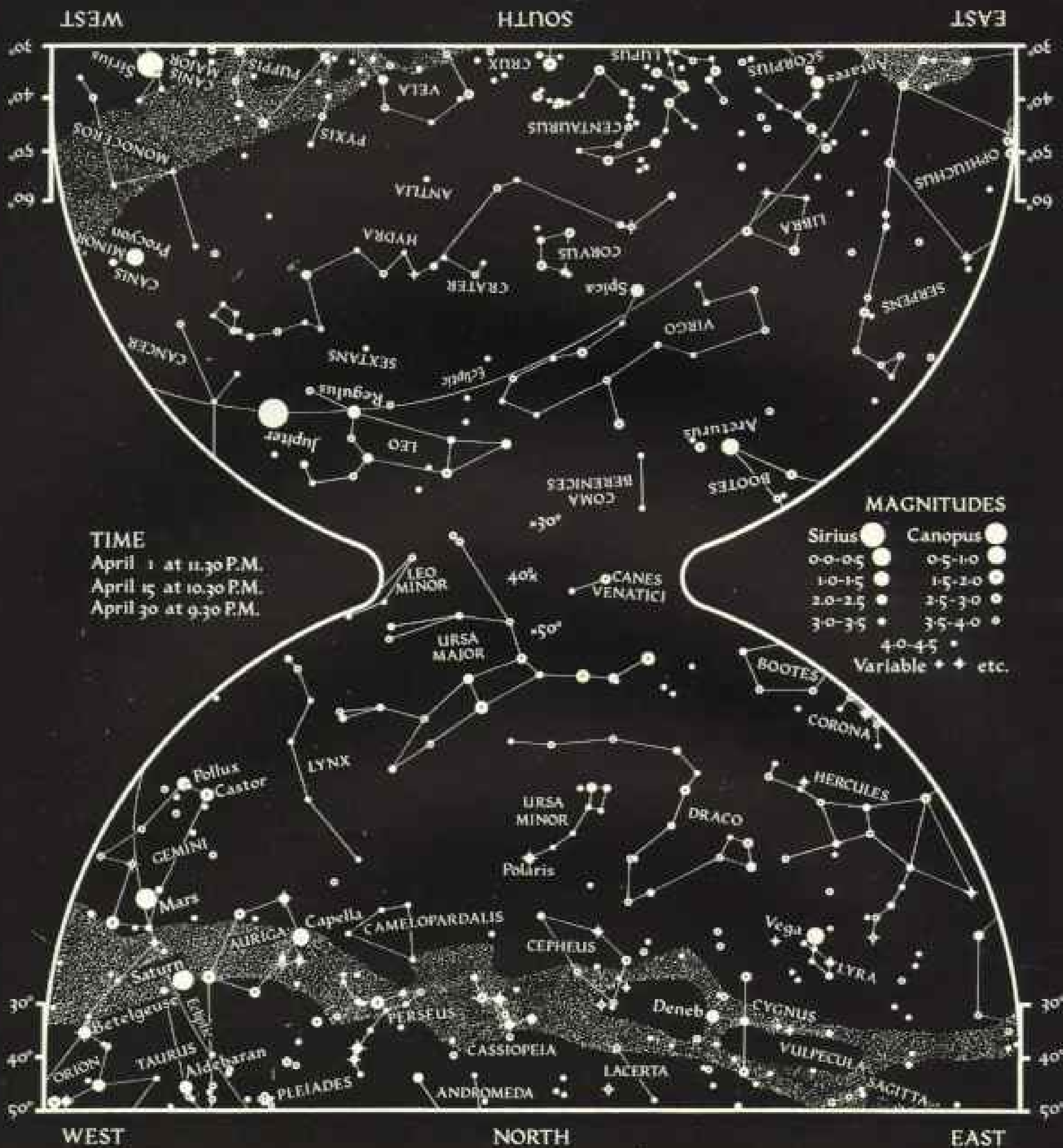
West of Leo lies Cancer (the Crab), a zodiacal constellation, its faint stars forming a rough Y outline.

In the northern sky, Ursa Major (the Great Bear), with the Big Dipper inverted, lies clumsily on its back and stretches its paws to the zenith.

Saturn and Mars now have moved far to the west, Mars having passed Saturn early in the month. Jupiter, south of the zenith, is the most striking object in the sky.

Antlia (the Air Pump) is located below the central part of Hydra. It is one of many minor southern constellations named in 1752 by Lacaille, a French astronomer, for his laboratory instruments, merely to fill empty space in this region of the sky (page 115).

The sky chart for March also is correct for early-morning use on December 1 at 5:30 a.m.; December 15, 4:30 a.m.; January 1, 3:30 a.m.; January 15, 2:30 a.m.



### Virgo (the Maiden) Rises to a Central Position in the Southern Sky in April

**T**HIS CONSTELLATION lies east of and behind Leo, slightly to the south. Let your eye follow the curving "arc" of the handle of the Big Dipper and you will see the bright star Arcturus in Boötes (page 105). Then continue to follow the curved "spike" of stars to Spica, which is the most conspicuous star in Virgo (page 103).

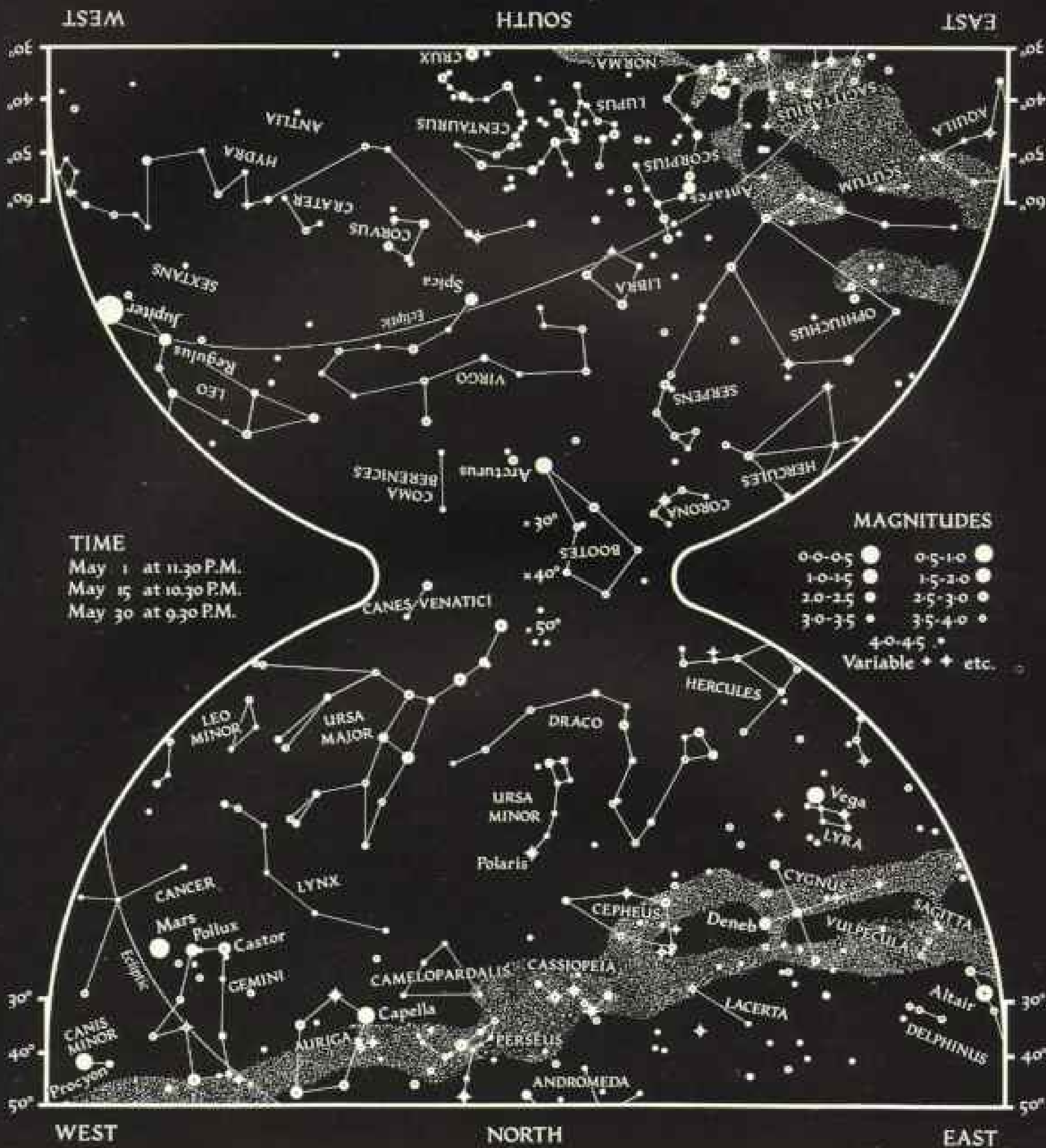
Boötes, to the north, is a prominent kite-shaped formation of stars, which is supposed to represent the driver of the Great Bear. Between Virgo and the tail of Hydra are two small but interesting constellations, conspicuous Corvus (the Crow) and faint Crater (the Cup).

Jupiter remains the most prominent planet in April, but Saturn and Mars still are visible low in the northwest. Mars has moved into the constellation Gemini, the Twins.

Crux, the Southern Cross, edges into view over the southern horizon. In the United States it can be seen only in southern Florida and Texas.

About April 12, you may see Mercury in Aries, between the heads of the Ram and Cetus, low in the west while the twilight glow persists.

The April sky also represents the appearance of the heavens in early morning on January 1 at 5:30 a.m.; January 15, 4:30 a.m.; February 1, 3:30 a.m.; February 15, 2:30 a.m.



**In May, Ursa Minor (the Little Bear) Balances on His Tail Tip, the North Star**

**T**HIS CONSTELLATION, often called the Little Dipper, swings continuously around Polaris, which is at the end of the handle.

Enveloping the Little Bear in its folds, the snakelike body of Draco (the Dragon) twists downward and then raises its brilliant lozenge-shaped head erect. Near the zenith, over the curving tail of Ursa Major, are the Hunting Dogs; Canes Venatici. Farther south is a star cluster of delicate beauty, Coma Beronices (the Hair of Berenice). Just east of Boötes lies the splendid circlet of stars forming Corona (the Northern Crown).

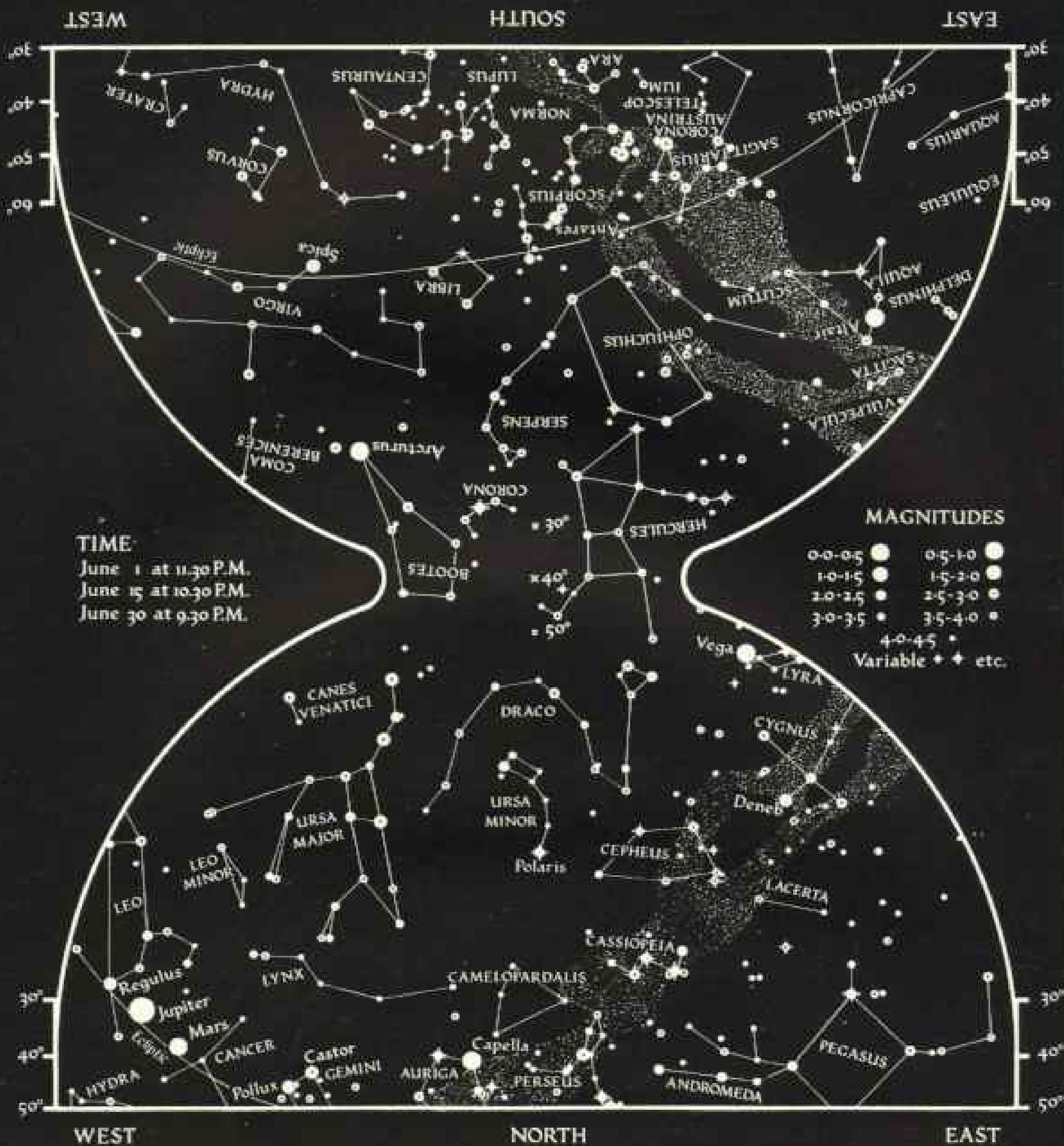
In May Jupiter has moved well to the west and

Saturn has set. Only the rapid eastward motion of Mars keeps it still above the horizon in the northern sky.

Low in the southern sky this month you can see two ancient constellations, Centaurus (the Centaur) and Lupus (the Wolf). We have not included them among our constellation drawings because they are so far south. Centaurus should not be confused with the figure of a centaur we have used for our picture of Sagittarius (p. 106).

The evening sky map for May also serves for the morning sky of January 15 at 6:30 a.m.; February 1, 5:30 a.m.; February 15, 4:30 a.m.; March 1, 3:30 a.m.; March 15, 2:30 a.m.





### Herecules Bends His Mighty Bow High in the Dome of the June Heavens

THE FIGURE of the giant almost straddles the zenith. To the east, in the Milky Way, lies Sagitta, the arrow shot from his bow (page 104). In the south, with his head almost touching that of Hercules, stands another giant, Ophiuchus, clutching Serpens (the Serpent) in his hands (page 104).

Between the feet of Virgo and the claws of the Scorpion, to the south, can be seen the faint zodiacal constellation, Libra (the Scales).

Jupiter and Mars are relatively inconspicuous in June. You will find them low in the sky, just north of the western horizon.

Near the southern horizon, Ara (the Altar) has

come into view. Ara in a sense is a duplication of Libra, which sometimes has been depicted as an altar held between the claws of the Scorpion (page 105).

The 12 charts (pages 117-128) may be used to find the star positions for January to December for every year, but they show the positions of the planets only in the evening skies from July 1943 to June 1944, as the planets' positions change rapidly (pages 101, 116).

The June sky shows also the appearance of the early-morning heavens for March 1 at 5:30 a.m.; March 15, 4:30 a.m.; April 1, 3:30 a.m.; April 15, 2:30 a.m.

# NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDINGS

SIXTEENTH AND M STREETS NORTHWEST, WASHINGTON, D. C.

