VOLUME LXXXIV NUMBER SIX

THE NATIONAL GEOGRAPHIC MAGAZINE

DECEMBER, 1943

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THE NATIONAL GEOGRAPHIC MAGAZINE

Weather Fights and Works for Man

By F. BARROWS COLTON

"WEATHER, in war, is always favorable—if you know how to use it." A young United States Army officer coined that phrase, and it may go down in history.

Knowing how to use the weather is helping us win this war. Never before has weather been employed so expertly as a weapon. Bomber flights are timed to be hidden by cloud banks. Blitzkriegs are planned to start when skies are fair and ground is dry. Airplanes are flown across oceans on routes where tail winds will give them the biggest boost.

Under the lash of war needs, our knowledge of weather and how to use it is moving forward by leaps and bounds. When peace comes this knowledge gained in war will help to make weather even more the servant of man, and less his master.

Forecasts Worth Billions of Dollars

Every day two million business men in the United States alone turn first to the weather report when they pick up the morning paper. Some seventy thousand people daily, in six leading cities, call the "weather number" to hear a recorded voice give the latest forecast. Many thousands more call weather bureaus and local telephone exchanges for information.

Three billion dollars a year in profits and savings result from protection to property, reduction in losses, or increased production brought about by weather forecasts, warnings, and reports. Yet the U. S. Weather Bureau costs each of us only about six cents a year.

What is weather?

Briefly, it is the movement and behavior of the restless, churning layer of air that thinly blankets our turning earth. This ever-flowing flood of air brings us heat from the Tropics, cold from the Arctic, rain and snow from moisture evaporated from the oceans, gales, and calms. It affects our daily lives, our health, our fortunes, and probably the growth and futures of our children.

Understanding the movements and foibles of this ocean of air is the secret of all weather forecasting.

Inseparable twin of weather is climate, which is "average weather" over a long period. Climate makes life hard in some parts of the world, easy in others; it largely decides what crops you can raise, whether you're lazy or energetic, and alters the destinies of nations.

"We're using world-wide weather and climate to fight a world-wide war," a young Army Air Forces colonel explained to me. He waved at a huge wall map of the world, divided into sections that covered all the continents, oceans, and even polar regions.

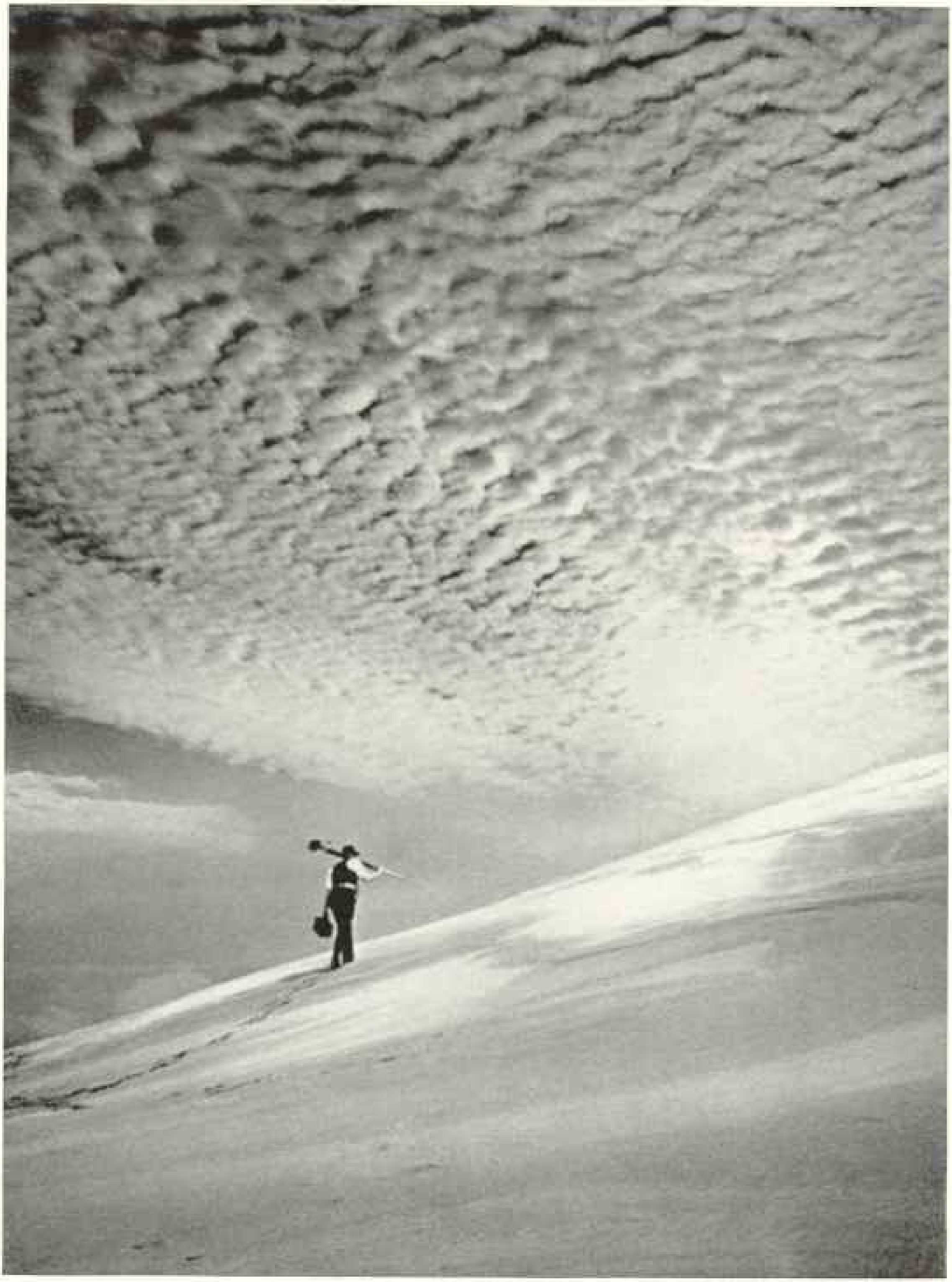
"We have a regional weather-control officer in every one of those sections. Between them they tell us what the weather is everywhere—even pretty accurately in enemy territory. It's possible, now, for the first time in history, to have a complete picture of the weather all over the world at the same time.

"The Air Forces handle weather for the entire Army, making forecasts for both flying and ground operations.

"We draw a world-wide weather map at least once a day and usually four times a day.

Weather Always on the Move

"We need to know world-wide weather conditions because weather is always on the move. A howling blizzard over Hudson Bay may seem harmless and remote, but a few days later it may shut off bomber flights to England and scatter a convoy all over the North Atlantic.



Michael J. Bell

Like Orderly Wisps of Cotton, Alto-cumulus Clouds Form a Pattern in the Sky

Clouds like these above a snow-covered hilltop near Dearborn, Michigan, nearly always are in rows. They form in an area of rising moist air and are composed of water droplets. Usually they hang at about three miles (page 653). See "Toilers of the Sky," by McFall Kerbey, NATIONAL GEOGRAPHIC MAGAZINE, August, 1925.

George M. Dyott

Over Mount Rumiñahui, Ecuador, Hangs a Cloud Peculiar to Mountaintops

Such lens-shaped (lenticular) clouds are thick in the center and thin at the edges. They are formed by winds blowing over mountaintops or ridges. Like a waterfall, such a cloud stays in one place, but keeps gaining new material and losing old. On the windward side more moisture is constantly blown up from below, condensed, and added to the cloud. To leeward, the moisture evaporates.

"Forecasting weather, in a nutshell, is figuring out where the weather that prevails in one place today will be tomorrow or next week. In the Temperate Zones weather travels in general from west to east; so today's weather in Siberia often is tomorrow's weather over Japan. A storm that's lashing the North Atlantic now will furnish cloud cover for Allied bombers over Europe a few days later."

In the next room, thumping teletypes were pouring in coded messages from everywhere. Among the reports were passages such as these: "Swamps in western Russia are beginning to freeze." "The prolonged dry spell in northern France is continuing." "A tropical storm is moving toward the Solomon Islands."

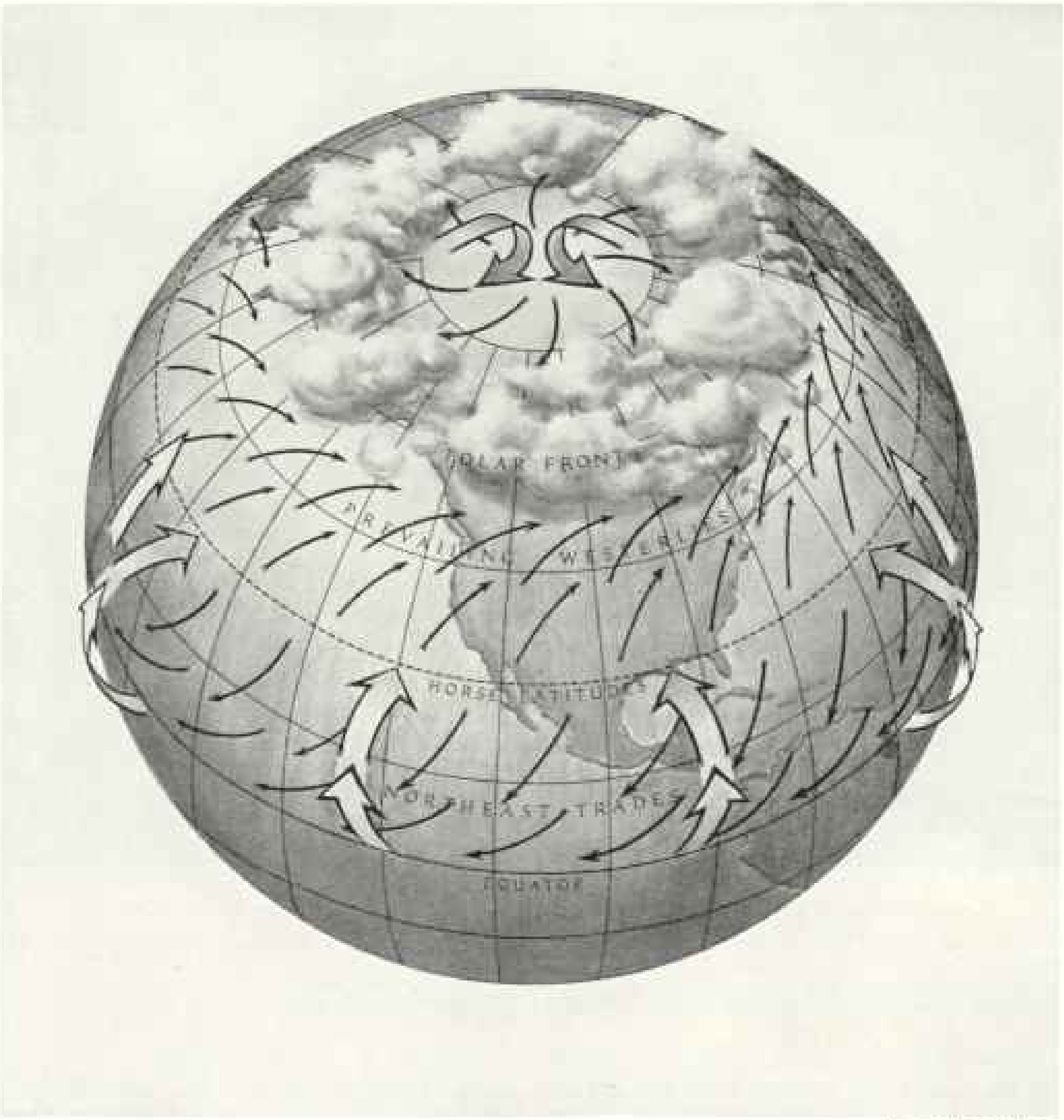
When swamps freeze, tanks and troops can move more freely. A windy dry spell is the best time to drop incendiary bombs. Under cover of a tropical storm Jap planes may raid the Solomons.

"Climate is just as important to us as weather," the colonel went on. He pulled out a drawer in a huge stack of card-index files.

"What's the best time of year to bomb Japan? These climatic data tell us. In winter the Japanese west coast, toward China, has much cloudy weather, but the east coast, where the industries are located, is mostly clear. In summer it's just the other way.

"Some people think China is remote, but the U. S. Army knows the speeds and directions of winds at different altitudes there, where you'll find fogs in the mornings, and the dates and *times of day* when thunderstorms are most likely! That's vital for our planes operating in China.

"Even different types of soil are important. A fine, sandy soil dries out fast after a hard rain so you can move tanks and heavy guns in a few hours without danger of their getting bogged down. But somewhere else the soil



Drawn by Irwin Allemon

Air Moves over the Earth in a General Pattern That Governs Weather Behavior

Wide arrows show how warm air rises over the heated equatorial region and flows north in the Northern Hemisphere. Over the "horse-latitudes" most of it drops nearer the surface, part returning southward and part continuing northward. Rotation of earth deflects currents, as shown by small arrows. Southward-moving air is deflected westward to form the northeast trade-wind belt. Northward-moving air is deflected eastward and forms "prevailing westerlies" in the latitude of the United States. Over the North Pole air moves in and down (wide arrows), then outward (small arrows). Where this polar air meets prevailing westerlies is the "polar front." Here clouds and storms form, and cold waves pour out. This diagram shows only generalized average pattern of air movement, which actually is far more complicated from day to day (page 645). Circulation in the Southern Hemisphere follows a similar scheme.

may be a heavy, sticky clay, which stays muddy for days. A general must know those things, or his whole campaign may go wrong.

"When it rains in northern France, how hard does it rain? The Army engineers have to know. If rains are heavy, rivers will rise, fords will become impassable, they'll have to build more bridges so the floods won't interfere with river crossings. But if rains are light, they won't have to bother.

"Take the bombing of the German dams in the Ruhr last spring. That was carefully timed on the basis of climate. The dams were bombed in May because we knew there would be the greatest amount of water behind them at that time.

"Our climate data from Germany showed that the winter flow rate of the streams feeding the reservoirs behind the dams is 32 tons per second, but in an average summer it drops to six tons. The greatest flow is in April and early May when snow is melting and the spring rains come.

"With a maximum amount of water behind the dams, there would be more pressure on them, causing greater damage when they were broken by our bombs. After May, we knew, it would be harder to refill the dams even if they were repaired, because the stream flow rate is so much less in summer, evaporation is faster, and more rainfall is soaked up by the ground and by vegetation."

Air Weighs Billions of Tons

Let's look at the world-wide picture of weather. Visualize our earth, surrounded by a layer of air. Ninety percent of it lies between the surface and a height of 10 miles. This layer of air weighs altogether about five and a half million billion tons.

As you lie on the beach sunning yourself, it presses with a weight of more than one ton on one square foot of your chest (14.7 pounds to the square inch). That weight we call atmospheric pressure. You don't feel the pressure, because the air inside you is pressing outward with the same force.

This vast mass of air is constantly in motion. How it moves over the earth is the key to all weather. The air flow follows an average pattern, not hard to understand. The power to keep it moving comes from the sun, shining down from outer space.

Air near the Equator is warmed by the sun. It rises and in the Northern Hemisphere starts to flow toward the North Pole. But the turning earth deflects it eastward, and the air piles up along the vicinity of the 30th parallel of latitude.

Here some of the air flows downward, but not horizontally, forming a region of calms, named the "horse latitudes" by the early sailors whose ships were becalmed there (diagram, page 644).

From the horse latitudes some air flows back south toward the Equator and forms the northeast trade winds. Air also flows north from the horse latitudes, is deflected still more to the eastward by the earth's rotation, and forms the "prevailing westerlies," winds that blow from west to east in latitudes between 30 and 60 degrees (United States, southern Canada, Europe, northern Asia).

These winds cause weather to move on the average from west to east in the North Temperate Zone.

Over the North Pole, air is cooled and sinks. Moving southward, it runs into the prevailing westerlies near the 60th parallel. Here the westerlies ride up over the cold polar air, and this boundary, between cold and warm air, extending almost all around the world, is known as the "polar front."

In this belt most storms of the North Temperate Zone are born. In the Southern Hemisphere much the same thing happens.

Warm air is able to contain much more moisture than cold air. One cubic mile of warm, moist air may have within it some 40,000 tons of potential liquid in the form of rain or snow.

Rain and snow are formed when warm air containing water vapor is raised from the earth's surface up to a height where the temperature is cold enough to condense the vapor.

Usually this happens when a mass of cold, dry air coming down from the north meets a warm, moist air mass moving up from the south. The warm, moist air is the lighter of the two, so it slides up over the cold mass, as it might slide up a mountainside (pages 646, 648).

These collisions between cold and warm air masses produce storms and bad flying weather. The boundary between a cold and a warm air mass is called a "front"—a "cold front" if the cold air is pushing under the warm, and displacing it; or a "warm front" if the warm air is overriding and displacing the cold. A front may be several hundred miles long and slope several miles up into the atmosphere.

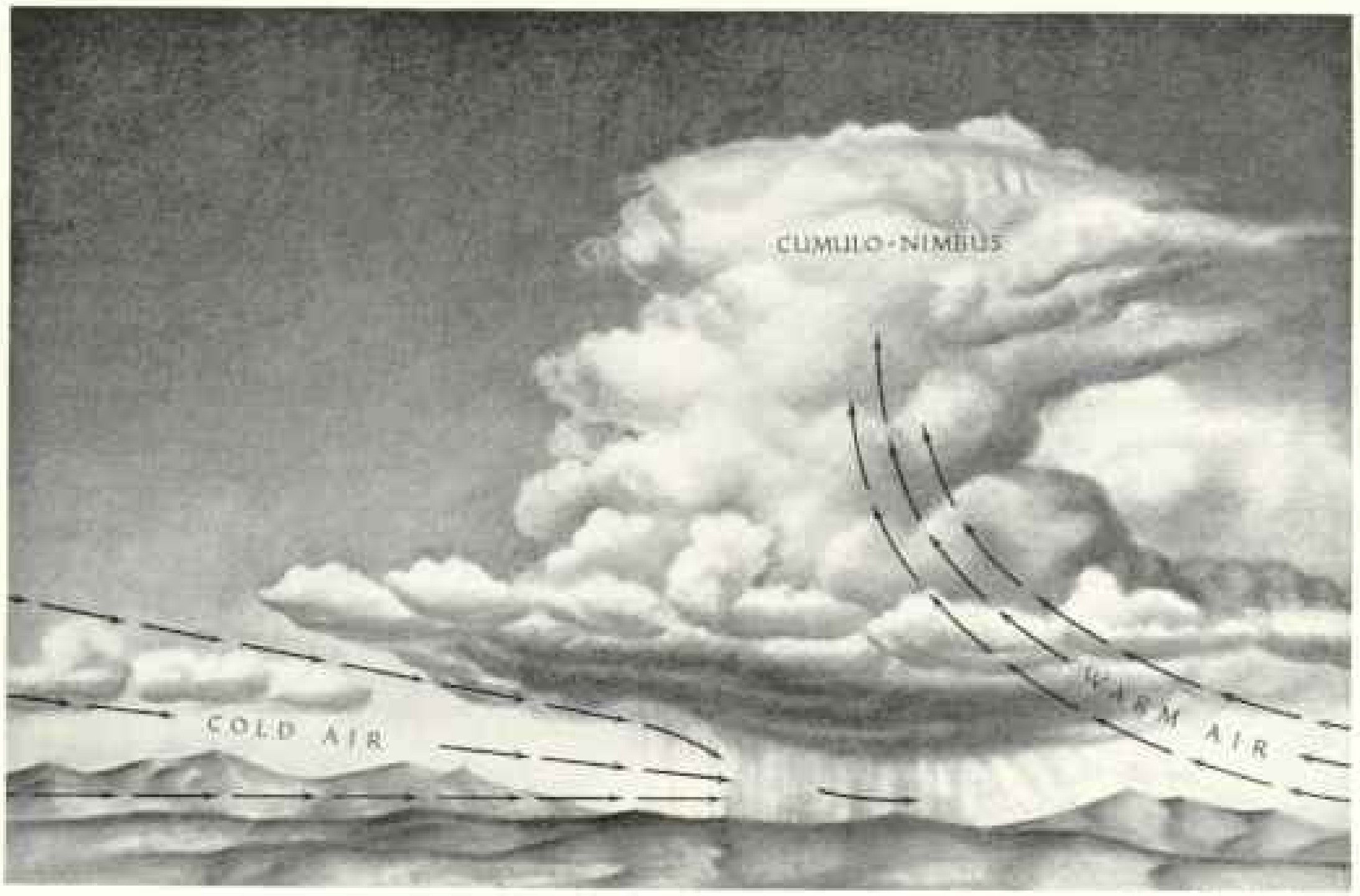
When the air rises and is cooled sufficiently it is able to hold less moisture. The excess water vapor condenses into visible water drops, just as water vapor in the air of a warm room condenses into drops on the outside of a cold glass. This water forms clouds, from which fall rain or snow (page 647).