GILBERT GROSVENOR, President  
ROBERT V. FLEMING, Treasurer  
HERBERT A. POOLE, Assistant Treasurer  
LYMAN J. BRIGGS, Chairman; ALEXANDER WETMORE, Vice-Chairman, Committee on Research

JOHN OLIVER LA GORCE, Vice-President  
GEORGE W. HUTCHISON, Secretary  
THOMAS W. MCKNEW, Assistant Secretary

## EXECUTIVE STAFF OF THE NATIONAL GEOGRAPHIC MAGAZINE

**GILBERT GROSVENOR, EDITOR**

**JOHN OLIVER LA GORCE, Associate Editor**

**J. R. HILDEBRAND**  
Assistant Editor

**MELVILLE BELL GROSVENOR**  
Assistant Editor

**McFALL KERBEV**  
Chief of School Service

**JAMES M. DARLEY**  
Chief Cartographer

**NEWMAN HUMSTEAD**  
Research Cartographer

**CHARLES E. HIDDIFORD**  
Cartographic Staff

**WILLMAN CHAMBERLIN**  
Cartographic Staff

**FREDERICK SIMPICH**  
Assistant Editor

**LEO A. BORAH**  
Editorial Staff

**LEONARD C. ROY**  
Editorial Staff

**WILLIAM H. NICHOLAS**  
Editorial Staff

**F. BARROWS COLTON**  
Editorial Staff

**FRANKLIN L. FISHER**  
Chief Illustrations Division

**MAYNARD OWEN WILLIAMS**  
Chief Foreign Editorial Staff

**W. ROBERT MOORE**  
Foreign Editorial Staff

**INEZ B. RYAN**  
Research Assistant

**EDWIN L. WISHERD**  
Chief Photographic Laboratory

**GERARD F. HUBBARD**  
Illustrations Division

**WALTER M. EDWARDS**  
Illustrations Division

## BOARD OF TRUSTEES

**CHARLES EVANS HUGHES**  
Formerly Chief Justice of the  
United States

**WALTER S. GIFFORD**  
President American Telephone and  
Telegraph Co.

**WILLIAM V. PRATT**  
Admiral U. S. Navy, Retired

**LYMAN J. BRIGGS**  
Director National Bureau of  
Standards

**GEORGE R. PUTNAM**  
Commissioner of Lighthouses,  
Retired

**THEODORE W. NOYES**  
Editor of The Evening Star

**L. O. COLBERT**  
Rear Admiral, Director U. S. Coast  
and Geodetic Survey

**GEORGE W. HUTCHISON**  
Secretary National Geographic  
Society

**ROBERT V. FLEMING**  
President and Chairman of the  
Board, Riggs National Bank

**H. H. ARNOLD**  
General, U. S. A., Commanding  
U. S. Army Air Forces

**LEROY A. LINCOLN**  
President Metropolitan Life  
Insurance Company

**EMORY S. LAND**  
Rear Admiral U. S. Navy, Retired;  
Chairman U. S. Maritime Commission

**DAVID FAIRCHILD**  
Special Agricultural Explorer, U. S.  
Department of Agriculture

**ALEXANDER WETMORE**  
Assistant Secretary, Smithsonian  
Institution

**JUAN T. TRIPPE**  
President Pan American Airways

**GILBERT GROSVENOR**  
Editor of National Geographic  
Magazine

**JOHN J. PERSHING**  
General of the Armies of  
the United States

**CHARLES F. KETTERING**  
President General Motors  
Research Corporation

**CHARLES G. DAWES**  
Formerly Vice-President  
of the United States

**GEORGE OTIS SMITH**  
Formerly Director U. S.  
Geological Survey

**ELISHA HANSON**  
Lawyer and Naturalist

**LLOYD B. WILSON**  
President Chesapeake and  
Potomac Telephone Companies

**ERNEST E. NORRIS**  
President Southern  
Railway System

**JOHN OLIVER LA GORCE**  
Associate Editor of the National  
Geographic Magazine

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

To carry out the purposes for which it was founded fifty-five 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 researchers solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1933, 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 72,095 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took along 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 3,625 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.

## Life-Saver for Men and Materials

A SIGNIFICANT development to come out of the first World War was a black, granular substance known as activated carbon.

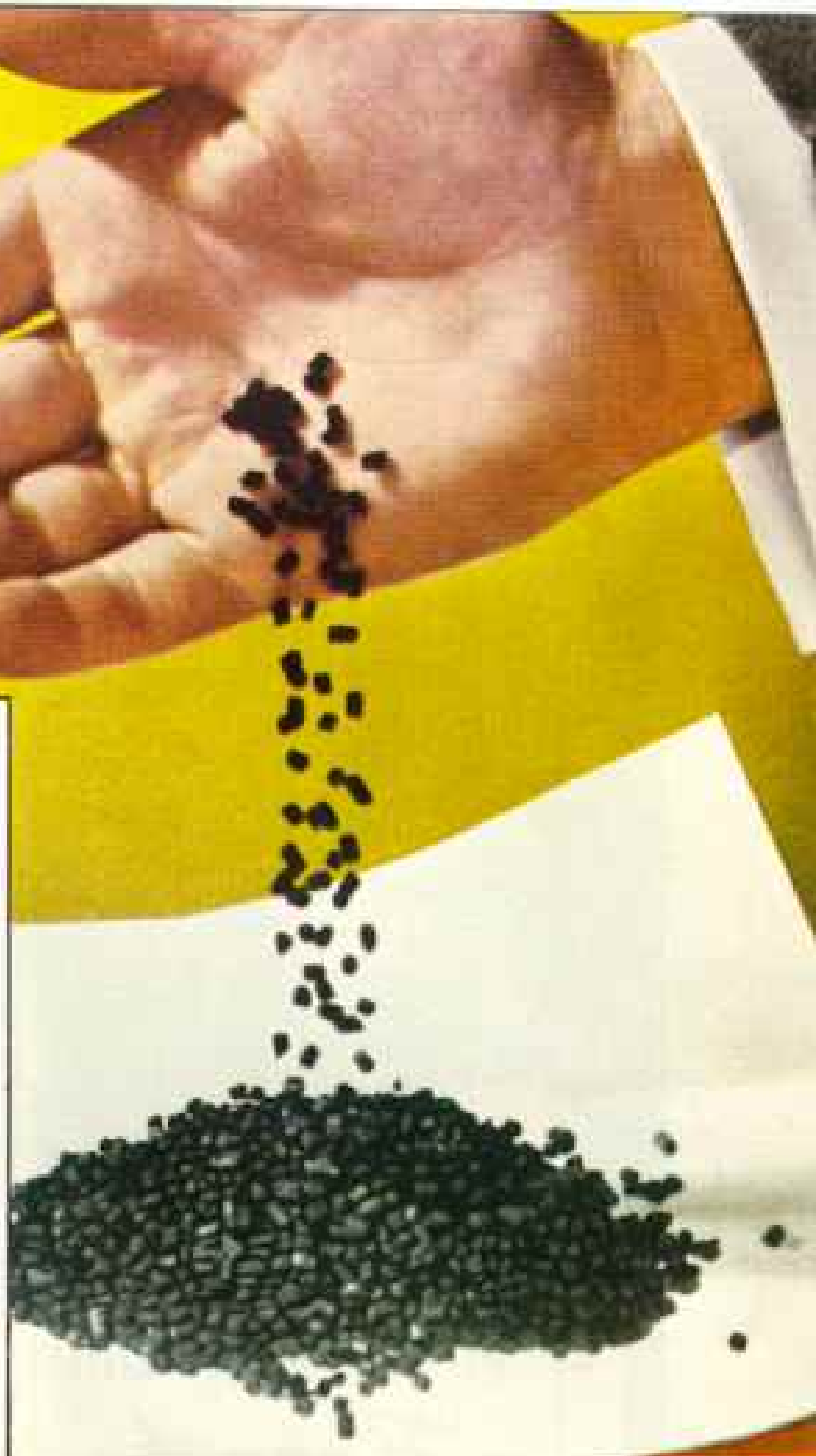
Particles of this material are so highly porous and have such tremendous active surface area, that they can pick up and hold surprising amounts of toxic gases, volatile vapors, and odors. Developed by NATIONAL CARBON COMPANY, INC., a Unit of UCC, to meet the specific menace of gas warfare, activated carbon saved many lives during the last war as an important ingredient in gas mask canisters.

After the Armistice, this amazing material was further developed by CARBIDE AND CARBON CHEMICALS CORPORATION, another Unit of UCC, for numerous industrial uses. As a result of this work, one type of activated carbon is now saving millions of gallons of such essential solvents as alcohol, ethyl acetate, ether, and acetone, previously lost through evaporation in manufacturing processes. This is accomplished by passing vapor-laden air from solvent-using processes through tanks containing COLUMBIA activated carbon, and then steaming the solvents out of the carbon.

This year, in smokeless powder plants, plants making plastics, and in other plants engaged in war work, it is estimated that savings will amount to over 100 million gallons of solvents.

And the work of activated carbon is just beginning. Through the constant research that typifies all UCC Units, CARBIDE AND CARBON CHEMICALS CORPORATION has developed still newer uses which are contributing to the nation's health and welfare.

**BUY UNITED STATES WAR BONDS AND STAMPS**



**FRESH AIR!** War workers are kept supplied with odor-free, healthful air by means of activated carbon purifiers used in conjunction with air conditioning installations.



**SAVINGS FOR INDUSTRY!** Recovery of alcohol and other solvents by activated carbon is releasing transportation and production facilities for other vital war uses.



**SAVINGS FOR YOU!** In making plastics, artificial leather, one type of rayon, and many other products, the recovery of solvents with activated carbon results in savings to consumers.



**MERCY MASK!** Men of the armed forces, Civilian Defense volunteers, and workers exposed to the dangers of toxic atmospheres are protected by activated carbon in masks.

# UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street  New York, N. Y.

*Principal Products and Units in the United States*

#### ALLOYS AND METALS

Electro Metallurgical Company  
Haynes Stellite Company  
United States Vanadium Corporation

#### CHEMICALS

Carbide and Carbon Chemicals Corporation

#### ELECTRODES, CARBONS AND BATTERIES

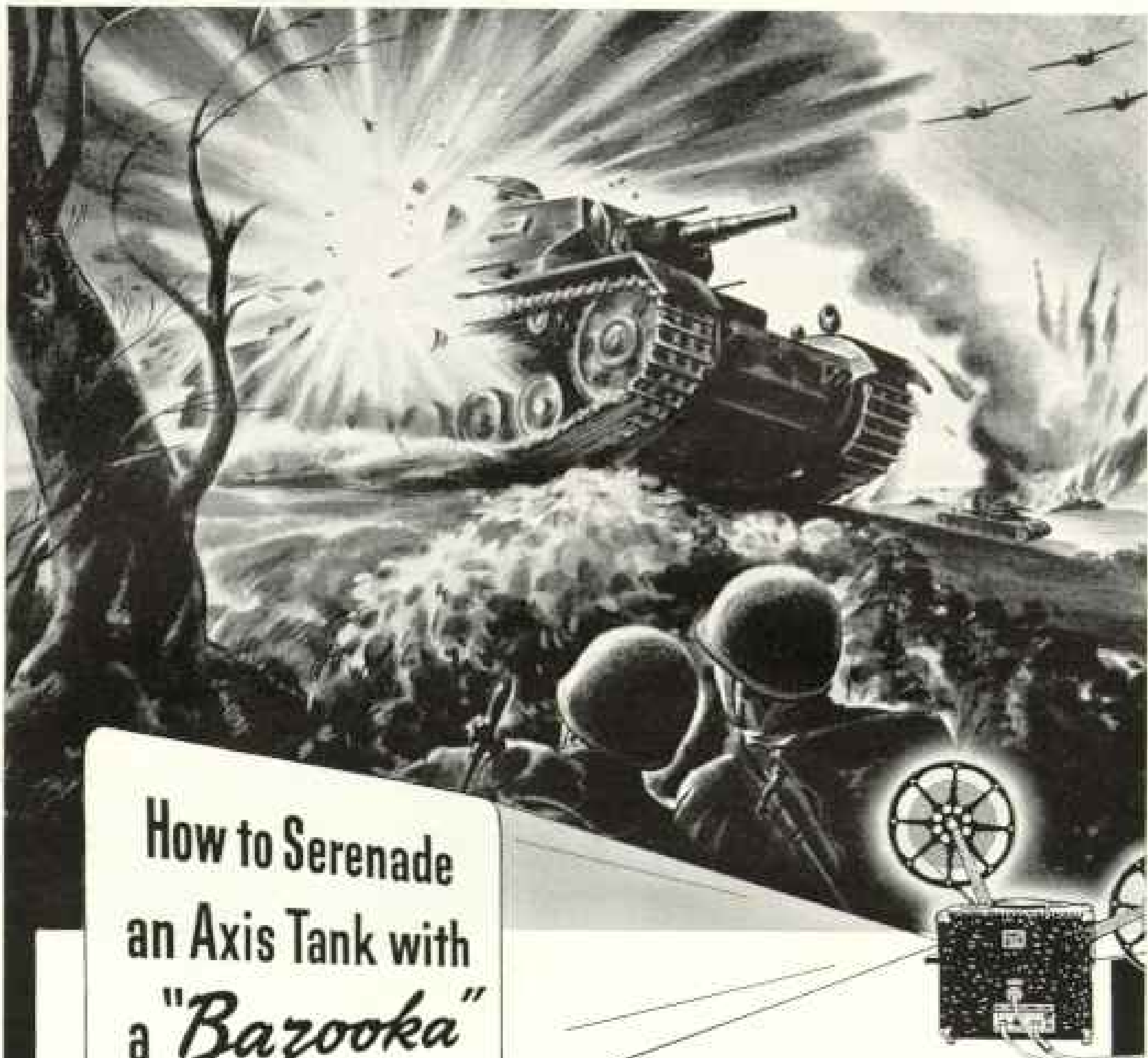
National Carbon Company, Inc.

#### INDUSTRIAL GASES AND CARBIDE

The Linde Air Products Company  
The Oswald Railroad Service Company  
The Prest-O-Lite Company, Inc.

#### PLASTICS

Bakelite Corporation  
Plastics Division of Carbide and Carbon Chemicals Corporation



## How to Serenade an Axis Tank with a "Bazooka"

"Bazooka!" That is what our fighting men in North Africa have christened the latest American invention for reducing Axis tanks to smoking piles of scrap.

How a "bazooka" looks and works is a military secret—but we can tell you that when the "bazookas" start "serenading," a near-by motion picture camera crew photographs details of the action. Soon the film is projected on the screens of U. S. Army training camps so that our men can learn how to "serenade" Axis tanks effectively and fast!

In this and hundreds of other ways, Filmo motion picture equipment is in the thick of the fight on *all* fronts of this global war. It is cutting many hours off training time. It is providing priceless hours of essential relaxation. It is saving countless lives by making it possible for

BUY WAR BONDS

American armed forces to learn the *right* way—without having to learn the *hard* way!

The need of the armed forces for Filmo motion picture equipment is great—and must be served *first*. That is why the facilities and craftsmanship of Bell & Howell are concentrated on the task of providing them with Filmo motion picture cameras, projectors, and sighting devices.

Filmo

Bell & Howell Company,  
Chicago; New York; Holly-  
wood; Washington, D. C.;  
London. Established 1907.



• WHAT YOU SEE—YOU GET •

MOTION PICTURE CAMERAS AND PROJECTORS

PRECISION-MADE BY

*Bell & Howell*



## CROSS ROADS OF THE WORLD!

**A**T MIAMI, Flight 10 is loading passengers, mail and express for points across the United States—for Canada and Alaska—for Hawaii and Australia.

A transport plane in war paint is coming in, with people and cargo from India, Africa and South America.

As soon as some of its passengers are transferred to the waiting ship, Flight 10 will be ready to go.

Today, any airport is truly a "cross roads of the world!"

Its airways feed into a vast, invisible web over which day-and-night Airline schedules carry important passengers and

cargo between hundreds of U.S. towns and cities, and to scores of foreign countries.

In addition, the Airlines fly a giant fleet of transport planes for Army and Navy supply, to every zone of war throughout the world.

Over a global system of airways, Air Transport will one day be devoted entirely to friendly commerce, with the nearest airport your short-cut to any point on earth!

*When you travel by Air make reservations early; plans cancel early if plans change. When you use Air Express speed delivery by dispatching shipments as soon as they're ready. Air Transport Association, 1515 Massachusetts Ave., N. W., Washington, D. C.*

PASS THE AMMUNITION . . . BUY BONDS!

**THE AIRLINES OF THE UNITED STATES**

AIR TRANSPORT GETS THERE FIRST . . . PASSENGERS . . . MAIL . . . AIR EXPRESS



## If that's what the Luftwaffe is using ...our SYNTHETIC RUBBER will beat it!

*"TO protect aircraft from incendiary fire the Luftwaffe is using a bullet-puncture-sealing petrol tank built of a composition of fibre, buckskin and raw rubber, with an inner lining of thin vulcanized rubber."* So the British reported shortly after the outbreak of war in 1939.