A Mixing Bowl for Air Masses

We get changeable weather in the United States because that region is a mixing ground for air masses from the Arctic and the Tropics.

Where a great mass of cold air accumulates, it presses down on the earth with extra weight and barometers rise. This forms a "high-pressure area," or "high." Air flows spirally outward from it in all directions with clockwise motion (counterclockwise in the Southern Hemisphere). Usually it brings clear skies because the air in it is moving downward; so moisture is not carried up to condense and form clouds. However, warm air sometimes flows up over the cold air and gives rain where pressure is high.

Elsewhere, pressure may be less than normal



Drawn by Irwin Allaman

A Moving Wedge of Cold Air Pushes under Warm Air to Form a "Cold Front"

As the lighter warm air is pushed up to colder, higher levels, the moisture in it condenses and forms clouds. Rain or snow falls from them. Diagram shows a cumulo-nimbus or thunderstorm cloud, which often forms at a cold front. Most storms originate along a "front" between cold and warm air masses. As the front moves, the storm moves with it. A front may extend over many miles (pages 645, 648).

and barometers will fall. This is a "low-pressure area,†† or "low," with air flowing in toward its center with a counterclockwise spiral motion (clockwise in the Southern Hemisphere). A low brings storms and rain or snow, because the warm air is forced upward and its moisture condensed into clouds and rain. A high or a low may cover a third of the United States.

All this is what makes "weather."

It is a simplified picture, leaving out the details and unpredictable tantrums that give the weather forecasters headaches.

Grantland Rice wrote a verse that expresses the weatherman's perennial lament:

> And now among the fading embers,
> These in the main are my regrets:
> When I am right, no one remembers;
> When I am wrong, no one forgets!

Actually a 36-hour forecast averages 95 percent accurate in the first few hours, 85 to 90 percent at the end of 24 hours, and then drops to 80 or 85. Seldom are warnings of storms or other dangers in error.

Many of the Weather Bureau's observing stations are located at airports, because there they best can serve aviation, which depends heavily on weather. Moreover, airports are away from the high buildings, hot streets, gusty winds, and smoke of cities, which may make weather observations inaccurate.

Always on the Job

The Weather Bureau never sleeps. Night and day, all over the Nation, observers look at their thermometers and barometers, read their wind gauges, test the moisture of the air, and launch small balloons to plumb the heights above. About 5,000 "cooperative observers" of the Weather Bureau work without pay, faithfully sending in reports. Some of them have served thus valuably for 50 years.

At regular intervals, reports from the observers pour in, and every few hours the forecasters make their maps and issue their forecasts, upon which countless activities depend.

A mild spell in the spring stimulates the buying of spring clothing. When a cold wave hits an area where winter wheat has little protective snow cover, the buying of wheat is stimulated in Chicago markets. Ice hampers dredging for oysters.

In a big city, if a thunderstorm comes before 5 p.m. the sudden darkness will cause

U. S. Weather Bureau

A Forest Fire Creates a Cloud from Which Rain Might Fall to Put It Out

A cumulus cloud, forerunner of a cumulo-nimbus, or thunderstorm cloud, formed above this blaze on Sister Elsie Peak, California. Air heated by the flames rises to a height where it is cooled, and its moisture condenses to form the cloud. Vapor directly above the peak, lower down, is smoke.

Detroit News, by J. Parrod

How a Cold Front Looks. The Line of Cumulo-nimbus Clouds, Background, Shows Where a Cold Air Mass Is Pushing under Warm Air

Clouds with anvil tops build up when warm, moist air is pushed upward as cold air slides in beneath and moisture condenses (page 646). Tops of clouds are about 35,000 feet high. Small clouds in foreground are alto-cumulus. Picture was taken from plane at 18,000 feet. Front extended from Buffalo, N. Y., across Connecticut.

A. Rauschkolb

Myriad Lightning Flashes on the Horizon behind the Lights of Denver, Colorado, Caught by Exposing Negative for Half an Hour

Alohi E. Lillip

Six Waterspouts Seem to Hang from a Lowering Cloud over the Sulu Sea

This unusual scene was photographed near the Philippines. A waterspout is not a rotating column of sea water, but a funnel-shaped cloud created by a revolving column of moist, humid air. This motion causes a decrease in pressure. The whirling air expands and cools. Moisture in it condenses and becomes a long, thin cloud. Waterspouts usually last only a few minutes. This probably encouraged the old belief that they could be destroyed by cannon fire or some magic formula.

British and German Planes, Battling Miles above Earth, Weave a Tangled Pattern of "Artificial Cloud" Trails

Water vapor discharged from engine exhausts becomes a streamer of cloud when it condenses in very cold, humid air at altitudes of 25,000 to 40,000 feet (page 655). The trails may give away the position of planes flying too high to be seen from the ground. These were photographed during the Battle of Britain in 1940.

U. S. Navy Official

A Cloud Deck Conceals Navy Bombers from Spotters and Antiaircraft Gunners Below

Modern air fighters use clouds as Indian fighters used trees, as an ambush from which to attack, or as a hiding place. Both United Nations and enemy air forces publish handbooks on proper use of clouds by their pilots (page 655).

thousands of office lights to be turned on. Unless the power company is forewarned, it cannot always meet the sudden demand for extra electricity. But if the storm comes after 5, offices are empty and the power load will be far less.

In one western city gas for fuel is piped from a distant field, taking 24 hours to travel the distance. When a sudden cold snap is on the way, with increased demand for fuel, the gas company must have 24 hours' warning, to pump the extra gas through the line in time.

If you had cranberries with your Thanksgiving turkey this year, you can thank the Weather Bureau's frost-warning service, which operates as a modern Paul Revere in Cape Cod cranberry bogs. When the thermometer starts dropping toward freezing, messages flash over a telephone network. Bogs are flooded, and the crop protected.

Weather affects our health and moods. When a sudden weather change occurs, arthritis pains grow worse; mental patients become restless; a strain is thrown on the body as it strives to adjust itself. Blood vessels contract; the supply of oxygen to various parts of the body is restricted. Most healthy people suffer no ill effects, but some may become ill, and people already seriously ill may be unable to withstand the added strain (p. 668).

Weather "Tracks" for Planes

Because airplanes move *through* the weather, not under it, aviation has given weather forecasting a tremendous boost. Weather reports along an air route are almost as essential as tracks for a railroad train.

Winds at different levels have different directions and speeds, and planes take advantage of the most favorable. Violent up-and-down drafts of thunderstorms give a plane a terrific bouncing around at best and at worst can cause disaster. Here and there, in the cold upper air, masses of supercooled water drops lurk, ready to form ice on the wings of an unwary plane and force it down.

Clouds, concealing the earth, blot out landmarks or landing fields. One transatlantic airplane flew for seven and a half hours between two cloud decks, unable to see the ocean beneath or to fix its position by the stars above.

More than 20 years ago, Vilhjalmur Stefansson, writing in THE GEOGRAPHIC, said: "It is probable that the weather bureaus . . . will publish daily or several times a day maps of the air routes, the information of which will be conveyed by wireless messages to the commanders of aircraft, enabling them to vary from hour to hour the courses they steer, as to latitude and longitude and altitude." *

Today that has come true, and more. Pilots, even before they start, know what the weather will be along the way, and at their destinations. Between 600 and 700 Weather Bureau stations along United States airways report on the weather every hour.

When a flight of bombers starts across the Atlantic, they have a vertical cross-section diagram of the weather along their route all the way across, extending from the surface up to 25,000 feet.

The route is divided into segments, and for each one the expected weather is noted, such as "broken clouds; overcast, squally; showers; light rain; high scattered, lower broken clouds"; and so on. The clouds to be encountered actually are drawn in to show where they will be found, and areas of ice formation are clearly marked.

Where does such accurate information come from? Some of it is sent back by planes after they reach the other side. They often take only six or seven hours to cross, so the data are still good.

Ships and planes both keep radio silence en route, of course. But forecasters are so expert now that they can fill in the blank spots on their ocean weather maps accurately without having to know the conditions there at first hand. Weather reports sent from the British Isles, Iceland, Greenland, Bermuda, Spain, and Portugal give them many facts they need. For ocean flying, weather maps already are international and intercontinental.

Airplanes equipped with sealed cabins and oxygen to fly at 20,000 feet or higher could soar above dangerous storm conditions and cross the North Atlantic every day in the year, some weathermen say.

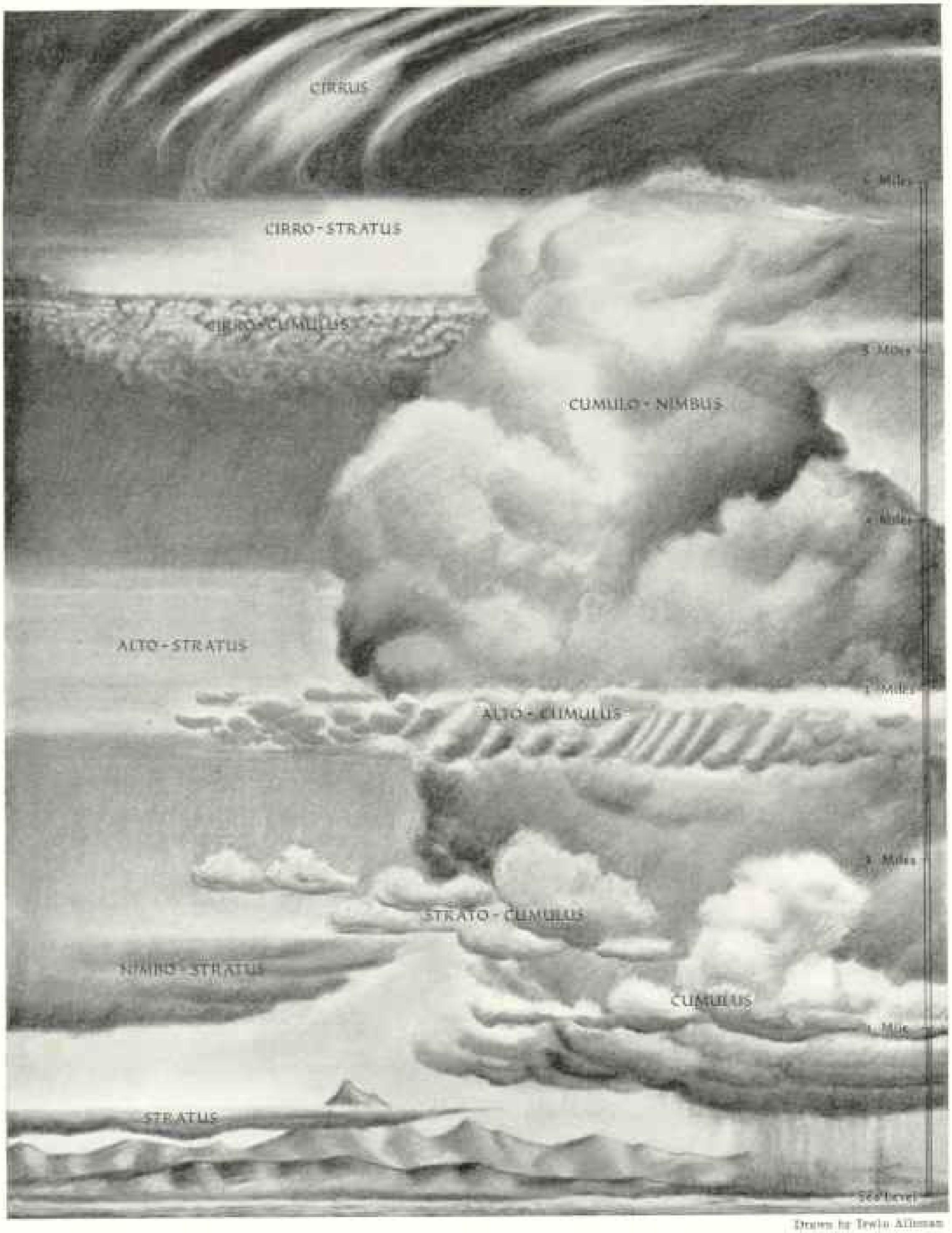
The "Atlantic Doughnut"