This was vital information to American aviation engineers. Could Yankee ingenuity devise superior fire-protection? Goodyear was consulted—since Goodyear had developed the first successful self-sealing fuel tank for the U. S. Air Corps at the close of World War I.

Goodyear chemists pointed out that this German tank was not suitable for the high-octane aromatic gasoline burned in American engines; that U. S. fuel "softened up" rubber far more rapidly than the lower-test gas used by the Nazis. The real

answer, they advised, was a liner that had proved its complete impermeability to gasoline—a synthetic rubber like Goodyear's Chemigum.

That was nearly four years ago. Today all American battleplanes are protected with fuel tanks lined with Chemigum or a similar synthetic—tanks so efficient they self-seal bullet holes in a twinkling—tanks that are saving the lives of many of our boys.

Unfailing resistance to solvents is only one of the reasons why synthetics are fast replacing natural rubber in many usages. Today all the Chemigum

Goodyear can produce is needed for fuel tanks and other military purposes. But the time is coming when Chemigum's superior resistance to oxidation and oil will be available to the public in tires and other

products, sold under the quality standard of the greatest name in rubber.

**CHEMIGUM**

**GOOD YEAR**

THE GREATEST NAME IN RUBBER

# RAILROADING CROSSES A NEW FRONTIER

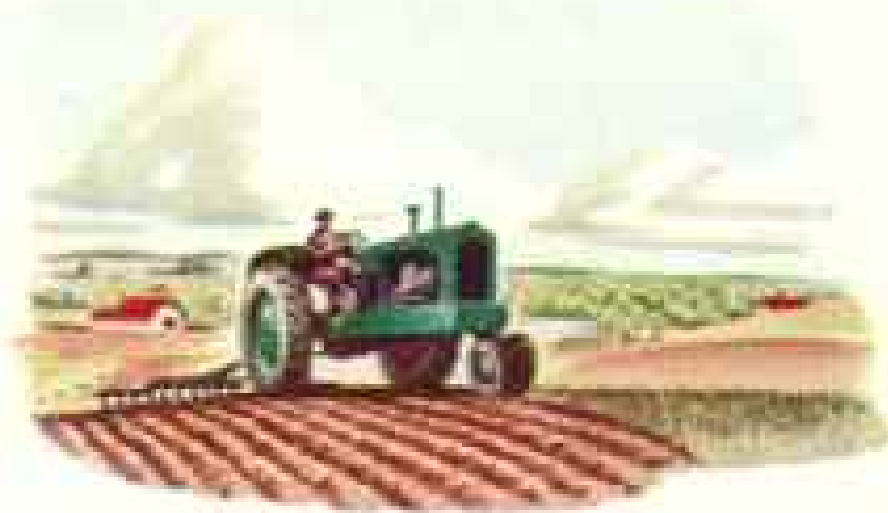
Today on the Great Northern, GM Diesel Locomotives like this are hauling heavy war loads through "The Great West." On one mountain operation, consisting chiefly of movement of metal vital to victory, the utilization of GM freight locomotives resulted in an increase of 50% in train-hauling capacity.



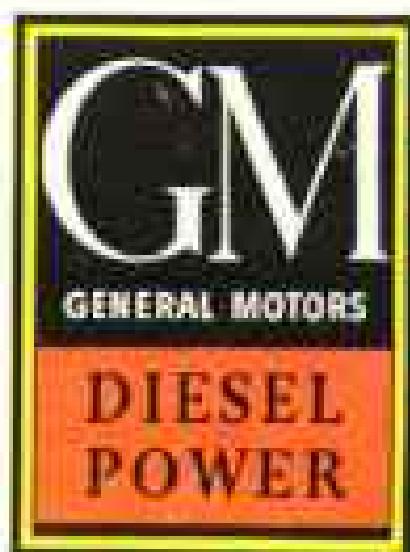
THE GREAT WEST.

*Here Currier and Ives, the famous portrayers of American life of the past century, depict one of the great eras of railroading—the achievement of rail transportation from East to West—the opening up of new lands and unexploited resources.*

WARS have a way of ending old eras and starting new ones. Following the Peace of 1865, the nation was first united from coast to coast by bands of steel (May 10, 1869). Geographically, America has no new frontiers. Technically we have many. The curtain already has been drawn back on one element of the new era that surely will follow the present conflict—a new tool for the improvement of national transportation—General Motors locomotives.



*Crossing the new frontier is not done for the railroads. GM Diesels will usher in new possibilities for the farm and for industry as well.*



LOCOMOTIVES ..... ELECTRO-MOTIVE DIVISION, La Grange, Ill.

ENGINES . . . 150 to 3000 H.P. . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

ENGINES . . . 15 to 250 H.P. . . . DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

## LIFE, LIBERATORS AND PURSUIT OF THE AXIS



**T**AKE a gang of young Americans – alert, eager, vital – and give 'em a big B-24 Liberator to fly.

Brief a target for them someplace where the Japs are thick, or where enemy factories cluster.

Take all that, lump it together, and you've got the big purpose for which tens of thousands of workers in quiet Flint and suburban Melrose Park are working night and day.

Buick men, schooled and traditioned in doing things the good way, who in the past year or so have learned to do things even better than before.

What they make is the Pratt & Whitney engines that are original equipment on the Liberator.

What they make it with is the finest of materials,

the best and latest of machinery, the fine, patient, insistent skill of people good at their jobs and proud of it.

Some day they won't be building war goods any more. They'll be back instead producing things to make life sweeter, liberty more meaningful, the pursuit of happiness easier.

But they're not thinking about that – yet. They've got a job to do for those guys swathed in flying suits whose work it is to drop the bombs that pave the way for Victory Day.

It's their biggest job ever, and they're making it their best. They want the crew to know, whenever they see a Buick name plate on their Liberator engine, that they've got something *good* to help 'em do their work!

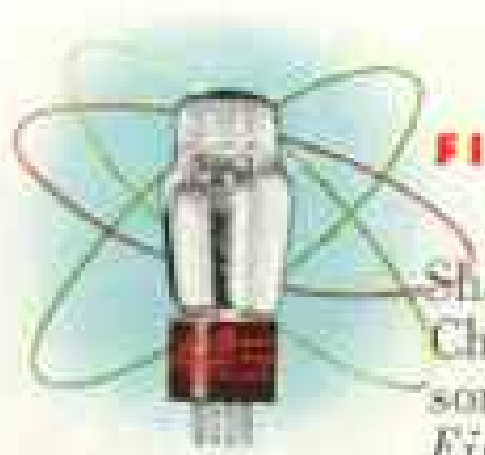


BETTER  
BUY BONDS

**BUICK DIVISION OF GENERAL MOTORS**

BETTER  
BUY BONDS





## FIGARO...BY ELECTRONICS

Shadowy figures in a star-lit garden. Cherubino arrives . . . and glorious song sweeps through the night! . . . *Figaro*, recreated by the Musaphonic! This superb instrument, a product of G-E electronic research, reproduces the tonal beauties of the human voice and the full orchestra so truly that you almost seem present at the original performance! The Musaphonic, with FM (Frequency Modulation), is already bringing the riches of radio and recorded music to owners, although today General Electric is devoted wholly to war production. Wartime advances in electronics will make the Musaphonic an even finer instrument.



*At the Metropolitan Opera: Risë Stevens as Cherubino and Eleanor Steber as the Countess in "Le Nozze di Figaro," by Mozart*



The distinguished Musaphonic Sheraton. Prices from \$300. Send for free 32-page book, "Electronics—a New Science for a New World." Electronics Dept., General Electric, Schenectady, N.Y. Listen to the "Hour of Charm," Sunday eve., N.B.C.

# MUSAPHONIC

GENERAL  ELECTRIC



# OVER A MILLION MILES A DAY...



*with*



## JACOBS <sup>AIRCRAFT</sup> *Engines*

Each day the future Bomber Pilots of the United Nations are flying Jacobs-powered twin-engine Trainers more than 1,000,000 miles, from United States and Canadian training fields, acquiring the skill and precision that will devastate the factories and ship-yards, the railroads and power lines of the Axis—and that soon will blast the way for our Armies to Berlin and Tokyo.

Day-in and day-out these sturdy engines are ready to go—from dawn to dusk and into the night—on their essential mission of qualifying the Bomber Pilots for their job of freeing the World from the ruthless selfishness of Hitler and Tojo.

When this job has been accomplished, these sturdy engines will carry millions of free people safely and economically on missions of commerce, of mercy and of pleasure.

JACOBS AIRCRAFT ENGINE CO.  
POTTSTOWN • PENNSYLVANIA • U. S. A.

# A GENERAL TIRE FROM **AMERICAN-MADE** RUBBER !



## *A Salute to* **PURDUE and CARNEGIE TECH!**

Cooperating closely with and augmenting General's corps of research engineers, in their constant search for improvement in rubber are the Purdue Research Foundation at Purdue University and the Carnegie Institute of Technology. General Tire salutes the chemists and engineers at these two great institutions for their major contribution to American-Made rubber.

*The*  
**GENERAL  
TIRE**

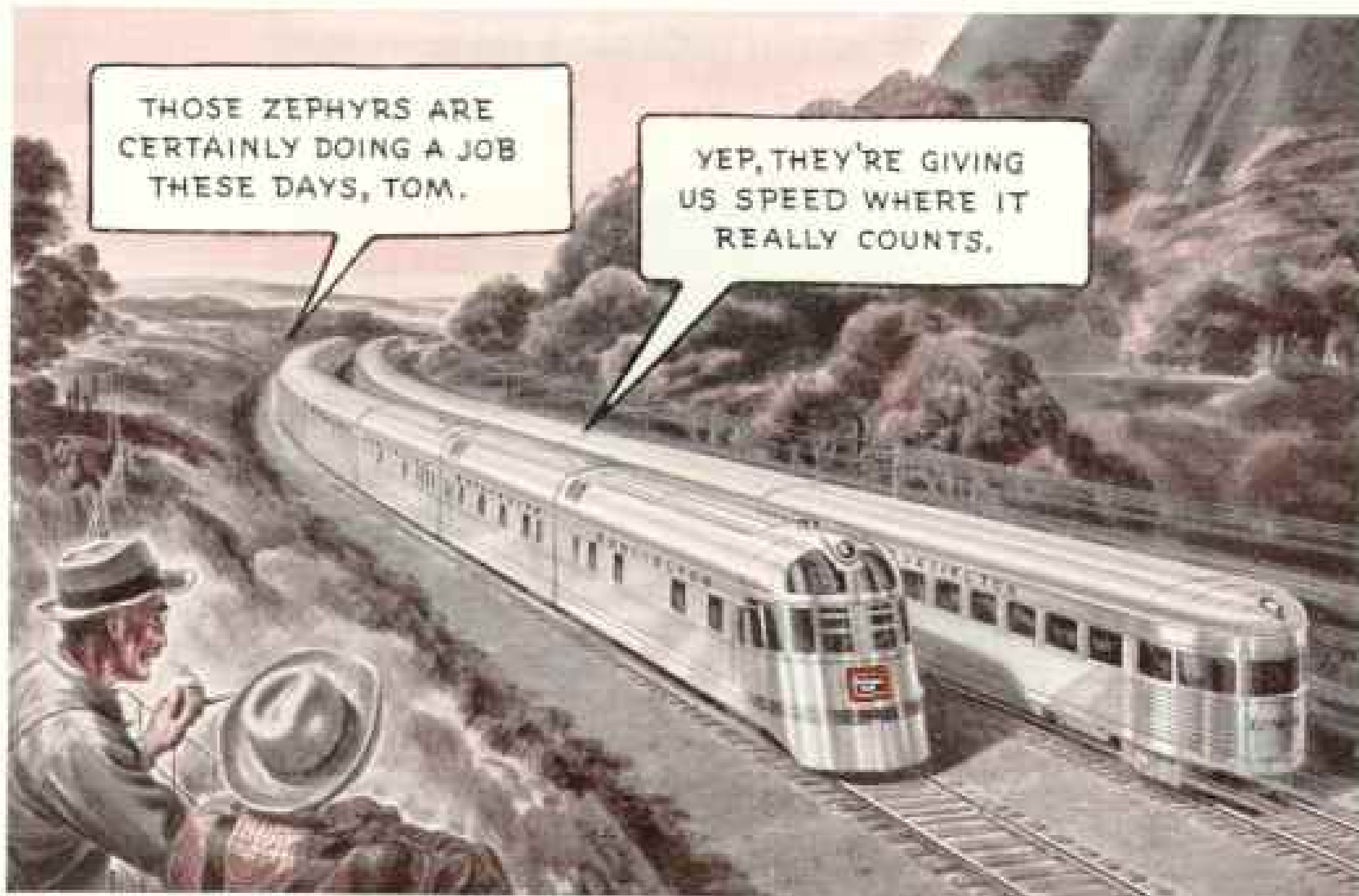
Out of 25 years of leadership in putting *more quality* into a tire . . . out of ceaseless effort to conquer America's rubber problem . . . General's research chemists, engineers and production specialists now proudly announce the development of a General Tire built with American-Made rubber.

Combined in this new-day General are the best things of the past, plus General's Top-Quality formula for getting *the most* out of American-Made rubber.

The tread is General's Silent-Grip design . . . famous for long, even wear and quick, safe stops. General's same extra strong cord body as always . . . is your assurance of greater blowout protection. And, step by step, this General is built by craftsmen who have never known anything but the highest quality.

Your General Tire dealer cordially invites you to stop in today and see the tire that *everyone* knew American engineering ingenuity would produce . . . the tire that some day, when the rubber crisis is over, will be available to all without restriction.

**THE GENERAL TIRE & RUBBER CO. • AKRON, OHIO**



THOSE ZEPHYRS ARE CERTAINLY DOING A JOB THESE DAYS, TOM.

YEP, THEY'RE GIVING US SPEED WHERE IT REALLY COUNTS.

*Bill* — Take those two Zephyrs right there, for example. Both of them make an 875 mile round trip between Chicago and the Twin Cities every day.

*Tom* — Average well over 60 miles an hour, don't they?

*Bill* — Yep—that's why they can make a round trip every day instead of a one-way run. And that means they can carry twice as many people.

*Tom* — That really means something when Uncle Sam's got so many men to keep moving.

*Bill* — Means a lot in handling important civilian travel, too.

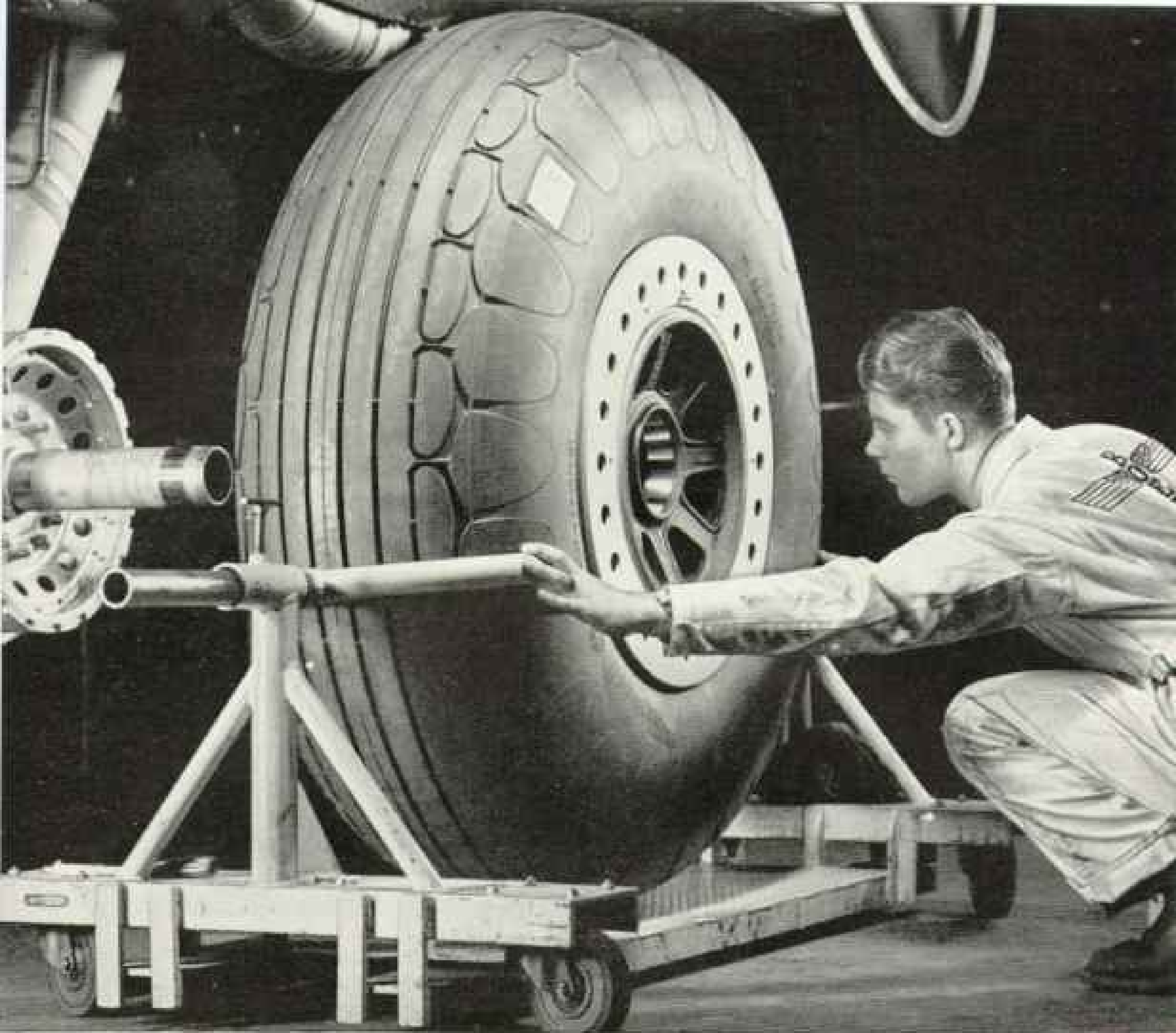
*Tom* — I understand the Burlington's got a lot of Zephyrs running around the country. I'll bet they're all plenty busy, these days.

*You're right, Tom—every one of our 14 diesel-powered Zephyrs is dedicated to one objective—to handle as much vital traffic as possible, as fast as possible. That goes for Burlington's entire fleet of steam-powered trains, too—both passenger and freight. More than 35,000 Burlington workers are dedicated to the same cause.*

### Way of <sup>THE</sup> Zephyrs



**AN ESSENTIAL LINK IN TRANSCONTINENTAL TRANSPORTATION**



BUY WAR BONDS AND STAMPS

## Easy does it

One of the most important jobs at Boeing is making other Boeing jobs easier . . . simplifying procedures so that, despite shortages of skilled workers, production constantly goes upward.

Above is pictured an example of this easy-does-it manufacturing philosophy—a simple device, but it illustrates the point: the Boeing-developed wheel-installation dolly, by means of which one worker slips quarter-ton wheels onto the axles of Boeing Flying Fortresses.\* The wheel, held firmly on the dolly by adjustable arms, is rolled

into position on casters. Once the wheel is slipped over the landing-gear axle, the arms of the dolly are moved back and the job is done.

This is but a simple example, and only one among hundreds, of the constant effort in Boeing plants (at Seattle and Renton, Washington, Wichita, Kansas, and Vancouver, B. C.) to achieve maximum production efficiency with a minimum of human exertion, through improved tools and handling equipment . . . an effort which has contributed to the highest output per man, machine and

unit of plant space among all manufacturers of aircraft.

Co-ordinated with Boeing know-how in research, design and more than twenty-five different engineering fields, this manufacturing skill has made Boeing Flying Fortresses renowned not only for quality but for quantity.

And in the peacetime to come, these same skills will make the phrase "Built by Boeing" a hallmark of skilfully designed, soundly engineered, efficiently manufactured products.

DESIGNERS OF THE FLYING FORTRESS • THE STRATOLINER • PAN AMERICAN CLIPPERS

**BOEING**

\*THE TERMS "FLYING FORTRESS" AND "STRATOLINER" ARE REGISTERED BOEING TRADE-MARKS

THE TOUCH OF TOMORROW IN THE PLANES OF TODAY



## War Is a Skill Our Sons Must Learn

Every American soldier fights with courage and self-sacrifice. But these alone do not win wars. War also demands high technical skill because it is a struggle not only of men against men, but also of machine against machine—tanks, planes, battleships. Without training in the use of these instruments of war, soldiers today are without weapons!

One weapon in this war—the airplane—calls for more personal skill than any other. And one of the most critical phases in a pilot's training is his step-by-step transition from primary trainers to combat planes. These steps cannot be abrupt, yet time demands that they be swift. Therefore, along with the relative stability and safety required in a training plane, Fairchild engineered into its trainers certain definite

characteristics of the combat plane. Thus, they get a pilot ready for his second step while teaching him the first!

Fairchild training planes—primary trainers, bomber crew trainers and gunnery trainers—are being used on United Nations training fields throughout the western hemisphere. They are powered by Fairchild Ranger aircraft engines. They reflect the 20 crowded years which Fairchild engineers have devoted to "creating the plane for the purpose." The "touch of tomorrow" in Fairchild engineering indicates courage to try new things. We shall need many new things to further prosecute this war against our resourceful enemies. Fairchild has quite a number on the way—to add to those already on its record!



FAIRCHILD

ENGINE AND AIRPLANE CORPORATION  
30 ROCKEFELLER PLAZA, NEW YORK

Ranger Aircraft Engines Division  
Farmingdale, L. I.

Fairchild Aircraft Division  
Hagerstown, Md. . . . Burlington, N. C.

Duramold Division  
New York, N. Y.



### Westinghouse helps in every zero hour . . .

On ships, in planes and tanks, with the troops and gun crews, zero hours bring thousands of Westinghouse war products to their destined, ultimate service—on every front, in every battle.

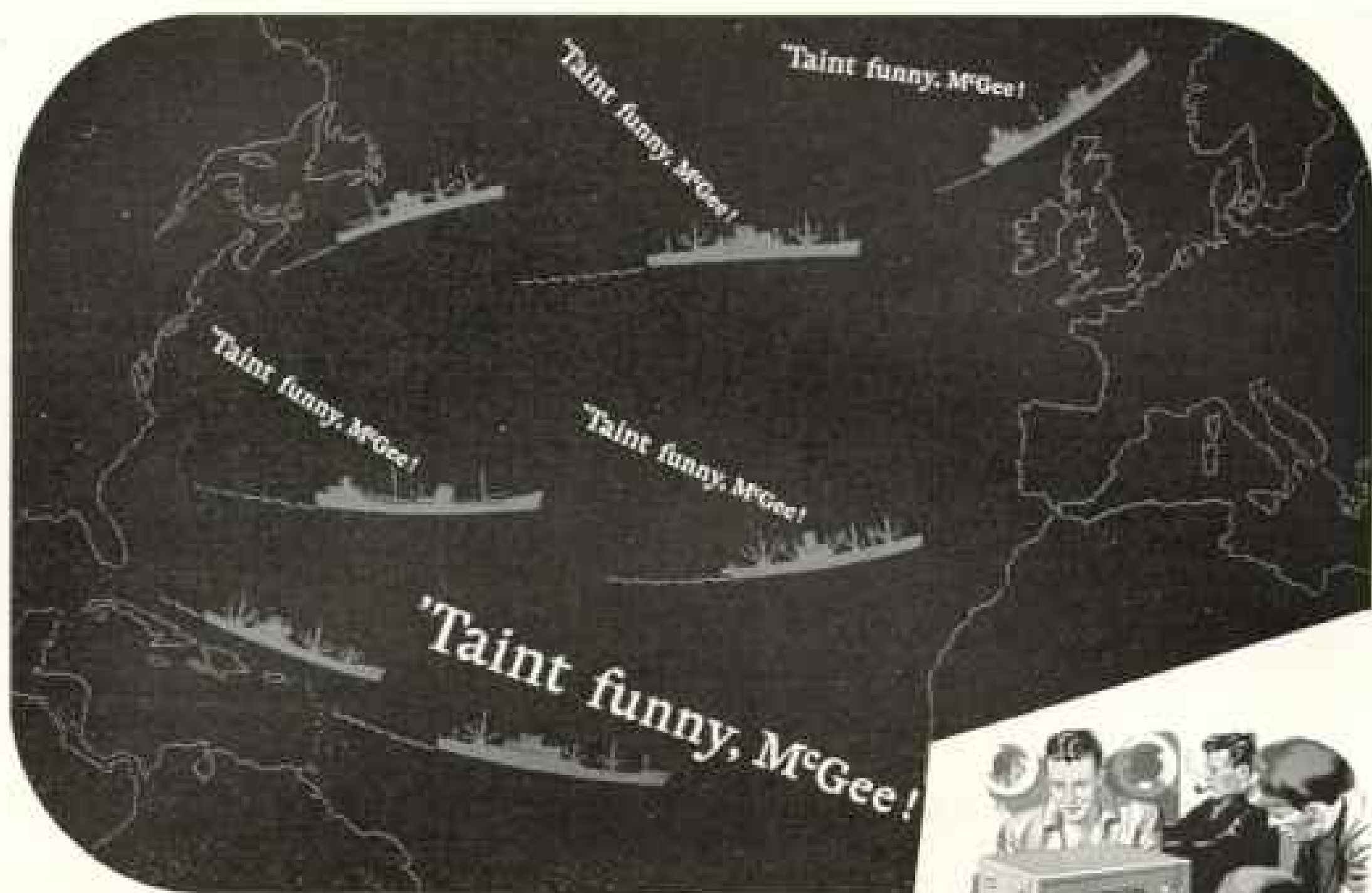
### Westinghouse fights with millions of man-power hours . . .

Westinghouse proficiency in electrical design and manufacture, in ceramics and plastics, in metallurgy . . . Westinghouse ingenuity and inventiveness are finding new and better ways for making weapons of war.



### Westinghouse will bring future hours of freedom . . .

Out of the skill and experience gained in wartime, will come even *finer* Westinghouse products. Improved electrical appliances and apparatus—for homes, farms, and industries—will bring a new measure of freedom and enjoyment to the men and women of a world at peace. Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania. Plants in 25 cities—offices everywhere.



But it is funny, McGee, to lonely sailors on the long haul to Murmansk . . . who listen with a Scott!

*Now, gratefully, our men-at-sea listen to programs from home . . . safe from enemy direction-finders!*

Sailors so far away that they may be hearing your favorite programs *a day earlier* than you—across the international date line—or men in the lonely reaches of the northern waters who listen the next morning—bless the programs from home. And bless the Scott that brings them.

The Scott was a "natural" for seafaring use. Back in 1928, on a trip to Australia, it logged a Chicago station *every night*. It has been purchased in 154 countries before the war—proud possession of Indian potentates, ambassadors, consuls. Now, built to sea standards, it roams the world, and makes distances shorter for men who long for news and entertainment from home ports.

And of course the Scott is *safe*—its low radiation never detectable by enemy submarines. Engineered in the Scott tradition, it is built with the precision of a marine instrument, the staunchness of a man-o-war. As fast as we can build them—they are going on merchantmen, tankers, transports and American ships of every kind. After the war, we shall try to have one for you.



## SCOTT *Marine Model* LOW RADIATION RECEIVER

• We regret that, due to present restrictions, the Scott Marine Model cannot be offered to individual purchasers.

E. H. SCOTT RADIO LABORATORIES, INC.  
4450 Ravenswood Avenue, Chicago

**SCOTT**  
FINE RADIO  
RECEIVERS





## *Bringing in the HARVEST*

**... SO VITAL TO VICTORY!**

**N**EVER before in history has food figured so much in American calculations.

Today we are a rationed nation, sharing our food with our boys abroad and their comrades-in-arms.

In order that there may be food for all, the railroads not only are moving great quantities from canneries, packing plants, fruit and vegetable areas but are sending thousands of cars into the harvest fields to haul millions of bushels of grain—your daily bread.

You may wonder how the railroads can take on so big a job as the harvest these days and still keep the war effort rolling. Here is the answer in one word—*cooperation*.

The railroads work together. While crops are still ripening in the fields, their plans are already laid. When harvesting starts, Pennsylvania Railroad contributes a share of its freight cars, along with other railroads, to the great American car "pool" . . . and there's a reserve army of cars all mobilized to move the crops to elevators and ship sidings.

Result: Plenty of cars for agriculture, the load evenly distributed among many railroads.

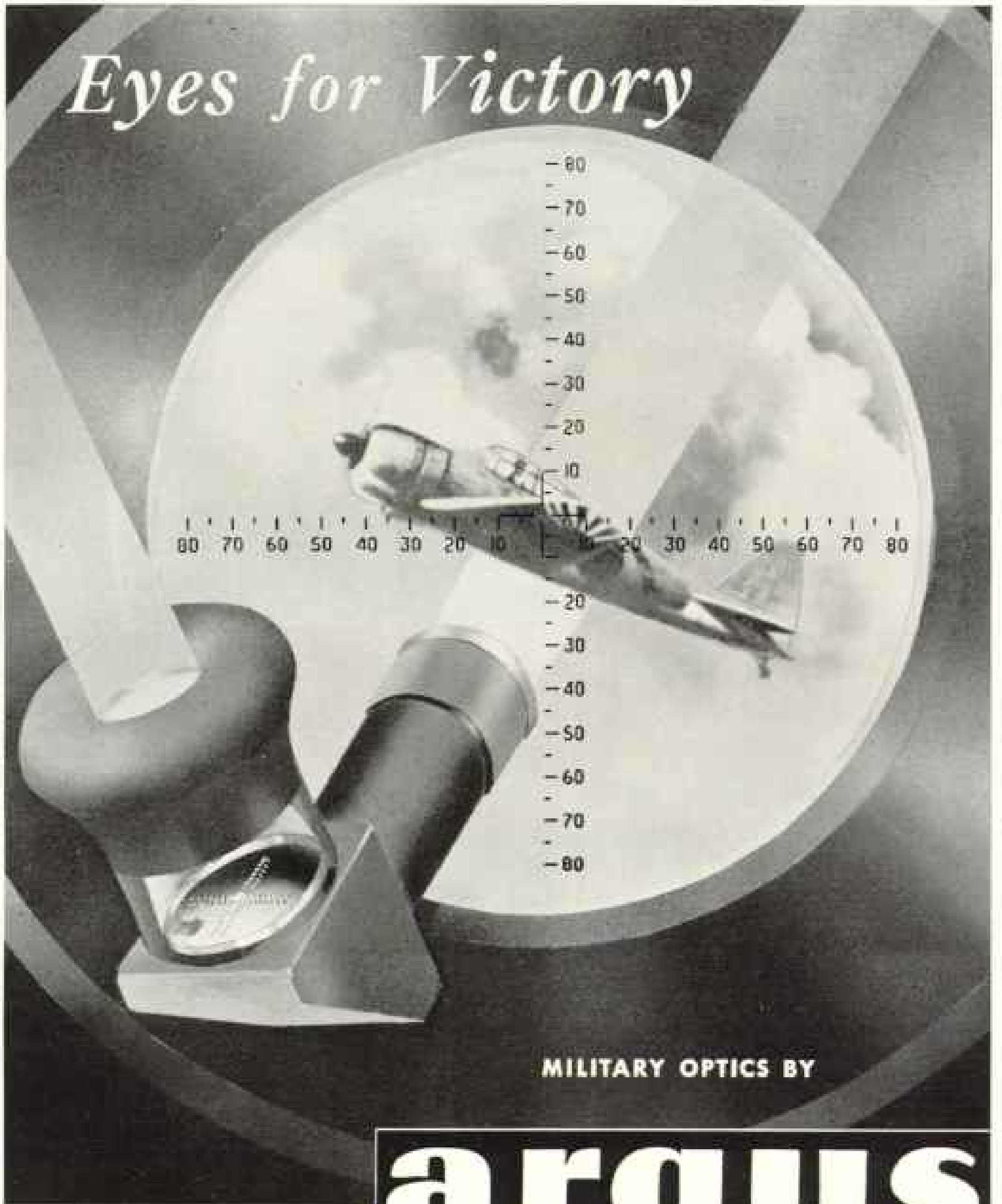
It is this sort of teamwork, going on every day, that is enabling the railroads to do for their country what United States Senator Clyde M. Reed of Kansas described as "the most phenomenal job in their history."



BUY UNITED STATES  
WAR BONDS AND STAMPS

★ 29,842 in the Armed Forces ★ 26 have given their lives for their country.