Over the North Atlantic, between the latitudes of Cuba and Maine, most of the time, hangs a large high-pressure area, its winds circling clockwise. Some flyers call it the "Atlantic doughnut." Eastward-blowing winds on its northern edge help push bombers from Newfoundland to Great Britain.

The doughnut shifts position with the seasons; and the bomber path shifts with it, so as always to take advantage of the tail winds which it supplies. Coming back, planes follow another route to get the push of winds blowing the other way.

Out in the Pacific they use prevailing winds

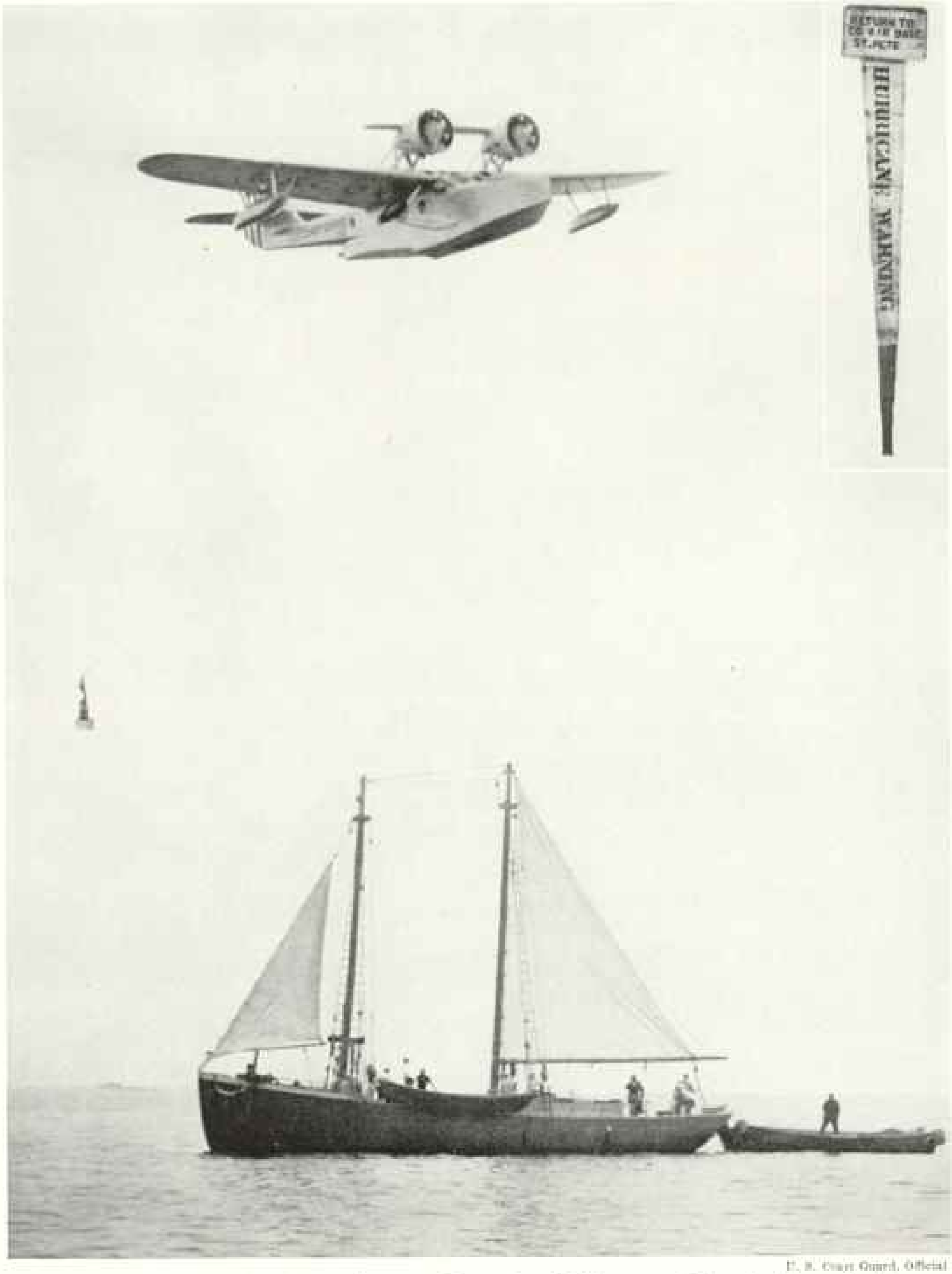
* See "The Arctic as an Air Route of the Future," by Vilhjalmur Stefansson, NATIONAL GEOGRAPHIC MAGAZINE, August, 1922.



Drawn by Irwin Allaman

Clouds Are Composed of Water Droplets or Ice Particles. Scale Shows Heights

Towering cumulus and cumulo-nimbus (thunderstorm) clouds form with rising air currents (pp. 647, 648). Cumulus means "a heap." Lowest cloud is the stratus, or "layer," from which a drizzle may fall. Dark gray nimbo-stratus clouds usually produce rain or snow (nimbus means "rainstorm"). Strato-cumulus is a dull gray mass or roll. White alto-cumulus clouds (alto means "high") resemble a herd of sheep. Alto-stratus is a gray sheet cloud. Highest clouds are the cirrus types composed of ice crystals (cirrus means "curl"). Cirro-cumulus forms the "mackerel-sky" pattern. Cirro-stratus resembles a thin white veil. Cirrus is the "mare's-tail" type.



U. S. Coast Guard, Official

A Hurricane Warning Drops from a Coast Guard Plane to a Vessel without Radio

The signal is a wooden block with streamer attached, on which are the words, "Hurricane Warning" (inset). During the storm season, from June to October, the Weather Bureau watches for such disturbances and charts their expected movements. Because this knowledge would be useful to the enemy, no news of the hurricane which struck the Texas coast in July, 1943, was released outside until the storm reached the vicinity.

the same way, and there's a point (or was in peacetime) called "Jones's Corner," marked by intersecting radio beams, where pilots shift course to take advantage of tail winds.

Air-line weathermen predict air lines over the North Pole after the war. Already there are weather-observing stations north of the Arctic Circle.

Flying weather over the Pole usually is good, and how well it can be forecast was shown during Sir Hubert Wilkins' search for the lost Russian flyers in 1937-38, when the United States, Russia, Canada, Norway, Sweden, and Denmark cooperated to furnish "excellent forecasts of conditions in the Arctic area." *

Weather has influenced history. A storm helped destroy the Spanish Armada and save England from invasion.

"Had it not rained on the night of the 17th of June, 1815," wrote Victor Hugo in *Les Misérables*, "the future of Europe would have been changed. A few drops of water more or less prostrated Napoleon. . . . The Battle of Waterloo—and this gave Blücher time to come up—could not be commenced before half-past eleven. Why? Because the ground was soft. It was necessary to wait for it to acquire some little firmness that the artillery might maneuver."

In today's war no bomber leaves the ground until the weather officer has assured the flight personnel that flying conditions are favorable.

One raid on Germany was planned so that bombers flew in a cloud bank that reached from England to within a few miles of their destination. Thus they were hidden from German attack all the way in, but emerged into clear weather over the target.

Once a group of German dive bombers flew out through a cloud layer to attack American positions in North Africa. A heavy escort of Messerschmitt fighters flew above the cloud layer to protect them against American fighters. But the U. S. fighters were waiting *below* the cloud layer and shot down 14 of the Stukas as they dove out of the clouds!

The Importance of Clouds

So important are clouds that Allied and Axis air forces both have issued handbooks to pilots on how to use them properly. Clouds may serve as either ambush or haven (p. 651).

In bombing raids on one German city, United Nations' losses were only one-half of one percent when there was cloud cover, but 12 percent without it.

One headache for bombers and fighters is caused by exhaust trails, which form when moisture given off from engine exhausts condenses in humid cold air and forms streamers of cloud behind an airplane. The bombers may fly so high they cannot be seen from the ground, but exhaust trails will fan out behind them as conspicuous as sky-writing smoke (page 650).

Enemy fighters then can spot them easily, and antiaircraft gunners can aim their shots just ahead of the exhaust trails; they need not see the planes.

Bombers can leave a field in low clouds or rain if necessary, because usually they don't take off in formation, but they need clear weather over the field for landing. Weather officers can plan for this at British fields, since the weather moves roughly from west to east. A storm area, covering a field when the bombers leave, often will have moved eastward by the time they return.

Since weather moves eastward, the Germans have to guess at what kind of weather is coming to them out in the Atlantic. That's why they risked establishing a secret weather station in Greenland (captured later by the U. S. Coast Guard).

That's why, too, some parts of weather forecasts in the United States are a military secret. We don't want the Germans to know what kind of weather is coming to them from us, nor when there are clouds off our east coast that could conceal German bombers attacking our cities. In the Pacific the Japanese have the advantage, since weather moves from their territory toward us.

Already weather has played a vital role in the Pacific war. The Japanese aircraft carriers that attacked Pearl Harbor sneaked in under the clouds of an eastward-moving storm. Later a Jap convoy approached the Bismarck Archipelago beneath cloud cover. But the storm veered away from its expected track and left the convoy exposed to Allied attacks.

"In war, any kind of weather can be both good and bad," one officer said, "depending on what you want to do.

"Winter weather freezes rivers and swamps, but requires special lubrication for trucks and tanks, and shelter for troops. Rain bogs down trucks and guns, spoils unpaved landing fields, but improves the water supply in arid country. Snow is a big help to aerial observation and photography, but makes it easier for enemy planes to spot the tracks of trucks, tanks, and guns on the ground, revealing their positions.

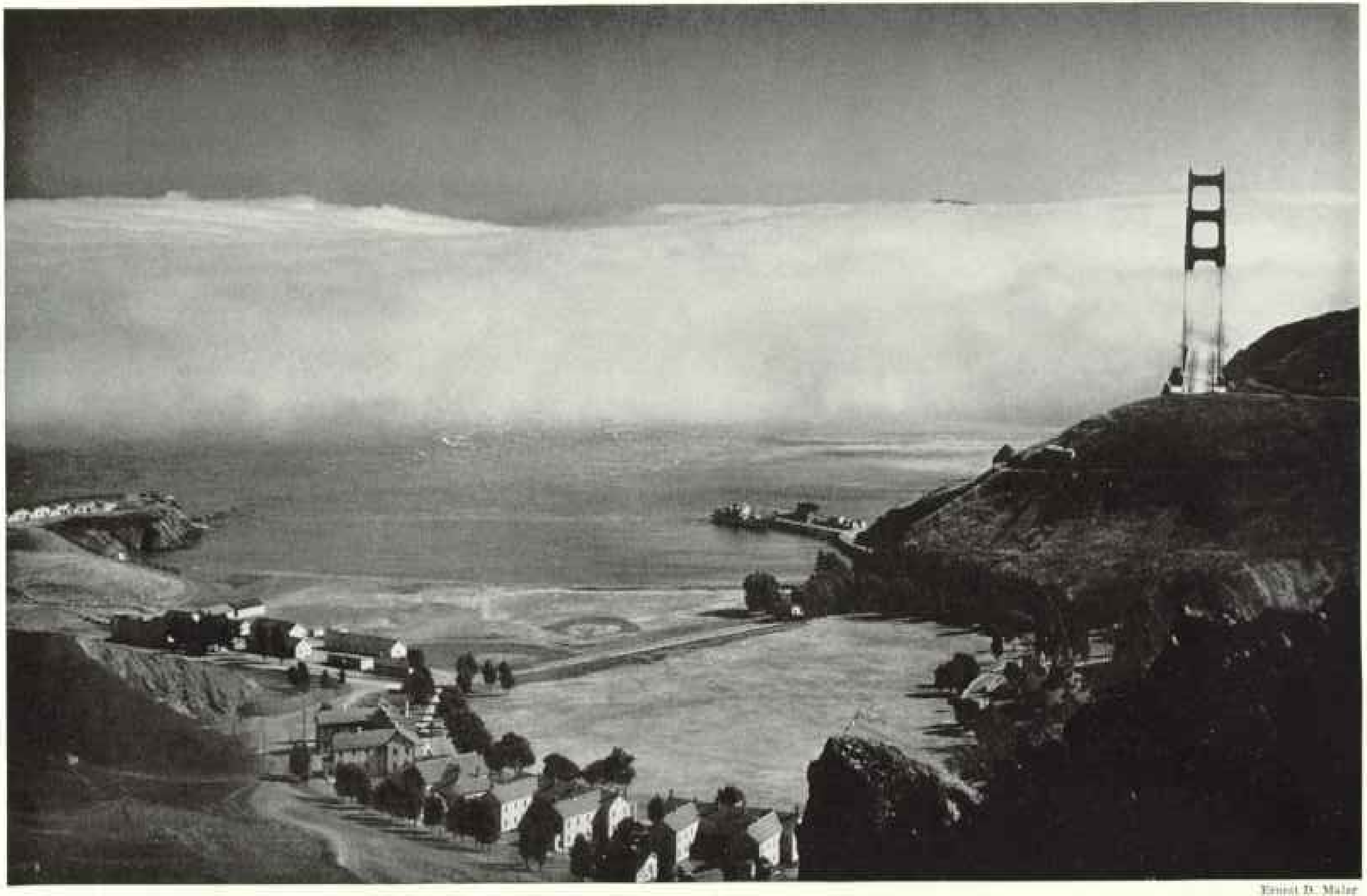
"Cloudy weather not only screens bombing raids and hampers antiaircraft fire, but also

* See "Our Search for the Lost Aviators," by Sir Hubert Wilkins, NATIONAL GEOGRAPHIC MAGAZINE, August, 1938.

British official

Like a Huge Smoke Screen, a Sandstorm Rolls up over the Horizon in the Sahara, Bringing Untold Misery to Troops

Time and again the British Eighth Army's operations against the Axis in Egypt and Libia were hampered by these surging walls of sand. The blinding, choking particles got into the eyes, noses, and mouths of troops, gave their food a gritty taste, and penetrated into parts of trucks, guns, and other equipment.



Ernest D. Mailer

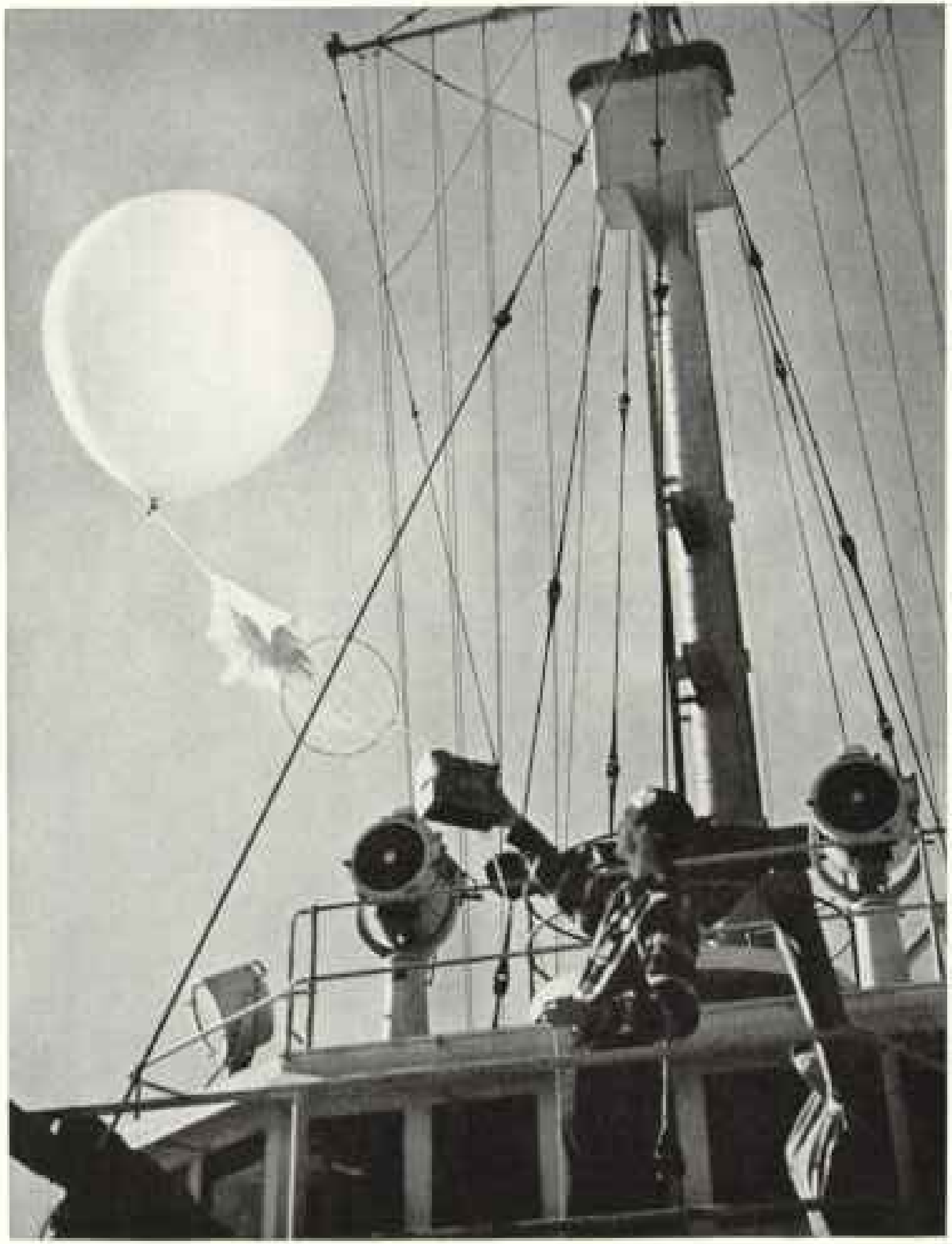
Fog, Rolling through San Francisco's Golden Gate, Forms when Warm, Moist Air Passes over Cold Coastal Water

Chilled water, from deep in the ocean, wells up along the northern Pacific coast. In summer, when moist winds from the northwest pass over this cold water, their moisture condenses into fog, which blows in with the sea breeze. Some San Francisco "fogs" really are low stratus clouds (page 664).