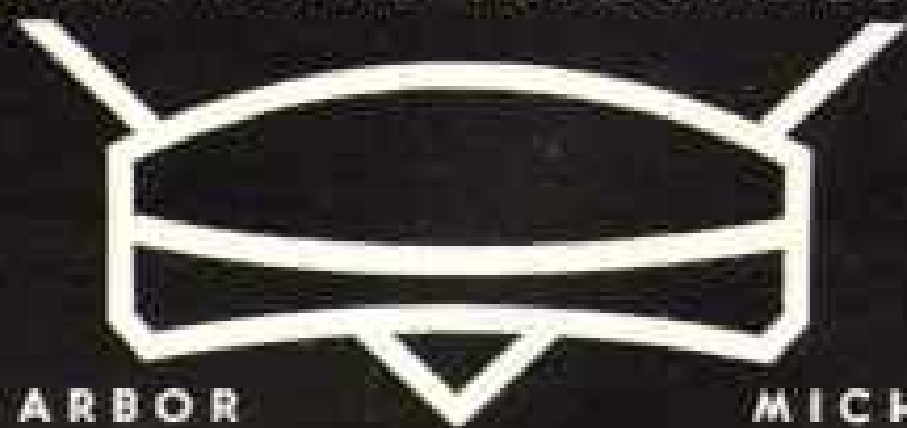
# *Eyes for Victory*



MILITARY OPTICS BY

# argus

INTERNATIONAL INDUSTRIES, INC.



ANN ARBOR

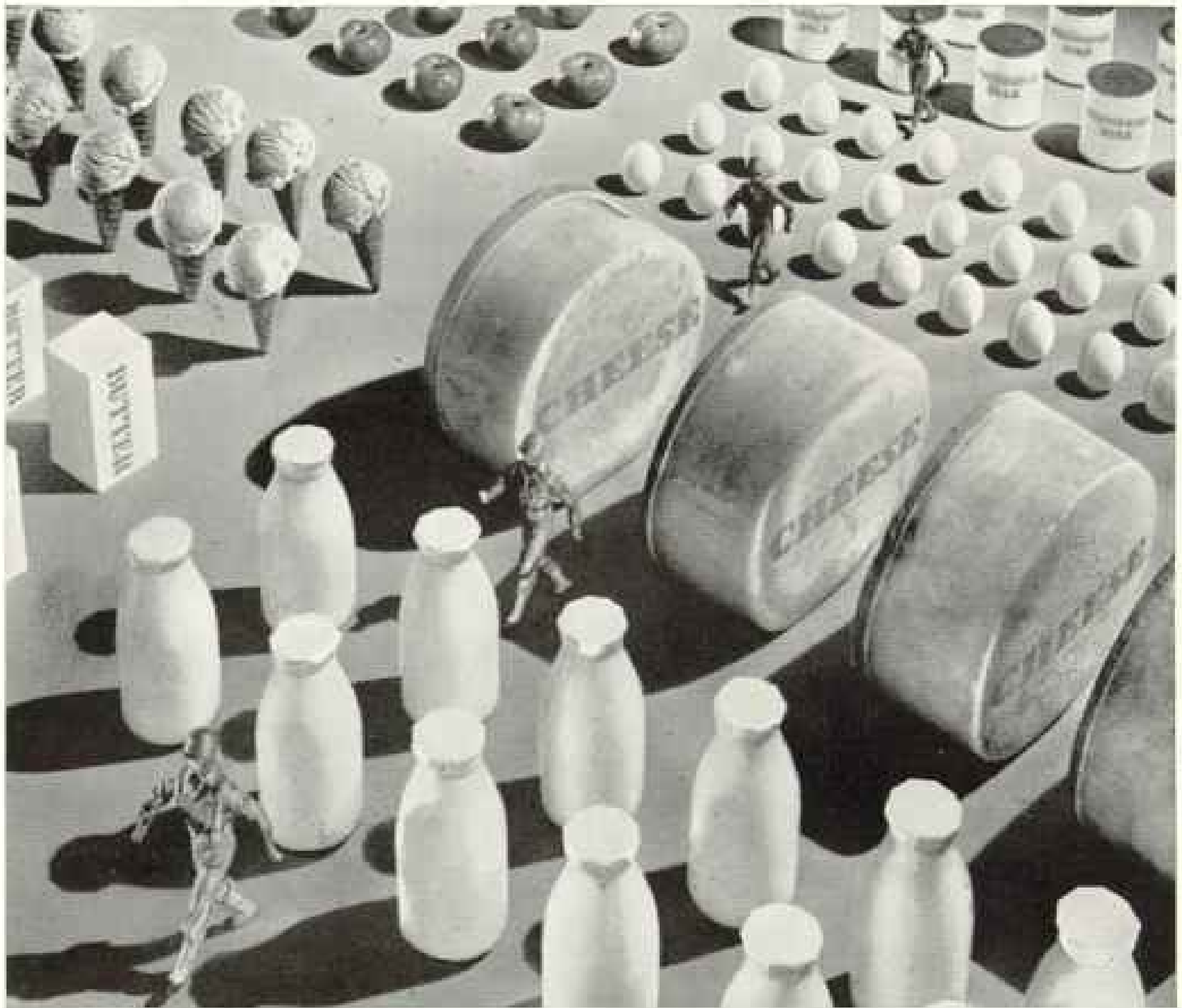
MICHIGAN

FINE AMERICAN  
CAMERAS

•  
PRECISION OPTICAL  
INSTRUMENTS

•  
AVIATION RADIO  
EQUIPMENT

•  
BUY WAR BONDS



BUY WAR BONDS AND STAMPS

## This army was raised to **ATTACK!**

Maybe you've never thought of food as an aggressive weapon of war—but *that's what it is today.*

Food fuels the workers who are making tanks, planes and ships to attack the Axis. Food reinforces the soldiers who launch those attacks. *And food will turn neutrals into friends, friends into fighters, as each new front opens up!*

What's more, service men eat 50% more than they did in civil life. Civilians eat more as they work harder for Victory. And that adds up to a huge order for the folks who raise, process, and distribute food—*folks whose war work is as vital as any welder's.*

Last year, America's farmers and food processors set new records for production.

This year, the need is greater—and the difficulties under which they work are greater, too.

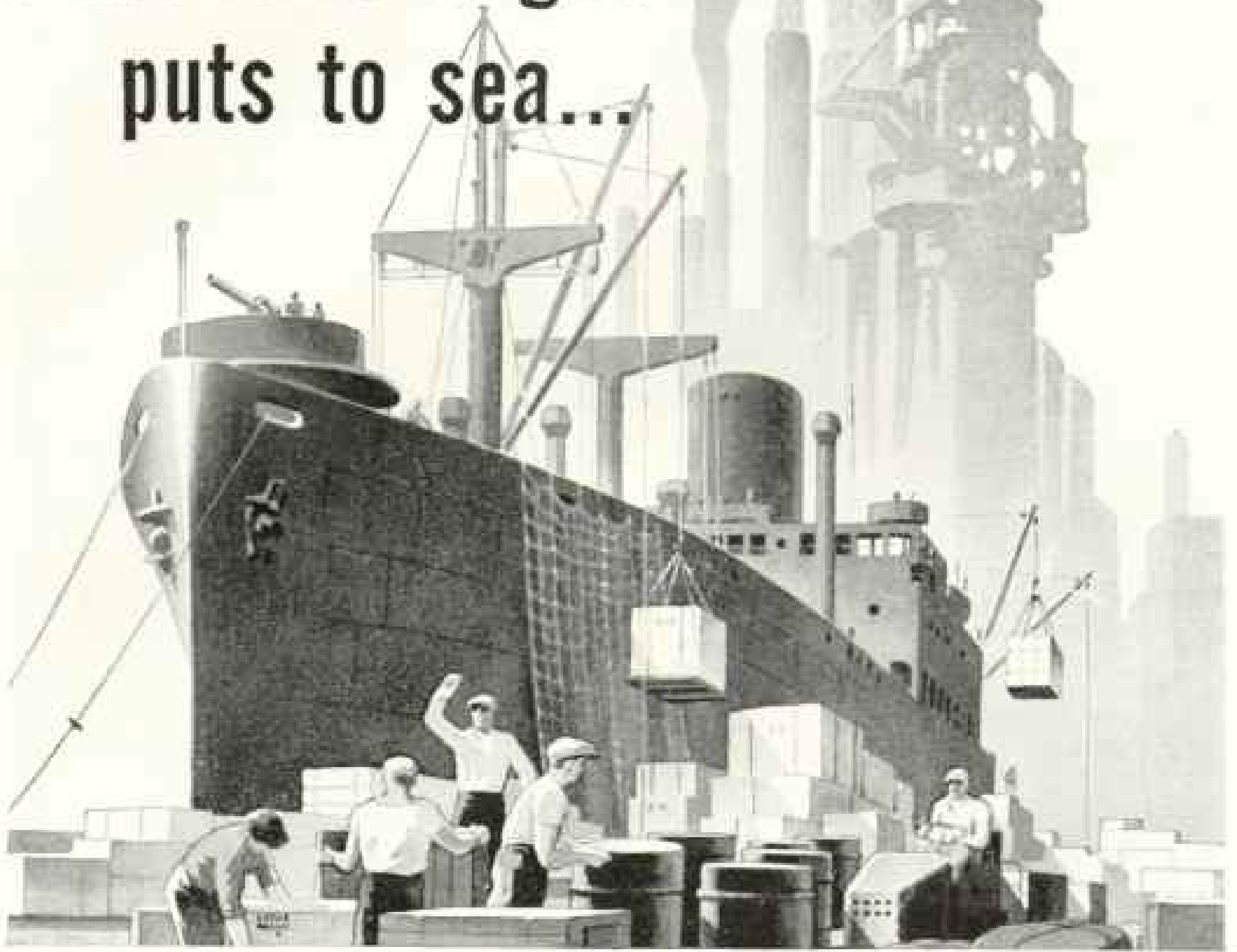
It's a big responsibility. A share of it falls on us, as processors of nature's most nutritious food—milk—as well as other dairy and food products. We're glad that we can make a real contribution.

*Dedicated to the wider use and better understanding of dairy products as human food . . . as a base for the development of new products and materials . . . as a source of health and enduring progress on the farms and in the towns and cities of America.*

**NATIONAL DAIRY  
PRODUCTS CORPORATION**  
AND AFFILIATED COMPANIES

Originators of the Sealtest System of Laboratory Protection

# America's might puts to sea...



**B**EFORE the might of American war production can be felt, it must be moved across many seas . . . to far-off battlefields where it will spell the difference between victory and defeat.

The American Merchant Marine is performing this heroic task—brilliantly. Compare its accomplishments in this war with its wonderful record in the last one. Six times as much freight, for the Army alone. Distances as great as 14,000 miles, instead of the maximum of 3500 last time. Ports that are frequently small, poorly equipped, on hostile shores . . . compared to the safe, well-organized harbors of World War I.

All this despite ferocious opposition . . .

despite the acute need for more ships, more men. How is it possible? Because of efficient supervision by the Maritime Commission and the War Shipping Administration. Because of experienced direction by the shore staffs. Because of the greatly improved ships. And because of the courage, the skill and the will of the men who man them.

★ ★ ★

*AGWI is proud to be in the service of Uncle Sam, sailing under his orders. But when peace and order have been restored, AGWI will resume its century-old role as the carrier of commerce and friendship between the United States and its Good Neighbors to the south.*

## ATLANTIC GULF and WEST INDIES STEAMSHIP LINES

Foot of Wall St., New York

CUBA MAIL LINE ★ PORTO RICO LINE ★ CLYDE-MALLORY LINES ★ SOUTHERN S. S. CO.

Cuba, Mexico, Puerto Rico, Dominican Republic, Texas, Florida and the South

★ BUY U.S. WAR BONDS AND STAMPS ★





## SYMBOL OF PROGRESS

Like radio, electric refrigerators and many other modern conveniences, the streamlined train has become an accepted part of our lives. It symbolizes the progressive spirit of American industry—of individual enterprise.

Union Pacific developed the first streamlined train *during the depression era*; an outstanding example of farsighted engineering and executive genius. It is largely

due to this same spirit of progress that miracles in war production have been achieved by our country's industrial plants; it is the spirit that has spurred our railroads to accomplish seemingly superhuman tasks in the transportation of war materials and troops.

It is this spirit of progress, this truly American characteristic, that will eliminate the Axis. Union Pacific, for its part, will continue to "keep 'em rolling."



*The Progressive*

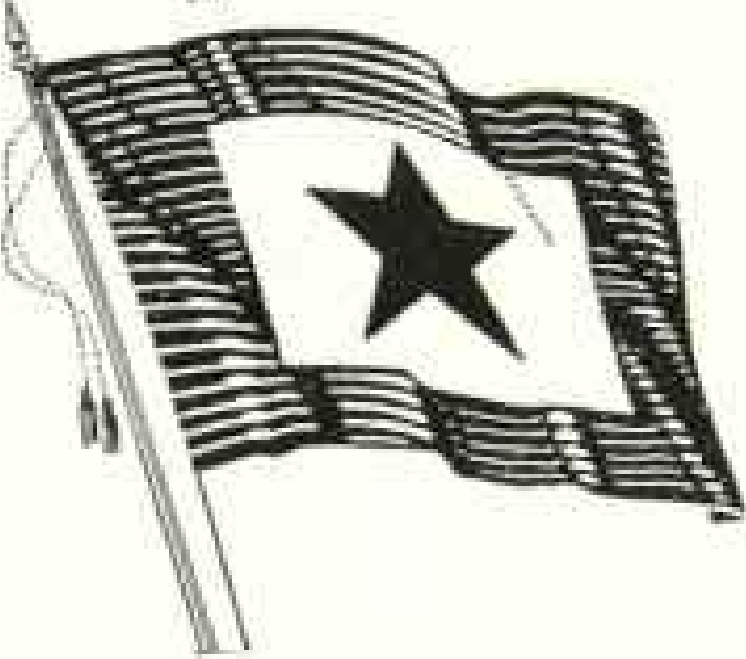
**UNION PACIFIC RAILROAD**

ROAD OF THE STREAMLINERS AND THE CHALLENGERS

# RADIONICS

## THE MIRACLE INDUSTRY

**Goes full speed ahead for Victory**



Zenith is dealing in war work with the thing we know best... Radionics... and Radionics exclusively.

☆☆☆

In producing for our armed forces we are meeting and solving many problems... and in so doing... learning and perfecting much that will mean a real contribution to post-war radio.

☆☆☆

Zenith prefers to speak conservatively of this war experience, and to promise conservatively for the future. But Zenith *does* promise that every ounce of energy, ingenuity and inventiveness that has been put forth to create war Radionic devices, will later be channeled into the making of superb peacetime Zenith Radio home receivers, once the war is won and civilian production resumed.

**ZENITH RADIO CORPORATION**  
Chicago, Illinois

**BETTER THAN CASH**  
**U. S. WAR SAVINGS**  
**STAMPS AND BONDS**



# Rolling through the Rockies

**Y**OUR uniformed sons and daughters, traveling over America on the Great Northern Railway, cross the Continental Divide almost without knowing it. The train follows a natural route—easy as a game trail—through the scenic grandeur of the Montana Rockies. That is Marias Pass!

At the top of the pass—at Summit, Montana—they see a statue of its discoverer, John F. Stevens, who still is living. In December, 1889, Stevens found a broad, natural corridor through the Rockies, which provided the lowest (5,213 feet) and easiest railway pass in the northern United States.