South African Railways and Harbours

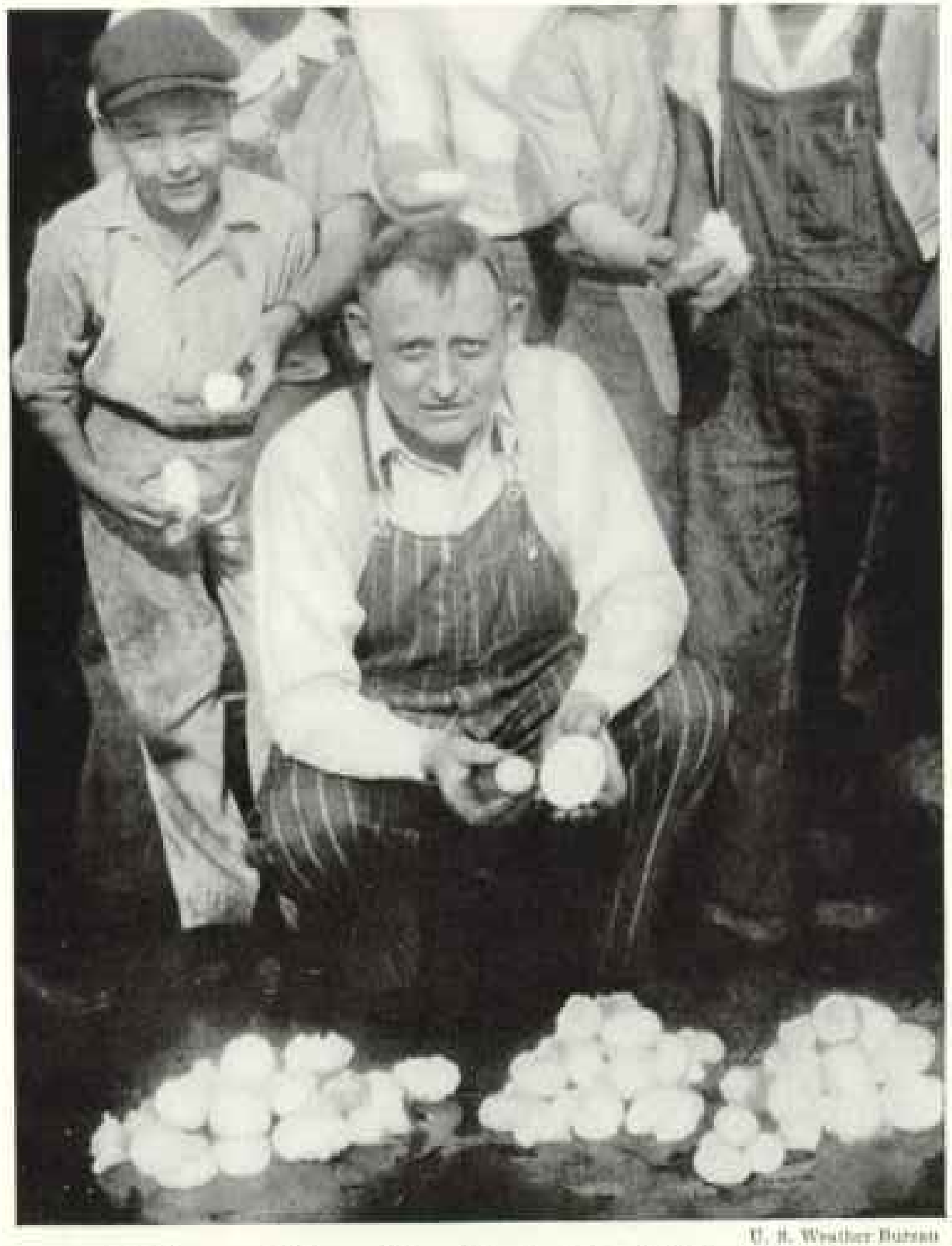
"Tablecloth," One of the World's Famous Clouds, Forms on Flat Table Mountain, South Africa

Spreading over the heights behind Capetown, the cloud gathers when warm winds are forced up the steep slope, and their moisture condenses in the cooler air above. The statue of Jan Van Riebeek, who founded the city in 1652, seems to admire the spectacle.



How's the Weather Aloft? The Radiosonde Will Tell

One of the new instruments which has revolutionized weather forecasting is about to be released from the bridge of a Coast Guard cutter. A tiny automatic radio broadcasts instrument readings in a series of tones which vary in pitch as temperature, humidity, and pressure change (pages 660, 662).



U. S. Weather Bureau

Hailstones Bigger Than Hen's Eggs Fell in Illinois

The egg in the man's right hand is small by comparison. Hail is a product of thunderstorms, when air currents violently toss raindrops up and down. At high, cold levels they mix with snow and freeze into globules of cloudy ice. Then they drop to the rain level where they get a coat of clear ice (page 664).

U. S. Weather Bureau

Safely Back from Miles Aloft, This Radiosonde May Soar Again into the Blue

Two boys find one of the weather-measuring instruments launched daily into the upper air to send back automatic radio reports of temperature, pressure, and humidity at high altitudes (pp. 659, 662). Many are lost, but one dollar is paid for each radiosonde found and returned to the Weather Bureau.

makes formation flying difficult and obscures the target. Fog assists surprise attacks and screens targets on the ground, but hampers airplane landings and take-offs and restricts naval patrols and submarine activity.

"You have to remember also that weather which interferes with your own plans may be just what the enemy has been waiting for."

A Boom in "Weather Bureaus"

The science of weather is called "meteorology," though it has nothing to do with astronomical meteors. The word "meteor" however, also refers to rain, snow, or any other atmospheric phenomena. Highly trained professional weather experts are known as "meteorologists."

When the United States went to war, there were not more than 200 of them in this country (not counting several thousand forecasters and observers less highly trained). Today there are 15 or 20 times as many meteorologists, all schooled by the Army, Navy, and Weather Bureau since Pearl Harbor (p. 665).

That shows how important is weather in this war. Besides hundreds of weather officers, many thousands of enlisted observers and forecasters are being turned out.

All over the world these men are setting up "weather bureaus" near the front lines, often under fire, forecasting rain that may hold back ammunition trucks, telling the bombers when to fly, or warning of low clouds or fog that will ground our fighter planes but provide cover for enemy parachute-troop attack.

Pfc. Don H. Fields of the 10th Weather Squadron, Army Air Forces, wrote these lines about the Army weathermen:

The problems climatic are not so romantic
As shooting down Japs from the blue,
But you bet your last dollar the fliers would holler
If the weatherman failed to come through!

"This war will advance the science of weather at least 20 years," said one Army

officer, a former air-line forecaster. "With plenty of money and men available, we're doing highly important research not possible before, as well as learning by everyday experience in war operations all over the world.

"In planning campaigns, our generals want to know what the weather's going to be months ahead of time. So we're experimenting with every known method of long-range forecasting.

"Thanks to modern sorting machines, we can use one method of long-range forecasting that never was practical before.

"Suppose we take today's map of the weather over northern Europe. We want to know what that weather will develop into four days from now. In 20 minutes, with the machine, we can run through all the weather maps of northern Europe for the last 40 years and pick out the map that most closely resembles today's map—in other words, a weather situation most like today's.

"Then we look up the record to see how that weather situation developed."

Weather Affects Military Plans

Thoroughness of the Army's and Navy's weather plans is amazing.

I saw a "Weather Guide for Long Range Planning" made for Censored City in enemy territory. It showed, for every month in the year, the highest and lowest temperatures that ever prevailed there; the average rain- or snow-fall each month, and what months are wettest and driest; the prevailing winds, not only at different seasons, but *at different times of day!*

Not only that, but it showed in great detail when flyers over that city might expect clear skies, scattered or broken clouds, or completely overcast weather, on the basis of past records. It showed also the average amount of rain or snow that had fallen on any day in the past and when fog or thunderstorms might occur. All this is compiled from records that go back 50 years or more, and shows what kinds of weather may be expected, although it is not a forecast.

A climatic survey of Nameless Valley in enemy country showed in detail what times of year are best in that area for high-level bombing, for incendiary bombing (driest months), parachute operations (minimum wind speed near ground), artillery-fire control, chemical warfare, and mechanized operations (soil north of the river is a heavy loam, south of it more sandy).

After the war many of the weathermen trained by the Army and Navy will find a market for their new knowledge. Expanding air lines and industries and public utilities will want their own weather forecasters. The Weather Bureau can't supply the entire demand for specialized forecasts. There will be "consulting meteorologists" just as there are now consulting engineers.

A streetcar company, for example, wants to know not just whether it will snow tonight, but whether the snow is likely to freeze on the trolley wires. If so, it will have to run cars over the lines all night to keep the wires free.

A State highway department manager wants to know, not just whether there will be an approximate total of 30 inches of snow in January, but whether it will come in small driblets, easy to clear away, or in one or two big falls that will tax his equipment.

You could buy special weather forecasts before the war from commercial services supplying long- and short-range predictions for market gardeners, vegetable canners, produce and milk shippers, and public utilities.

Movie companies paid to know whether rain would fall and hold up picture-making "on location," or whether the wind would blow hard enough to rustle leaves on trees and spoil sound effects. (Some clients of private forecasters played safe, though, and double-checked with the Weather Bureau!)

One commercial forecaster did his predicting on the basis of "tides" in the earth's atmosphere, and issued forecasts a year in advance for all areas of the world. Another based his forecasts on the sunspot cycle.

Under the stimulus of war, weathermen are working in high gear to refute that shopworn saying: "Everybody talks about the weather but nobody does anything about it." Tradition to the contrary, Mark Twain didn't originate the phrase. It was written first by Charles Dudley Warner in the Hartford Courant about 1890.

Doing anything about the weather is truly a David-and-Goliath proposition. Look at the magnitude and power of this swirling giant of air and moisture that hovers over and around us like some all-pervading, inescapable genie, half good, half evil.

44,000 Lightning Flashes a Day

All around the earth in an average day, there are some 44,000 lightning flashes. They release from the air every year about 100 million tons of valuable fixed nitrogen, which is deposited by rain to fertilize farmers' fields. That offsets some of the damage done by lightning.

To make one inch of rain over the State of Illinois would take *four billion tons* of water. Illinois in an average year has 36.64 inches of rainfall. Figure from that how

Staff Photographer Willard R. Culver

Lightning Makes a "Hole in One" and Leaves Its Imprint on a Golf Green

A bolt struck the staff of this flag at the Chevy Chase Club, near Washington, D. C., during a storm in 1938. Radiating outward along the ground from the bottom of the flagstaff, the gigantic lightning spark left a strange pattern of scorched grass.

much water is sucked up from seas, lakes, and rivers and dropped back again as rain or snow on the entire earth each year!

Over the world as a whole, it has been estimated, rain or snow is always falling at the rate of 16 million tons per second.

Enormous Power of Sun's Heat

Power of the sun's heat, which keeps our gigantic weather machine in motion, is equivalent to the energy generated by burning 100 million tons of coal every minute.

Here and there man "controls" weather on a small scale. California citrus groves are kept from freezing by "heating up all outdoors" with thousands of oil burners.

When fog settles down over an airport, it is possible now to clear a "tunnel" through it, 2,000 feet long, 150 feet wide, and 100 feet high—big enough to permit a bomber or transport plane to land. It's accomplished with a spray of calcium chloride, which absorbs moisture. But it's seldom done because the method is expensive and useless if a high wind keeps blowing in more fog.

Air masses, hot or cold, wet or dry, composed of millions of cubic miles of air, bring much of our weather.

"An air mass, moving over the earth, is something like an old-fashioned string mop moving over the floor," one weatherman said. "The knot on top of the mop moves in one piece, and you can always tell where it's going, but the ends of the strings, dragging on the floor, are all mixed up.

"The same is true of a mass of air. The upper part, far above surface obstructions, moves in a simple, clear-cut course. But the lower part, dragging over bumps and hollows, cities, mountains, lakes, and rivers, gets into a complicated, confusing set of motions.

"That's one reason why, today, we make maps not only of the weather on the ground, but at 5, 10, 20, and 30 thousand feet. Upper-air maps give a truer, simpler picture of how the atmosphere is moving."

To get the facts for those upper-air maps, 400 or 500 small balloons are launched upward each day at places scattered all over the earth. Hung beneath each balloon is an amazingly compact little automatic radio sending set—the radiosonde.

As the balloon rises, it sends back to the ground a radio report of temperature, atmospheric pressure, and moisture of the air every few moments (pages 659, 660).

Rodney B. Scott

Rare "Snow Rollers," Formed by Wind, May Be Big as Barrels

Resembling huge rolls of cotton batting, scores of the rollers covered this field in Chautauqua County, N. Y., in February, 1934. They take shape when the upper inch or two of a snow layer is damp and cohesive. A puff of wind strikes an irregularity on the surface, flips up a fragment of snow, turns it over on itself, and blows it along. The snowball grows as it rolls and leaves an ever-widening "trough" behind.

Thousands of other balloons without radio attachments are sent up also, and their movements watched through theodolites as they rise, to chart wind velocities and directions far aloft.

Cousin of the radiosonde is an automatic "weather robot." It can be anchored in the ocean, set up in remote, uninhabited regions, or even secreted in enemy territory. It broadcasts at predetermined intervals the atmospheric pressure, temperature, and relative humidity, and can send weather data from areas where it would be impractical to place human observers.

After the war, weathermen predict, weather robots will be widely placed in the Arctic and Antarctic. On the oceans, where it's too deep for anchoring, the robots may drift with currents, and their changing positions can be followed by radio "fixes" on their signals. They need servicing only once every few months.

Cosmic rays, mysterious forms of energy that pelt down on the earth from outer space, may help chart upper-air weather. On the University of Chicago campus stands a little shack in which arriving cosmic rays are counted automatically by the same machine used to count autos passing on a road! You can hear it click off the rays as they flash invisibly through the shack.

"We have reason to believe," Dr. Marcel Schein told me, "that the intensity of cosmic rays on the surface of the ground varies according to the changes in atmospheric pressure in the stratosphere and at other high levels, 15 or 16 miles above the earth, beyond where the radiosonde can reach. The pressure changes in turn give a clue to temperatures aloft.

"If that proves to be true, the rays will help give a continuous record of how the weather is changing at high altitudes."

Radio beams, too, are a new weather-measuring instrument.

Striking snowstorms in their paths, radio beams have been deflected as much as 15 degrees from a straight line, Dr. Harlan T. Stetson of the Massachusetts Institute of Technology has found.

Secret radio gadgets for charting and forecasting weather are in use in the war. Scientists already are using an ultra-high-frequency radio beam flashed into the sky, which reveals a continuous picture of changes in the upper air by the way the signal echoes back.

Besides keeping an eye on the upper air, the weatherman must also know myriad detailed weather facts.

Let's look at a few. Some may surprise you, as they did me.

What are snowflakes? They're not frozen raindrops, but water vapor that changes directly into ice. Incidentally, it's never really "too cold to snow," though there's usually not much water vapor in very cold air. Snow has fallen in Alaska at 52 degrees below zero, Fahrenheit.

Dew doesn't fall. It forms on the spot from water vapor already present in the air. When the grass on your lawn becomes cool enough, water vapor condenses on it and forms dew, just as moisture forms on the outside of a glass of ice water.

Frost, on the ground or on the windowpane, is ice. It is the form that dew takes when water vapor is condensed at a temperature below freezing (page 670).

Mist is composed of tiny drops of water, not water vapor, which is invisible.

Humidity is the amount of water vapor in the air, and relative humidity is the amount of water vapor in the air compared with what the air can hold at its current temperature.

Clouds and fogs are the same thing, both composed of tiny droplets of water. A fog is a cloud hanging low enough to touch the ground (page 657).

A cloud is a high fog. A cloud five miles deep may make a layer of water only about half an inch deep. Some clouds at high levels are composed of ice crystals.

Rain falls from clouds only when enough cloud droplets cling together to form a raindrop heavy enough to fall. A good-sized raindrop contains as much water as several million ordinary cloud droplets.

Raindrops range in size from a fiftieth of an inch in diameter for a light rain to an eighth of an inch or more in a cloudburst or downpour. There is reason to believe that they cannot form without a particle of sea salt, waste from factory chimneys, or dust as a nucleus.

Hailstones have alternate layers of snow and ice. Hail is formed in the turbulent air in front of a thunderstorm, being thrown up and down between layers of warm and cold air several times before falling to earth.

At high levels the growing hailstone is coated with snow, and at lower levels with rain, which turns to ice as the stone is again hurled upward to a colder region (page 659).

Hailstones as large as baseballs have been photographed and measured. They do three or four times as much damage in the United States as tornadoes, and have been known to kill people.

Lightning strokes are huge sparks of electricity. The water droplets in thunderstorm clouds are all electrically charged (pages 648, 662).

The electrical discharge that produces a lightning flash may travel between two parts of one cloud, between two clouds, or between a cloud and the earth. Thunder is the noise created by the sudden expansion of air when heated and disrupted by the passage of lightning through it.

Lightning from the accumulated charge in the earth rises up to meet the lightning coming down from above. These are faint preliminary discharges, followed by the main visible flash. A person struck by lightning is usually struck upward from the ground rather than down from the sky.

Lightning can strike any number of times in the same place. If it has struck a spot once, in fact, it is more likely to strike there again, for conditions at the spot may be especially favorable for lightning to strike.

The Names of Some Winds

Wind is not a mass of air moving steadily at the same speed. It usually is full of waves and eddies, and blows in gusts.

A monsoon is a wind that reverses its direction with the season. It blows from the interior of a continent toward the sea in winter and from sea toward land in summer.

Tornadoes, or twisters, may be only 100 yards in diameter, but their winds whirl at a speed of up to 500 miles per hour or more, faster than those of a hurricane. Tornadoes usually travel about as fast as an automobile —30 to 60 miles per hour (pages 666, 667).

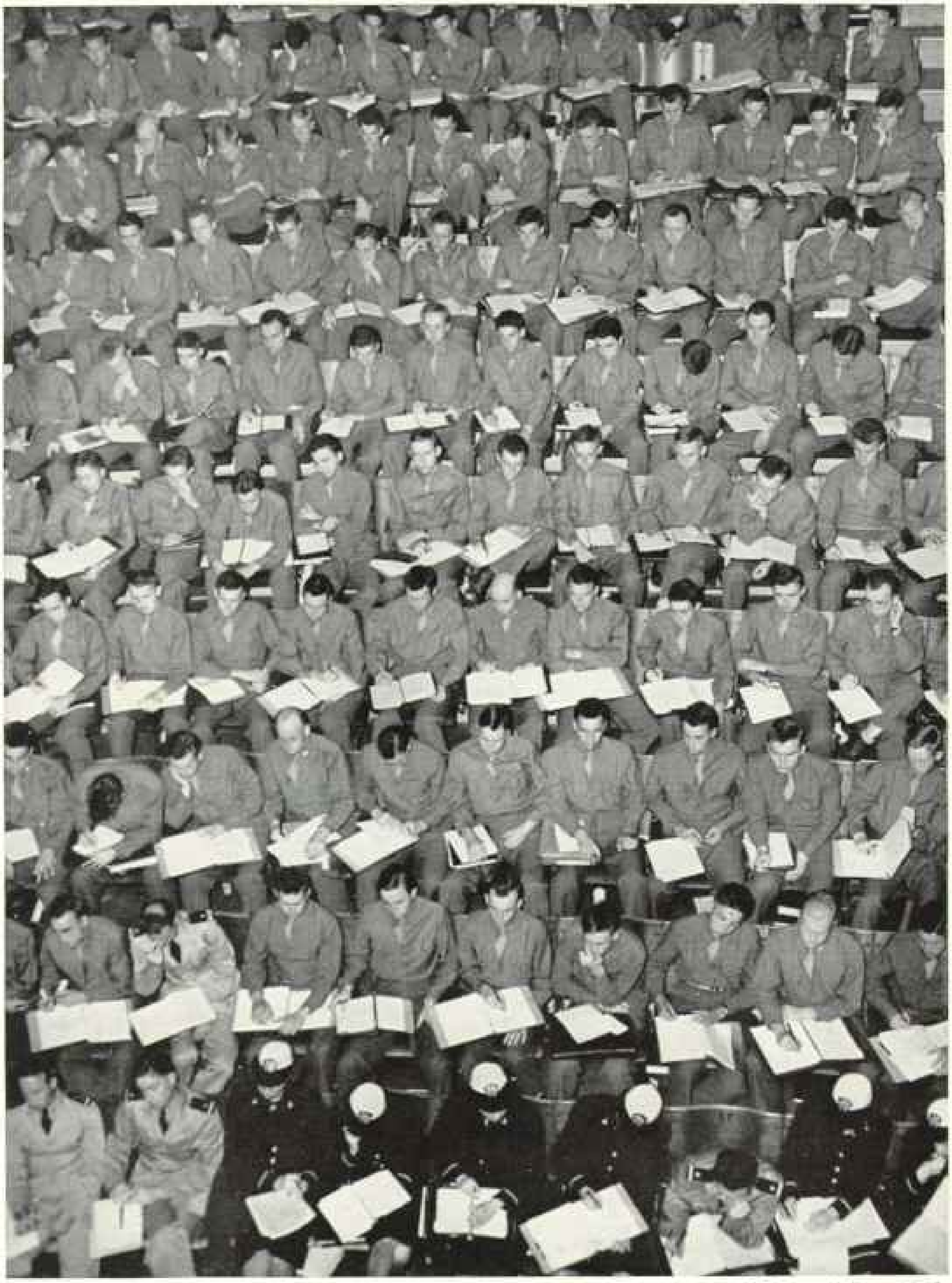
Hurricanes (called typhoons in the Far East) are born in the doldrums, near the Equator. From the sea, warm, moist air rises over a wide area, and the inflowing cooler air acquires a whirling motion from the effect of the earth's rotation, building up gradually to tremendous speed (page 654).*

Weather extremes may interest you.