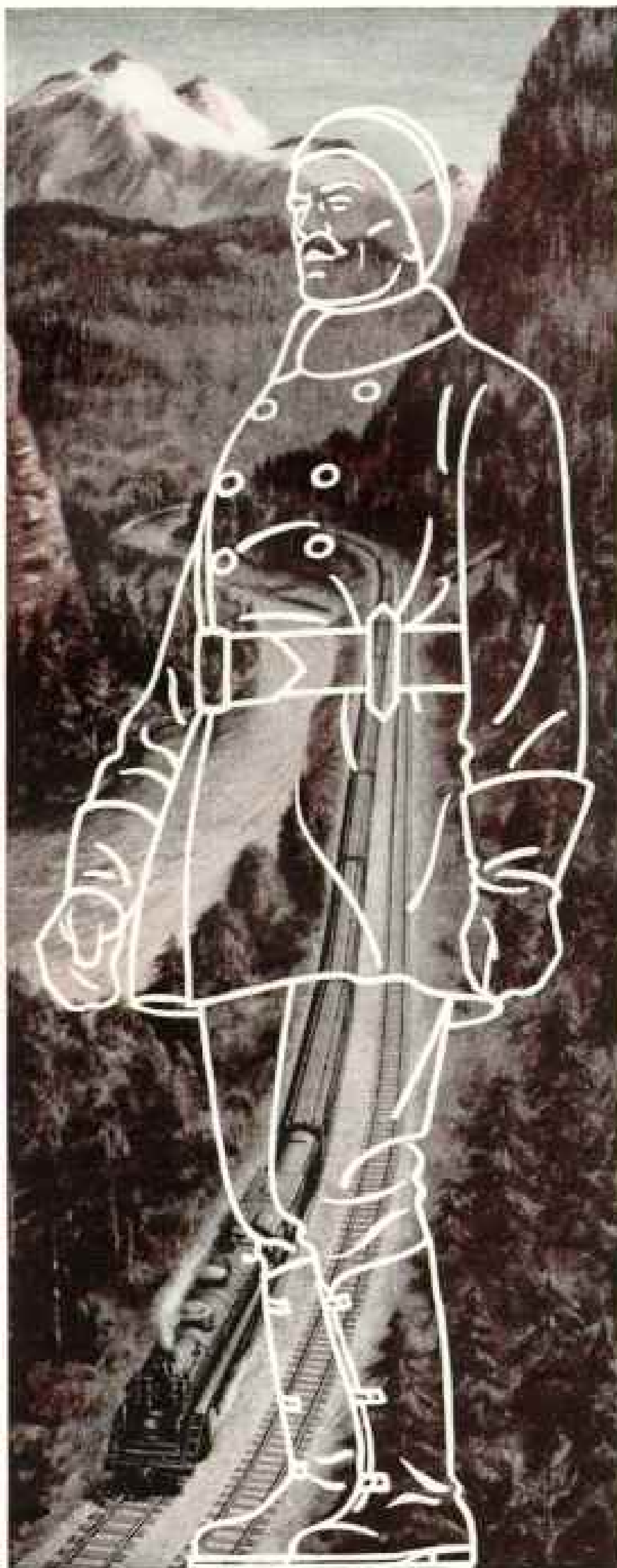
Stevens' discovery not only gave Great Northern its low-altitude pass through the mountains, it also led to establishment of Glacier National Park—the only national park on the main line of an American railway.

Manpower, firepower and supplies for America and her Allies are rolling through the Rockies faster and on time because Marias Pass affords swifter, safer handling of trains.

Marias Pass helps make Great Northern dependable—a vital artery to Victory.

## GREAT NORTHERN RAILWAY

ROUTE OF THE EMPIRE BUILDER  
BETWEEN THE GREAT LAKES AND THE PACIFIC



**LISTENING POST  
FOR GROUP RIDERS**



# Motorola Radio

## INFORMS and ENTERTAINS

With critical days ahead you'll want to be "on the spot" with your favorite news reporter . . . and, too, working harder and faster, you'll welcome the relaxation and rest that comes from good radio entertainment. If your car is not already radio-equipped . . .

**You Can Still Get a Motorola to FIT and MATCH Your Car, Old or New!** Most dealers can still supply you with America's Finest Car Radio. A custom-fitted installation takes just a few minutes. Why not plan to

**SEE A MOTOROLA DEALER TODAY!**



The Army-Navy "E" for excellence in production of Communication Equipment for our Armed Forces.

**Motorola**  
Radio

AMERICA'S FINEST  
FOR CAR AND HOME

GALVIN MFG.  
CORPORATION  
CHICAGO



One of the famous MOVADO Waterproofs. Made in stainless steel, steel and gold, 14K gold. Varied sizes for men and women. This sturdy watch is watertight and airtight. No superfluous parts have been added which might affect the efficient construction of its full-size movement. Moderately priced.

## MOVADO Watches

Winners of 165 Observatory Awards  
Sold and Serviced by Leading Jewelers All Over the World  
Genl. Dist. Movado Watch Agency, Inc. 611 Fifth Ave., N. Y.



A BATTERY OF MULTICOLOR PRESSES

## Judd & Detweiler, Inc.

(Established in 1868)

Printers

ECKINGTON PLACE AND FLORIDA AVENUE  
WASHINGTON, D. C.

THIS MAGAZINE IS OUR INDORSEMENT





## WHO should exercise . . . and WHY

**L**IKE OUR ARMED FORCES, civilians, too, must keep fit for their part in this war. This means adequate sleep, rest, recreation, a nutritious diet—and *exercise*.

Everyone in good health should take some form of exercise—the type depending upon age, strength and occupation.

Proper exercise strengthens the muscles which hold us erect and in good posture. It stimulates the circulation and keeps the heart and lungs in prime condition. It helps us avoid putting on excess weight. Digestion and elimination are improved . . . vigor and endurance are heightened . . . we have that feeling of being in "the pink" of condition.

In short, proper exercise helps us *live longer!* Meanwhile, we get keener enjoyment out of everything in life.

Generally, some form of exercise which may be continued the year round is preferred. Moderate *regular* exercise is far better than too much at one time.

*Any* exercise is more beneficial out of doors. The tonic effect of fresh air and sunshine is great. Wisely taken, exercise should produce a

pleasant exhilaration—not undue fatigue and aching muscles.

Desk workers and those who do light manual work—sitting or standing at a machine, for example—need exercise to keep them limbered up. Workers whose jobs demand great physical exertion need *recreation* more than "muscle building." They should seek sunshine, rest and fresh air in their leisure time.

If regular checkups show us to be sound, we are never too old to benefit from some form of exercise. This year, millions of Americans are getting splendid exercise through their Victory Gardens. If you are one of these, Metropolitan will send you upon request a free booklet, 73-N, "Keeping the Garden Going."

COPYRIGHT 1943—METROPOLITAN LIFE INSURANCE CO.

*75th ANNIVERSARY—1868-1943*

### Metropolitan Life Insurance Company

(A MUTUAL COMPANY)

*Frederick H. Lohr*, CHAIRMAN OF THE BOARD

*Leroy A. Loucks*, PRESIDENT

1 MADISON AVENUE, NEW YORK, N. Y.





## The Common Mackerel

**T**HE SCOMBER SCOMBRUS, the common mackerel which roams the seas of the North Atlantic, is the perfect embodiment of streamlining.

His slim, iridescent body is long and spindle-shaped, designed especially for great endurance. He has strong muscles along his spinal column and can tuck his fins in close to his body so as to swim with a minimum of effort.

Nature has equipped the mackerel in this fashion because he has a serious handicap. Unlike most fish, he has no air bladder to give him buoyancy.

If he happened to be in shallow water, he could sink to rest on the bottom without being endangered by the pressure of water above him. But as he spends much of his life far out in the open sea, this solution is usually impossible.

He cannot suspend himself motionless near the surface like some fish with an air bladder. Yet, if he should allow himself to sink, the pressure of the depths would crush him. So, as long as he is in the open sea, he can never rest, but must keep swimming constantly to avoid disaster.

In this respect, the mackerel is like the average man who has no insurance. Each is safe only as long as he can keep going.

If the man without insurance has an accident which lands him in the hospital and keeps him from work, both his normal activity and his normal income are interrupted. When this happens, he must either dip into hard-earned savings to meet his obligations, or, if he has no savings, be crushed by the weight of his misfortune.

Insurance protects you from the heavy cost of an accident you can neither foresee nor prevent. It thus relieves you of many worries that otherwise would disturb you. As actuarial experience indicates that the chances are actually one in ten that you will be involved in an accident within the coming year, you should not be without this protection at any time.

In your own community there is an experienced Travelers agent who will be glad to explain just what accident insurance can mean to you. He will also see to it that the policies you choose become an economical yet efficient part of a well-rounded insurance program.

\* \* \*

**MORAL:** Insure in The Travelers. All forms of insurance. The Travelers Insurance Company, The Travelers Indemnity Company, The Travelers Fire Insurance Company, Hartford, Connecticut.

Full point value . . . no waste, no bone, no surplus fat

# SPAM DINNER

## SPAM DINNER

Broiler fry thick slices of Spam, or broil whole Spam with cloves and bake 20 minutes. Basting with sauce:  $\frac{1}{2}$  tsp. vinegar,  $\frac{1}{2}$  cup brown sugar, 1 tsp. prepared mustard, 1 tsp. water. Serve with lima and baked potato. Or with peas and baked squash, greens and spaghetti casserole.



### GET THE MOST FOR YOUR POINTS

— Spam is all meat, all good to eat— no bone, waste or surplus fat to rob you of precious points. Cooks with

scarcely any shrinkage—and there's a use for every scrap of left-over. Remember too, that when you have to eat less, it's wise to choose the best!



WHY YOUR GROCER MAY BE OUT OF SPAM . . . explained by letter from Lt. [redacted], Hormel salesman on leave with the U.S. Marines in the Southwest Pacific: "New Year's Day was made exceptionally bright by the arrival of mail and the presence of plenty of good old SPAM! Boy! You never fully realize how delicious and good Spam really is until you taste it out here in the bottom of a fox-hole. All the boys out here think Spam is swell."

COLD OR HOT... **SPAM** HITS THE SPOT!

© 1954 A. Hormel & Co., Austin, Minn. Spam is registered trademark.

## HORMEL

GOOD FOODS





Actual-size reproduction of a 2 X Minicolor Print, from a miniature Kodachrome transparency.



# Beautiful Minicolor Prints like this . . .

from your miniature Kodachrome Transparencies



Now—you can send your soldier beautiful *full-color prints* from any of your 35-mm. or Bantam Kodachrome transparencies—in a size he can carry around in his billfold or pin up in his barracks.

Kodak Minicolor Prints are full-color photographic enlargements that reproduce all the natural beauty and brilliancy of your original Kodachrome Film transparencies.

They come in three sizes—2 X (about  $2\frac{1}{4} \times 3\frac{1}{4}$  inches), 5 X (about  $5 \times 7\frac{1}{2}$  inches), and 8 X (about  $8 \times 11$  inches).

Save the high spots for Minicolor Prints. Your dealer will show you samples of these beautiful full-color enlargements.

**Snapshots in full-color . . . with Kodacolor Film . . .** Biggest news in photography since roll film was introduced: *With the new Kodacolor Film you can take snapshots in good sunlight with your Kodak or Brownie—and from the negative get Kodacolor Prints made by the Kodak Company—full-color snapshots printed on paper.* A limited supply of Kodacolor Film is available.

**Home Movies with Kodachrome Film . . .** There's still a fair amount of Kodachrome Film available for 8-mm. and 16-mm. Ciné-Kodaks. Use it for important occasions . . . Eastman Kodak Company, Rochester, N.Y.

## Kodak Research has made Color Photography a part of everyone's life



Clear the Mental Cobwebs...Come to  
**NEW HAMPSHIRE**

Just as the government maintains rest and recreation facilities for the military, so New Hampshire resort operators are doing the same thing for those in civilian life. No other area offers as delightful and refreshing a summer climate; few vacationlands have something ideal for every purse and taste.

*Plan now for that needed summer vacation!*

STATE PLANNING & DEVELOPMENT COMM.  
414 Capital St., Concord, New Hampshire

Yes! send me your new, illustrated vacation booklet.

Name \_\_\_\_\_

Address \_\_\_\_\_




**New Tadoussac Hotel**

For "on leave" vacations ... a grand new hotel ... up where the Saguenay joins the St. Lawrence. "Hay-fever-free" air. Outdoor pool ... golf ... tennis. 6 fishing lakes. Amer. plan, \$7 up single, \$12 up double. Special weekly rates. Season: June to September. Apply Fred G. Brown, Resident Manager, at Tadoussac, Province of Quebec, or Canada S. S. Lines offices in principal cities, or Travel Agents.

**CHAMPION-INTERNATIONAL  
COMPANY**

Manufacturers of the paper used in  
**THE NATIONAL GEOGRAPHIC MAGAZINE**  
and other high-grade coated paper

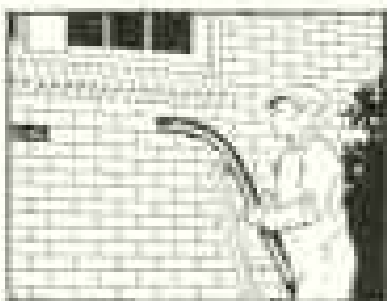
OFFICE-MILL - - - LAWRENCE, MASS.

**DON'T LET THIS HAPPEN TO YOU!**

**BEAT WINTER'S FUEL RATION or  
SHORTAGE with GUARANTEED  
CHAMBERLIN ROCK-WOOL INSULATION**



IN ATTICS



IN WALLS

Get fullest benefit of fuel saving, improved winter heating, summer comfort, year-round safety by **CORRECT** insulation.

When your home is Chamberlin-insulated the job is backed by a 50-year quality reputation, serving millions of American homes—your best guarantee of satisfaction. Chamberlin Rock Wool insulation gives you: fire protection; installation by factory-trained experts working with pneumatic equipment—no skimping, but a force-fill that means fullest penetration to every corner for lasting efficiency.

**BUY NOW!—FIRST PAYMENT NOV. 1st—3 YEARS TO PAY!**

Help Uncle Sam conserve fuel; help yourself to fullest comfort—government regulations now permit immediate insulation with no payment till Nov. 1st—3 Years To Pay! Send coupon NOW for full details on Chamberlin Rock Wool Insulation for home economy and savings. Don't delay, plan now and write today for free details.

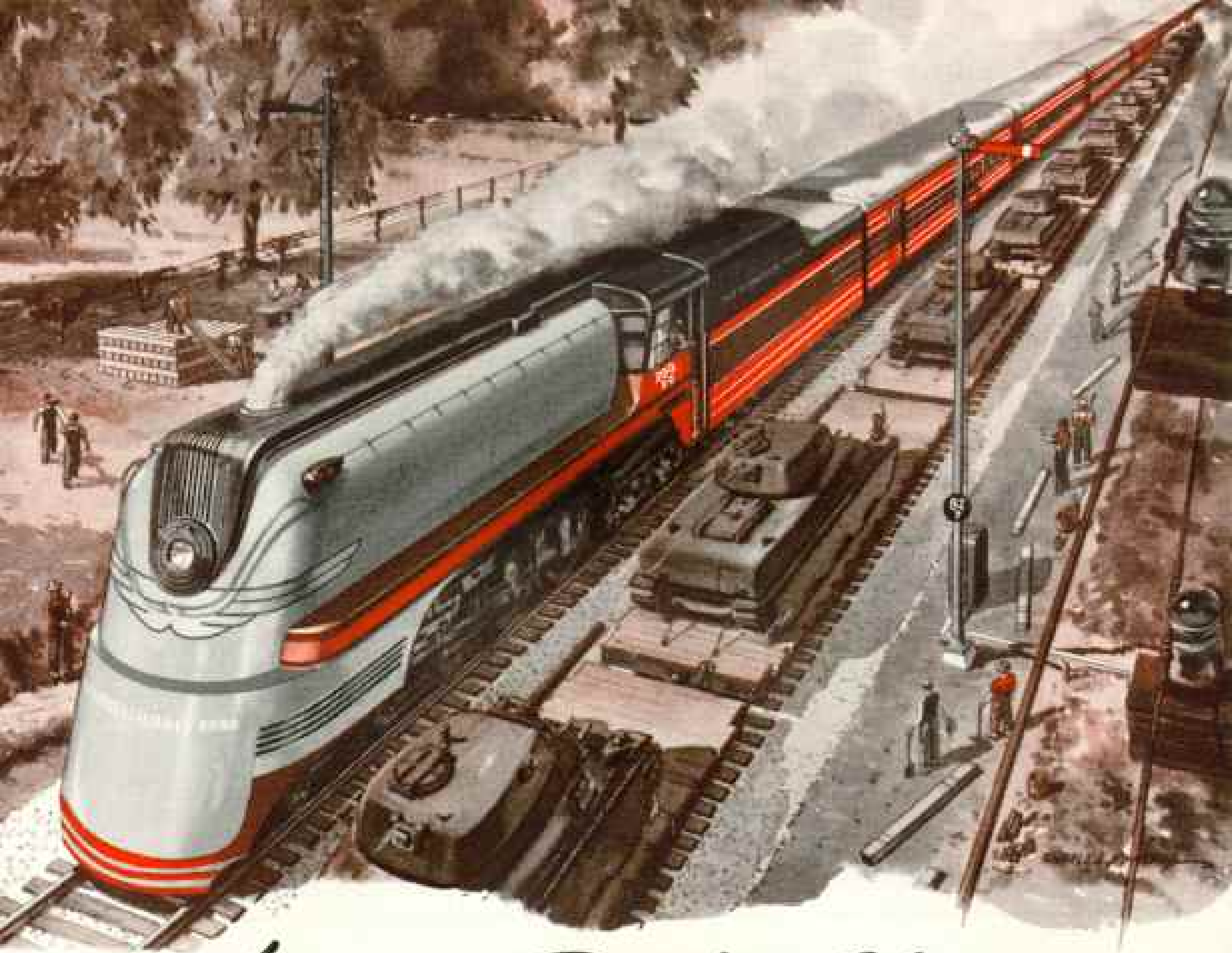
**FREE** Special gov't book on how to completely insulate your home correctly. Know how your home should be insulated for full value and efficiency. Send coupon NOW!

**CHAMBERLIN METAL WEATHER STRIP CO., INC.**

1397 LaBrosse • Detroit, Mich.

Send me U. S. Gov't Book on Fuel Savings. Also information on  Weather Strips  Rock Wool  Storm Sash  Calking

Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_



## *America's Roads to Victory* **are boulevards of steel and stamina**

**F**ASTER, faster," is wartime America's cry to the railroads. Speed the troop trains! Speed the supply and munitions trains! Speed the critical materials to the factories!

It's a challenge the railroads are taking in stride. They're coming through on every assignment, even though their need today is more new equipment than is available under existing priorities.

The railroads are mastering war traffic problems because they were ready with a modern plant that, in recent years, had been utilized to only half its capacity.

The Milwaukee Road, for example, prepared with new power as well as new freight

and passenger cars, in the decade before war struck. It improved more than 2,000 miles of track with heavier rail and new ballast. It rebuilt over 80,000 lineal feet of bridges. It reduced curvatures to permit faster schedules... and 300 grade crossings were eliminated or provided with automatic protection.

These improvements, plus heavier tonnage on both cars and trains, account for The Milwaukee Road's present ability to double its load. Aided by the co-operation of business and government shippers, its 35,000 loyal, determined employees are ably handling their tremendous responsibilities.

The Milwaukee Road and the other railroads constitute one of our vital war industries.



# THE MILWAUKEE ROAD

11,000-MILE SUPPLY LINE FOR WAR AND HOME FRONTS



**MANOIR RICHELIEU and Cottages**  
Murray Bay, Quebec

A superb resort hotel overlooking the sparkling St. Lawrence River. Pollen-free air. Championship golf, salt water pool, tennis, riding. \$9 up per day, room with bath and meals. Apply to Myron H. Woolley, Manager, or travel agents.

*Beautiful*  
**COLOR SLIDES**  
FOR EDUCATION OR RECREATION



From all over the world, S.V.E. has gathered exquisitely made 2" x 2" Kodachromes on thousands of subjects including Nature Study, Art Masterpieces, National Parks, Sciences, etc. Available in sets of 5 on related subjects or sold individually. Write for Free Circular!

Write for  
**FREE Circular!**

**SOCIETY FOR VISUAL EDUCATION, Inc.**  
Dept. 7G, 300 E. Ohio St., Chicago, Ill.

**YOUR CHOICE OF 15,000 SUBJECTS**

USE

**LAVORIS**

**Do Not Buy Imitations**

Genuine Lavoris is sold in sealed cartons only

\*DUES: Annual membership in United States, \$3.50; Canada, \$4.30; abroad, \$4.50; life membership, \$100. Remittances should be payable to National Geographic Society. Those from outside of continental United States and Canada should be made by New York draft or international money order.

RECOMMENDATION FOR MEMBERSHIP

IN THE

**NATIONAL GEOGRAPHIC SOCIETY**

\* *The Membership Dues, Which Are for the Calendar Year, Include Subscription to the National Geographic Magazine*

PLEASE FILL IN BLANK BELOW, DETACH, AND MAIL TO THE SECRETARY

1943

To the Secretary, National Geographic Society,  
Sixteenth and M Streets Northwest, Washington, D. C.:

I nominate \_\_\_\_\_

Occupation \_\_\_\_\_

(This information is important for the records)

Address \_\_\_\_\_

\_\_\_\_\_ for membership in The Society.

*After the War is over...*  
**SEE SAN FRANCISCO**



Some day the news will flash around the world that the United Nations' victory is won . . . the War is over!

Glorious release for you and all America . . . and a time of promise. America at peace will seem more beautiful than ever. You will want to see it all.

The sun will point an enticing way for your first journey—a Victory Vacation, if you will—over sweeping roads through the wonderful West, to San Francisco.

You may know that San Francisco was never a village, that it sprang into being in the Gold Rush Days, and that it is romantic and storied. Still you will hardly be prepared for it.

Your heart will leap when you see the city's towered hills, rising from the bay to form a pastel-tinted rampart for the great Pacific harbor and its shipping. There are the record bridges . . . the islands . . . the Golden Gate . . .

Your San Francisco days and nights will be filled with adventures, as you explore the hills, waterfront, Chinatown, Latin Quarter, Golden Gate Park . . . enjoy the sprightly metropolitan scenes and debonair shops, seek out delightful eating places in story-book quarters, dine and dance in famous night clubs and hotels . . .

San Francisco is a seaport-city of contrasts. Old St. Mary's Church, for instance, built in 1854, is on the edge of Chinatown (see picture above). Its red brick

and iron work came around the Horn, its granite from China. It is one of a thousand sights.

And close to San Francisco are many places you will want to see; Yosemite National Park; Lake Tahoe, "Sea of the Sky"; the quaint old mining towns the Forty-Niners built; the Big Trees and the tall Redwoods; volcanic Mt. Lassen, and Shasta Dam; the lovely resorts on Monterey Bay.

All this is something to look forward to, for after the War is won.

San Francisco today is virtually the West Coast capital of America at war, and we are not inviting merely pleasure-seekers now. You are busy too.

However, it may give you relaxation just to think about and plan your Victory Vacation. So send today for your free copy of our 48-page illustrated booklet, "The Chapter in Your Life entitled San Francisco," and a large picture-map of California. Mail the coupon now.

#### **CALIFORNIANS INC.**

Dept. 507, 703 Market St., San Francisco, California.  
Please send me your free illustrated booklet, "The Chapter in Your Life entitled San Francisco," and the free picture-map of California. Thank you.

Name \_\_\_\_\_

Address \_\_\_\_\_



## Colleges for Women

**CHRISTIAN COLLEGE** ACCREDITED Junior College and Conservatory (A. A. degree). Terminal, transfer, pre-career courses. Music, Art, Drama, Secretarial, Nursing, Int. Bus., Costume Design, Home Mgmt. All sports, post. 10th year. Catalog James C. Miller, Ph.D., Pres., Box D, Columbia, Mo.

**LINDENWOOD COLLEGE** A. B., B. S., B. M. degrees. Also 2-yr. Junior College. Prepares for civic and social leadership. Modernized curriculum. Vocational courses. Secretarial. Special work in music, art. Near St. Louis. Sports. Catalog. President, Box 243, St. Charles, Mo.

## Girls' Schools

**ASHLEY HALL** ACCREDITED college preparatory and general courses in atmosphere of historic Southern culture. Music, dramatics, home economics, art. Mild climate, year round outdoor sports; riding, pool. Lower school. Write for catalog. Mary Vardrine Miller, L. H. D., Principal, Box N, Charleston, S. C.

**CENTENARY JUNIOR COLLEGE** EDUCATION for usefulness. Fully accredited courses: Liberal and fine arts, secretarial, medical care, business, pre-nursing. Sports. Near New York City. Train. Bus. Catalog. Mrs. Robert J. Trevarrow, Box 62, Hackettstown, N. J.

**EDGEWOOD PARK** ACCREDITED College preparatory. Advanced courses in liberal and fine arts, secretarial science, medical care, pre-nursing, home ec., dramatics, journalism, photography. Costume design, interior decoration, merchandising, kindergarten. Sports—riding. Box N, Blaircliff Manor, N. Y.

**FAIRFAX HALL** STANDARD accredited 4 years high school. Secretarial, Fine Arts, Hair, beautiful location in Shenandoah Valley. Spacious grounds. Happy social life. All sports. Private stables. Indoor, outdoor pools. Wm. B. Gates, Pres., Box 7-N, Park Station, Waynesboro, Va.

**GREENBRIER COLLEGE** For young women. Junior College and Preparatory. Founded 1872. In the Alleghenies. Art, Music, Dramatic Art, Secretarial, International and Social Activities. Modern fireproof dormitory. Address French W. Thompson, Pres., Dept. N, Lewisburg, W. Va.

**GRIER SCHOOL** In the Alleghenies. Accredited College Preparation and General Courses. Home atmosphere for girls 12-15. Music, Art, Typing. Unlimited riding. Winter and team sports. 80 acres. Gym. post. 10th year. Catalog. Thomas C. Grier, Dir., Box 47, Birmingham, Pa.

**HOUSE IN THE PINES SCHOOLS** Complete School: college prep. and general courses. Junior College 2-year courses, academic, secretarial-medical, secretarial, aquatics, art, music, home-hold arts. Write for other catalogs. Gertrude Cornish Milliken, 120 Pine St., Norton, Mass.

**KINGSWOOD—CRANBROOK** GRADES 7-12, post-graduate. College preparatory and general courses. 50 acres on lake near Detroit. Unusual opportunities in arts, handicrafts, sciences. Music, dramatics, sports, typing. Secretary, 156 Cranbrook Road, Bloomfield Hills, Mich.

**THE KNOX SCHOOL** COLLEGE PREPARATORY. Post-graduate. Special training for secretaries, laboratory technicians, medical secretaries. Art, music, drama. Riding, winter sports. Catalog. Mrs. E. Russell Houghton, Box N, Cooperstown, N. Y.

**LASELL JUNIOR COLLEGE** TEN miles from Boston. Two years Junior College, two years high school. Academic, Home Ec., Secretarial, Merchandising, Fashion, Pre-nursing. Art Music. Catalog. Guy M. Winslow, Pres., 123 Woodland Rd., Auburndale, Mass.

**LINDEN HALL** JUNIOR College and School for Girls. Cultural and Vocational. Music, Home Economics, Secretarial Studies. Fine and Commercial Art, Dramatic Art. All sports. Preparatory and General Courses. Beautiful Campus. Riding, Swimming Pool. Moderate Tuition. F. W. Stengel, D.D., Box 67, Little, Pa.

**LOW-HEYWOOD** Prepares for College or other fields of study.

• Separate residence for younger girls.  
Miss Marjorie L. Tilly, Principals  
Mrs. Henry Heywood Fox,  
Box N, Stamford, Connecticut

**MARY A. BURNHAM** FACING Smith College Campus. Accredited college preparation and general courses. Exceptional work in music, art. Advanced courses, drama, secretarial, riding, all sports. Also Junior School. Train service. Sister Catalog. Mrs. Geo. W. Emerson, Box 43-N, Northampton, Mass.

## OAK GROVE

A TREND SCHOOL FOR GIRLS  
EMPHASIZES Preparation for College and Graduate Living. Music, Art, Dramatics, Upper and Lower Schools, Junior College Secretarial Science. Joyous Outdoor Recreation features Winter Sports. Riding included. Beautiful New Fireproof Buildings.  
Mr. and Mrs. Robert Owen,  
Box 140, Vassalboro, Maine

**OGONTZ JUNIOR COLLEGE** TRAINING, terminal wartime courses: barbers, (restoration, station operation, child care), home nursing, first aid, tag, drawing, vet., languages. Music, art, dramatics. Military drill. Home from Philadelphia. Box 24, Abby A. Sutherland, Ogontz School P. O., Pa.

**PENN HALL JR. COLLEGE** ACCREDITED 2-yr. College with degree; 4-yr. Prep. Career Courses, Music, Art, Drama, Home Ec., Merchandising, Radio, Journalism, Medical Ass't, Secretarial, Cosmetology, Sports, Riding, Trips. Social life. Catalog—Box W, Chambersburg, Pa.

**RYDAL HALL** JUNIOR Department of Ogontz School. Kindergarten through grammar grades. Careful guidance of each child's natural tendencies. Music, dancing, dramatics, French daily. Spacious campus. Ten miles from Philadelphia. Abby A. Sutherland, Box 24, Ogontz School P. O., Pa.

**SOUTHERN SEMINARY** ACCREDITED Junior College and High School for girls and young women. Blue Ridge Mountains of Virginia. Music, Art, Drama, Home Ec., Phy. Ed. Society, Bible, Kind. Tr. 10th Year. Robert Lee Durham, Pres., Box H-1, Buena Vista, Va.

**Warrenton** Country School  
• Forty miles from Washington. Selected group of students from ten to eighteen years old. Eleven buildings. Beautiful gardens. Two hundred acre farm operated in connection with school. Thorough College Preparation, well-planned General Courses. Music, art, domestic science. All sports, riding.  
Miss Lila M. Bouigny, Principal  
Box N, Warrenton, Virginia.

SCHOOLS FOR  
**Exceptional Children**  
**THE MARY E. POGUE SCHOOL** SOCIAL and educational adjustment for exceptional children, all ages. Visit the school specializing in work leading to more normal living. Home atmosphere. Separate buildings for boys and girls. Catalog. 96 Geneva Rd., Wheaton, Ill. (near Chicago).

**ADMIRAL BILLARD ACADEMY** GRADUATES now attending college, Coast Guard Academy, Annapolis, Merchant Marine. Fully accredited. Self discipline, naval training, uniforms, drills. Cruises in famous schooner Yantex. Junior school grades 4-6. New London, Conn.

**ADMIRAL FARRAGUT NAVAL and MILITARY ACADEMY** GRADUATES have attended 90 colleges. Accredited. Special prep. for U. S. Coast Acad. Sports, Equestrian. Moderate rate. Separate Jr. School. Adm. S. S. Robinson, U.S.N. (Ret.), Supt. Catalog. Box L, Toms River, N. J.

**AUGUSTA MILITARY ACADEMY** Country location in the famous Shenandoah Valley of Virginia. Prepares for all Universities, West Point and Annapolis. Also faculty of experienced teachers. R. O. T. C. Beautiful gymnasium, indoor swimming pool. All sports for every cadet under faculty supervision. Fully accredited. 76th session. Catalog. Col. T. J. Roller or Major C. S. Roller, Jr., Fort Belknap, Virginia  
Capacity enrollment last year.

**BLACK-FOX MILITARY ACADEMY** APPROVED by Institute particular parents. Accredited college preparation—all grades through high school—in beautiful climate. High standards. Small classes, individual program. Year-round outdoor sports, under expert coaches. Catalog. 640 No. Wilcox, Los Angeles, Calif.

## BERKSHIRE

**Prep School Boys Can Learn to Fly**  
UNUSUAL accelerated program gives actual flight training under C. A. A. to boys preparing for college. Graduates may qualify for Air Corps commission, private pilot license. Navigation, meteorology, radio and communications, topography, military science. Grades 8 through 12. Boys can complete 1 1/2 years' work in one year—obtain diploma before military age. Beautiful location convenient to railroad. 57th year. Write, Albert Keep, M.A., Box N, Sheffield, Mass.

**BLAIR ACADEMY** SOUND preparation for College or War Service. Aeronautics, physics, chemistry, mathematics. Physical fitness. 25 miles from New York City. Fast train service. Sixth grade and up. Address Charles H. Broad, Headmaster, Box 17, Blairstown, N. J.

**THE BOLLES SCHOOL** On St. Johns River  
Accredited. Prepares for college and Government Academies. 10th-12th grades. Pre-Induction program. Prepares for Army, Navy, Air Force. Military training. Honor Naval School. Fall term begins September 13. For catalog, address: Col. Roger D. Painter, Pres., Jacksonville, Fla.

**CASTLE HEIGHTS MILITARY ACADEMY** R. O. T. C. Preparatory. Jr. College Dept. P. G. Separate Jr. School—special instructors, house mothers. 17 modern buildings. New \$10,000 Chapel. Endowed. For catalog, write: Col. H. N. Armstrong, Pres., Lebanon (near Nashville), Tenn.

**COLUMBIA MILITARY ACADEMY** 12 BUILDINGS, 9 built by U. S. Government. Fully Accredited. Special Department preparing for Gov't Academies. R. O. T. C., P. G. and Jr. Schools. New \$6,000 gym. Athletics: swimming, golf. Summer session. Catalog. Dept. N, Columbia, Tenn.

**CRANBROOK SCHOOL** Beautiful, modern school of recognized standing. Grades 7-12 and post-graduate. College preparatory. Summer school. Arts, crafts, music. Athletics and hobbies encouraged. Single rooms. Near Detroit. The Registrar, 4030 Lone Pine Rd., Bloomfield Hills, Mich.

**CULVER MILITARY ACADEMY** ON LAKE MADDUCKSBURG. Prepares for leading colleges and responsible citizenship. 8th grade. Develops initiative, stamina. Senior R. O. T. C. units—Artillery, Cavalry, Infantry, Band. All sports. Catalog. 79 Pershing Walk, Culver, Indiana.

**FISHBURNE**  
For 64 Years a Distinguished Military Preparatory School for Boys  
Write for Catalog • COL. M. H. HUGHES  
Box H-38 WAYNESBORO, VIRGINIA

**FLORIDA MILITARY ACADEMY** One of the outstanding schools of the South. R. O. T. C. Fully accredited. Separate Junior School. Recreation center on Gulf of Mexico. All-inclusive rate. Limited enrollment. Colonel Walter B. Mendels, President, Box 1, St. Petersburg, Florida.


**FLORIDA NAVAL ACADEMY** "Only Exclusively Naval School in South." On Matanzas Bay. Prepares for college. Annapolis, West Point, Coast Guard. 1-yr. high school course for decoration. Naval and aviation training. 36-ft. training ship. Summer camp. For catalog, address: Lt. Commander Claude N. Brubeck, St. Augustine, Fla.

**FORK UNION** FULLY ACCREDITED. Small classes. ROTC. Super-study. Prepares for college or business. Junior school small boys; Home-mother. Athletics, Swimming. 8th year. Catalog. Dr. J. J. Wicker, Fork Union Military Academy, Box N, Fork Union, Va.

**GEORGIA MILITARY ACADEMY** 8 miles from Atlanta—fine, equable climate. Many cultural advantages—Accredited—R. O. T. C.  
Courses of Study—College and West Point—Annapolis Prep. 2-Year Junior College—includes course in business administration.  
Aviation—pre-flight training, physics and meteorology. Junior School—A separate department for 10th-12th years. Athletics—Expert coaches develop teams in major sports. Home Life—Cadets live in small groups with their teachers.  
Fall term begins on Sept. 8. For catalog, address: Col. W. N. Brewster, Pres., College Park, Ga.

## GREENBRIER

**MILITARY SCHOOL Also SUMMER CAMP**  
132nd Year. Fully accredited Lower School, High School, Junior College. Trains for leadership in War or in Peace. Remarkable success records at Government Academies and elsewhere. Over 2000 cadets. Near White Sulphur Springs. Health conditions ideal. Modern fireproof connected buildings. Complete athletic program. R.O.T.C. For catalog, address: Major D. T. Moore, Registrar, Box N, Lewisburg, W. Va.



## HARGRAVE MILITARY ACADEMY

"Making Men—Not Money." Accredited college preparatory and Junior school in beautiful Piedmont. Character building stressed by Christian faculty. All sports. Moderate rates. Catalog: Col. A. H. Camden, Pres., Box N, Clifton, Va.

## HOWE MILITARY SCHOOL

TRAINING young Americans for leadership in war and peace. R.O.T.C. Accredited college preparatory, business courses. Jr. school. Small classes. Sports. Episcopal. Est. 1884. Catalog: Barrett B. Bouton, M.A., Supt., 973 Academy Place, Howe, Indiana.

## KEMPER MILITARY SCHOOL

JUNIOR College and High School. Fully accredited. 30 years building young America for leadership. Superior scholastic, military, athletic rating. 200,000 ysm. Indoor pool, rifle range. 35 acres. Catalog: Col. A. M. Hitch, 73-B Third St., Beaverville, Mo.

## KENTUCKY MILITARY INSTITUTE

A school with a Winter Home in Florida. Oldest private military school in America. Fully accredited. Prepares boys for service. Full and spring sessions on beautiful estate near Louisville. Winter sessions in fine modern buildings at Venice, Florida. Boys enjoy beautiful land and water sports all year. For fully illustrated catalog, address: Col. Charles B. Richmond, Pres., Box N, Lyndon, Ky.

## LA SALLE MILITARY ACADEMY

ACCREDITED college preparation under Brothers of the Christian Schools, 7th grade through High School, meeting war and peacetime demands. R.O.T.C. Two regulation rifle ranges. 60th yr. Moderate rates. Catalogues: Brother Brandon, Headmaster, Box G, Oakdale, L. I., N. Y.

## MANLIUS SCHOOL

Develops initiative, character, fitness. R.O.T.C. Ski troop. Aviation ground course. Excellent background for post-graduate studies. Accredited college preparatory, 7th, 8th grades. All sports. Catalog: Director of Admissions, Box 473, Manlius, N. Y.

## MERCERSBURG

Develops self-reliance, good judgment. Grades 7-12. Superior instruction in "free-choice subjects": math, sciences, geography. Special attention to younger boys. Summer session. Founded 1838. Catalog: Charles S. Tippetts, Ph.D., Box N, Mercersburg, Pa.

## MISSOURI MILITARY ACADEMY AND JUNIOR SCHOOL

5th yr. Fully accredited. R.O.T.C. Individualized instruction teaches boy how to study. Complete guidance program prepares for future. All sports. Facilities: 200ac campus. Riding. Aviation. Catalog: Col. C. R. Stribling, 973 Main St., Mexico, Mo.

## MORGAN PARK MILITARY ACADEMY

FOUR-ACADEMY YEAR U. S. Army Reserve Officer training program. Superior prep. course. Fully accredited. 90% of graduates go to leading colleges. All sports. Gym. Near Chicago's cultural advantages. 70th yr. Lower Jr. School also. Catalog: Box 773, Morgan Park, Ill.

## MOSES BROWN SCHOOL

HERITAGE and inspiration for each boy, a century-old tradition. Known for successful college preparation. Arts and crafts hobbies. 30-acre campus. BELMONT, separate residence for younger boys. L. B. Thomas, Headmaster, 279 Hope St., Providence, R. I.

## NEW MEXICO MILITARY INSTITUTE

BALANCED program of academic, military, physical training: High School, Junior College, Outdoor life year round; dry climate—370 ft. alt. All sports. Cavalry R.O.T.C. Catalog: Col. D. C. Pearson, Supt., Box F, Roswell, N.M.

## NEW YORK MILITARY ACADEMY

The School of Distinction  
The Academy feels proud that in this year so many of its graduates are prepared to serve our country as officers in the armed forces. N.Y.M.A. training continues to meet the demands of the national emergency.  
For Catalog, address 22 Academy Avenue  
Cornwall-on-Hudson, New York

## ONARGA MILITARY SCHOOL

FITS BOYS for quick Army promotion, or Defense Industries. Teaches How to Study, Stresses character. Friendly teachers. Accredited without exams. Ages 10-18. New gym & pool stands S. of Chicago. Enrolled. Catalog: Col. L. W. Billinger, Box W, Onarga, Ill.

## PEDDIE

PRE-INDUSTRIAL courses emphasizing mathematics, sciences. Physical fitness (athletic course). Pre-flight aeronautics. College preparation for 18 years. Acceleration for older boys. Summer session. With our E. Saunders, Box 7-N, Hightstown, N. J.

## THE PENNINGTON SCHOOL

WELL-BALANCED program develops whole boy: mentally, morally, physically. Graduates have attended 60 colleges. Small classes. Crafts, Sports. Convenient to N. Y. and Fla. 10th year. Catalog: Francis Harvey Green, Box N, Pennington, N. J.

## RANDOLPH-MACON MILITARY ACADEMY

ACADEMY Year. At northern entrance to Skyline Drive. Prepares for out-lets through intensive study methods. Fireproof buildings. Supervised athletics. Write for catalog. Col. John D. Beggs, Prin., Box E, Front Royal, Va.

# RIVERSIDE

MILITARY TRAINING  
Supervised by U. S. War Department  
Highest official R. O. T. C. rating with commission in Army of U. S. is qualified graduates. Record, economy, and progress appeal to boys and parents. Optimal accelerated program. Individual attention of carefully selected faculty. Complete program for physical fitness. Preparatory and Post-graduate Courses. Junior College. Separate school for younger boys. Total expense of 2-semester year \$1000. Catalog, address:  
GENERAL SANDY BEAVER, President,  
Box N-7, Gainesville, Ga.  
Year-round school in Georgia.  
(Florida plant occupied for the duration by U.S. Naval Gunnery School)

## ST. JOHN'S MILITARY ACADEMY

INSPIRING military discipline helps your own development: confidence, leadership. Balanced program of conference study, recreation. Accredited. All sports. 59th year. Summer session. Catalog: 1373 DeKoven Hall, Delafield, Wis.

## ST. THOMAS MILITARY ACADEMY


A CATHOLIC preparatory school for boys ideally equipped for scholastic, military, athletic development. Accredited. R. O. T. C. Full sports program. Limited enrollment. Reasonable rate. Catalog: St. Thomas Military Academy, Box N, St. Paul, Minn.

## SHATTUCK SCHOOL

ACCREDITED Episcopal school offering a complete program of academic, military, spiritual, and physical training for the development of boys in grades 7 through 12. Complete Summer Session. Catalog and Viewbook, The Registrar, Box N, Faribault, Minnesota.

## STAUNTON MILITARY ACADEMY

Distinguished for excellent academic, military and athletic training. In historic Shenandoah Valley of Virginia. High altitude. Unexcelled health record. Modern fireproof buildings. R.O.T.C. Unit has highest War Dept. rating. Separate Junior School. Visitors welcomed. For catalog address: Supt., Box D-7, Staunton, Va.



## STONY BROOK

ACCREDITED program including: thorough grounding in mathematics, science, English, other fundamentals; physical fitness; distinctive Christian training. Graduates flow to colleges. 40-acre campus, accessible by train. Address: Frank E. Gabelstein, Litt.D., Box N, Stony Brook, L. I., N. Y.

## TENNESSEE MILITARY INSTITUTE

High academic and military standards, developed through 70 years, encourage good scholarship, develop fine character traits. R.O.T.C. Superior prep work for post-graduate, technical schools, college. Grades 8-12. Athletics for all. 144 acres. Restricted to 200. Catalog: Col. C. R. Endsley, Supt., Box 147, Sweetwater, Tenn.

## TODD SCHOOL AND CAMP

BOYS 6 to 18. 8th year. Accredited, Vitalized individual College Preparation. Study help. Defense courses: Shop, Radio, Music. Friendly teachers. Swimming, Riding, Hunt from Chicago. Catalog: Roger Hill, Prin., Box G, Woodstock, Illinois.

"At the Nation's Service"  
**VALLEY FORGE**  
Parents appreciate importance of young graduates under 18 being educated at distinguished Mt. Ararat for civil life and commission in U. S. Army over 1000 student men officers. Small classes. R. O. T. C. 22 modern fireproof bldgs. All sports. Mounted Field Artillery, Cavalry, Inf., Dent. Highest Gov't rating. Catalog: Box M, Wayne, Pa.  
**Military Academy**

## WENTWORTH MILITARY ACADEMY

4-YEAR HIGH SCHOOL—Separate 2-Year College R.O.T.C. All accredited. 84 years. Center of America. Large Gym. Indoor pool. All sports. Stadium. C.A.A. Flying. Large campus. Summer School. Catalog: Col. J. M. Sellers, 873 Wash. Place, Lexington, Mo.

## WESTERN MILITARY ACADEMY

SPERMATIZING military records of alumni in service prove value of training at Western. Fireproof barracks. Complete athletic and social program. 25th year. Catalog: Col. R. L. Jackson, Pres., Box N-7, Alton, Ill. (near St. Louis).

## Vocational Katharine Gibbs

• BOSTON  
90 Marlborough St.  
• NEW YORK  
230 Park Ave.  
• PROVIDENCE  
150 Angell St.  
• SECRETARIAL. War work demands more Gibbs secretaries—at available salaries! Practical courses for high school graduates. Special courses for college women. Headquarters in Boston and New York. Catalog: Assistant Dean.

## BE A DIETITIAN!

ONE YEAR INTENSIVE COURSE  
qualifies you for position in hotels, schools, hospitals, aircraft, food, etc., dept. stores, etc. Day or Eve. Course. Age no obstacle. New Semester begins July 1st. Licensed by N. Y. State. Free Placement Service. Catalog 40.

## NEW YORK INSTITUTE OF DIETETICS

600 MADISON AVE. (at 60th St.) N. Y. C., REGENT 4-7400

## NORTHWEST INSTITUTE OF MEDICAL TECHNOLOGY

offers intensive course in Clinical Laboratory technique and Basic Metabolism in 9 months. X-Ray and Electrocardiography 2 months. Catalog: Estab. 34 years. 3437 E. Lake St., Minneapolis, Minn.

## SARGENT COLLEGE OF PHYSICAL EDUCATION

of Boston University 4-yr. degree course for women. Health, physical ed., recreation. Approved (Am. Med. Assoc.) physiotherapy major. Modern dance. 5-man. rank in N. H. 6th yr. Catalog: Nelson S. Walker, Ph.D., Dean, 50 Everett St., Cambridge, Mass.

## SPARTAN SCHOOL OF AERONAUTICS

Train at SPARTAN for a place in America's war program, and for a lifetime aviation career. \$2,000,000 worth of new buildings, new equipment. Government Approved. Aircraft or Engine Mechanics. Flight Engineering. Radio, Instruments, Meteorology. Qualified graduates quickly employed. Spartan factory, contractor to the U. S. Navy, directly connected. Next semester starts Sept. 29. Write for catalog. Give age and education. Captain Maxwell W. Balfour, Director, Dept. NG-73, Tulsa, Okla.

## Municipal Sunshine Schools

WARM, sunny days all winter. Healthful, happy outdoor life. Excellent public schools from kindergarten through 2-year Junior College. Splendid private schools, including Florida Military Academy. Many families come to St. Petersburg for the entire school year. For School booklet, write P. P. Davenport, Chamber of Commerce—

## ST. PETERSBURG • FLORIDA



## **"PLEASE, MR. AND MRS. PUBLIC"**

"Please think over the Long Distance calls you've made recently to war-busy centers. Won't you agree that some of them are unessential?"

"All of these calls can't be vital, but we don't know which are necessary and which are not. You who make them can best decide that.

"We have plans to spend a billion and a quarter dollars to take care of your needs after the war but we can't do much about it now.

"If you will ease up on calls that aren't really necessary, we'll do our best to get the vital calls through with little or no delay."

P. S.—This is serious.

BELL TELEPHONE SYSTEM





**WHAT DO YOU MEAN**  
*medium*  
**bomber!**

There's nothing "medium" about our American medium bombers but their size. For example, the Vega Ventura can bomb accurately from high-level flight—tloop down on its target for low fast attack—strafe troop concentrations—blast tanks—tow gliders loaded with men and supplies, and tow high speed targets for our fighters to practice on—a combination of tasks no other medium bomber can do.

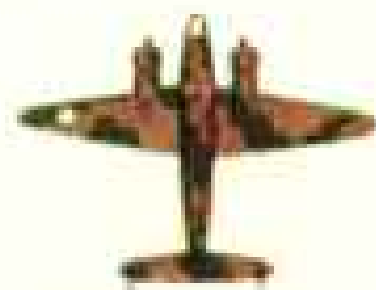
Then, too, the Ventura patrols thousands of miles of cold gray ocean to drop depth charges when it finds a sub—carries torpedoes to attack enemy ships—plants mines to trap them. What do you mean, "medium" bomber!

The Ventura has the same basic qualities of *all* Lockheed and Vega planes, *extra* strength and *extra* dependability. That's why the Canadian, British, Australian and U. S. Army and Navy Air Forces are all using Venturas—lots of them.

**A subsidiary of Lockheed**

*Vega*

**Aircraft Corporation**



*Lockheed Hudson  
Medium Bomber*



*Lockheed P-38  
Lightning Fighter*

ALL FIRST CLASS MAIL BY AIR



Copyright, 1943, Lockheed Aircraft Corporation,  
Vega Aircraft Corporation, Burbank, California.  
Members Aircraft War Production Council, Inc.