Highest temperature officially reported on earth, 136° Fahrenheit, at El Azizia, Libia, September 13, 1922. Highest in the United States, 134° F., in Death Valley, California, July 10, 1913.

Lowest temperature reported on earth, 90 degrees below zero F., at Verkhoyansk, Siberia, February 5 and 7, 1892. (But it has hit 94 degrees above in summer!) Lowest in the

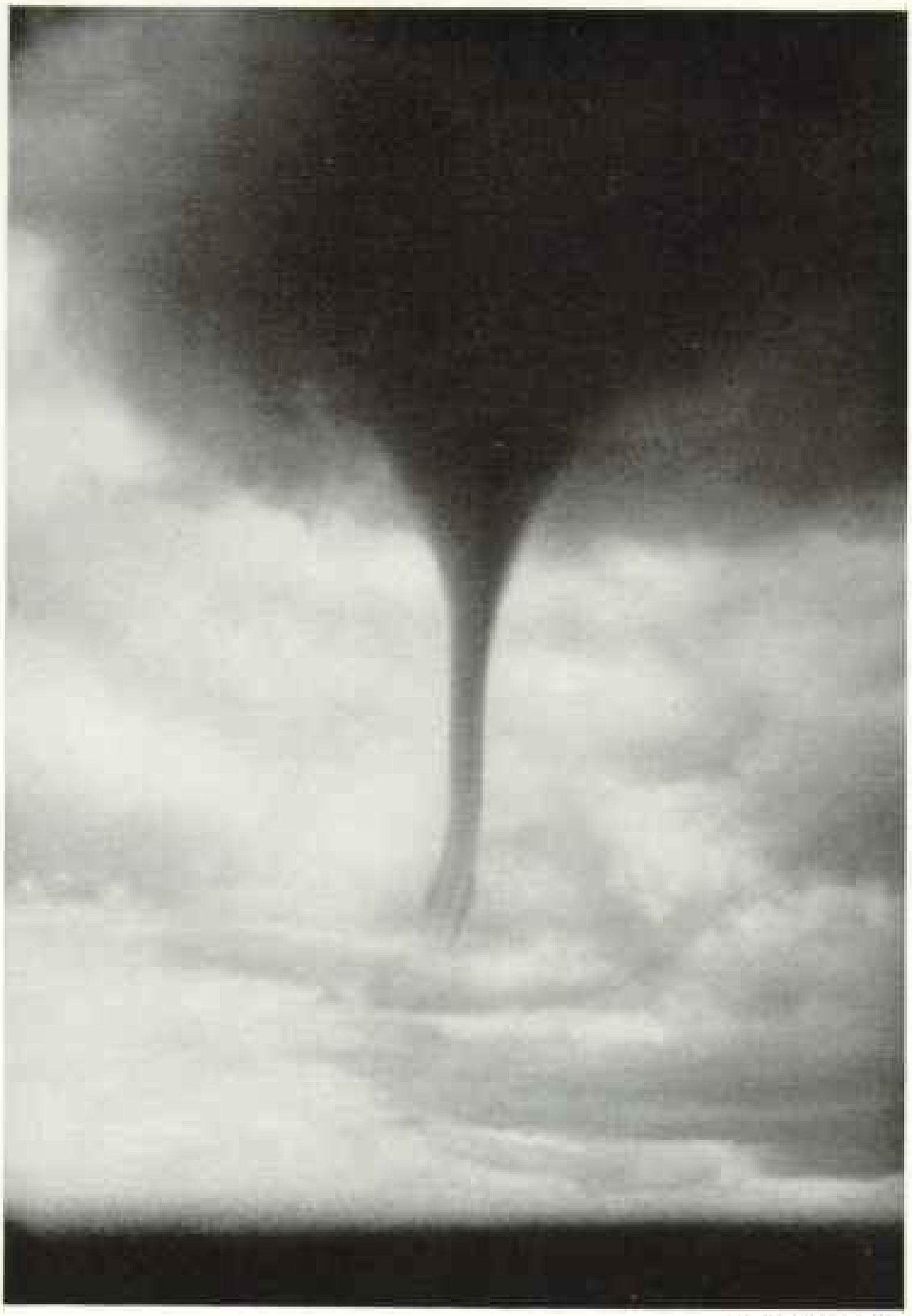
* See "The Geography of a Hurricane," by F. Burrows Colton, National Geographic Magazine, April, 1939.



U. S. Army Air Forces, Official

Army and Navy Turn out Needed Weather Experts by Mass Production

More than 100 students from both services, only a part of one class, compose this picture at the University of California at Los Angeles. So important is weather in planning and fighting the war that thousands of officers and enlisted personnel are being trained as weather forecasters and observers (page 660).



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A Whirling Cloud Pillar Approaches Ground

Air in the tornado rotates at high speed, effecting a drop in pressure, which cools the air and causes moisture to condense and form the column of cloud. Tornado winds have carried fragments of houses several miles and blown railroad cars off tracks (pages 664, 667).

United States, 66 below zero at Riverside Ranger Station, Yellowstone National Park, February 9, 1933.

Highest wind velocity officially recorded in the United States, 187-204 miles per hour (over a period of five minutes), Mount Washington, New Hampshire, April 12, 1934.

Heaviest rainfall on earth, 45.99 inches in 24 hours at Baguio, Luzon, Philippine Islands, July 14-15, 1911. Heaviest rain in United States, 23.22 inches in one day at New Smyrna Beach, Florida, October 10-11, 1924.

Heaviest snow in the United States in one day, 60 inches at Giant Forest, California, January 19, 1933.

Wettest State, Louisiana, average annual rainfall 55.11 inches. Dryest State, Nevada, 8.81 inches.

Mountains and ocean currents affect weather and climate.

On the U. S. west coast, winds blow in from the Pacific and slide up the mountains. As the air is forced upward it expands, cools, and drops rain or snow on the western slopes. Then the air slides down the east side of the mountains and is compressed, which makes it hot. Having lost most of its water on the other side, this air is also extremely dry.

That fact explains why the western slopes of Washington and Oregon are the rainiest parts of the United States, but the land to the east of the Coast Ranges is arid.

The warm Japanese Current gives the Aleutian Islands some of the world's worst weather. Moisture-laden air warmed by the current is cooled by the colder water near the Aleutians, and the moisture condenses into fog and cloud over the islands. Jap soldiers, hiding on the mountain sides on Attu, fired at American soldiers in the clear areas below, just when the fog would roll in and conceal them from return fire.

People often say our climate is changing. Your grandfather probably has told you that winters were colder when he was a boy. Glaciers are steadily melting back (page 669). The crop-growing season in southeastern Iowa, between the last killing frost in the spring

and the first frost in the fall, is 20 days longer than in the early nineties.

Cycles of Warmth and Coolth

Is our climate really changing? Over short periods, yes, says the Weather Bureau, but there is no evidence of any permanent change. If your grandfather was a boy from 1854 to 1872 he was correct in saying the winters really were colder then. At Washington, D. C., 14 of the 19 winters in that period were colder than normal and that of 1855-56 was the coldest in over 100 years.

Since the start of this century we've been living in a generally warm period, with temperatures averaging around three degrees higher than the early seventies. But there's no reason to think it will last. The colder winters of grandpa's day probably will return. Since weather records began to be kept in the United States, 125 years ago, there have been several cycles of warmer and cooler weather.

In some sections of the Great Plains, from about 1900 to 1920, rain was unusually plentiful. Farmers said the climate was changing, and plowed up much land never before cultivated. The Weather Bureau warned that the increased rainfall wouldn't last, but many people refused to listen. Then came another dry time, and the resulting "Dust Bowl."

Today, rain is falling in the Dust Bowl again, but more droughts will return. There was a drought in the Dust Bowl in the 1890's.

Can man make it rain? Some have suggested building artificial ponds in arid regions to increase the evaporation of moisture into the air. "Rain makers" discharge bombs whose concussion is supposed to make rain fall. Some people have thought that the heavy firing of great battles increased rainfall.

Actually, say weathermen, there is only one way to make it rain. That is to lift a mass of air containing water vapor up high enough so that it is cooled and the moisture condenses and falls as rain. The air almost anywhere contains enough moisture to produce rain, provided you can get it up to the colder levels of the atmosphere.

In parts of southwest Africa, even near the

© Wright and Gale

Touching Ground, a Tornado Tears up Mud and Buildings

This photograph and that on the opposite page were taken a few miles northwest of York, Nebraska, June 2, 1935. Tornadoes seldom travel more than 25 miles. Rarely are they more than 1,000 feet in diameter; more often, less.

coast, where the air takes up plentiful moisture from the near-by Atlantic Ocean, the average rainfall is under one inch a year, because this moist air doesn't rise high enough to be cooled.

Some have blamed droughts on radio broadcasting, forgetting droughts were just as bad before radio was invented. Drainage of lakes and swamps also is sometimes blamed. Yet Iowa, with few lakes, averages 25 percent more rain than Minnesota, with many lakes.

Climate Charts Migrations of Man

Climate has changed in some local areas. Crops once were raised in such desert areas as the Sahara and Gobi. Climate has influenced most of the migrations of history.

And the Miami Beach Chamber of Commerce uses climate to influence a modern southward "migration"—by printing the highest and lowest temperatures of the previous day on its letterheads!

Does the sun cause changes in weather and climate? Most weathermen agree it must have some effect. Sunspots wax and wane in number through a period of about eleven years. There seem to be cycles of climate, rainfall, heat, and cold, but their lengths vary, not always corresponding to the sunspot cycle.

The sun's heat varies as much as two percent from time to time. Such a large variation surely must affect earthly weather in some way, scientists say, for the sun furnishes the power that "manufactures" weather and keeps it moving.

What can happen when the sun's heat is reduced was graphically shown in 1816, famous as "the year without a summer," or "Eighteen Hundred and Froze to Death." In New England that year, snow fell six inches deep in June, people wore overcoats and mittens on the Fourth of July, and the temperature on August 29 was 37 degrees.

That chilly summer probably resulted from three great volcanic eruptions that occurred in 1812, 1814, and 1815, which threw up so much dust into the atmosphere that it shut off some of the warmth of the sun.

Climate changes over long periods of time affect man's behavior, some scientists believe.

"Climate affects human behavior by conditioning the energy level," said Dr. Raymond H. Wheeler, of the University of Kansas. "When it is too hot or too cold, the body has to do too much work maintaining normal internal temperature, leaving little if any reserve for aggressive and constructive behavior."

Experimenting with rats, Dr. Wheeler and his associates placed some in a cold room at 55 degrees Fahrenheit, some in a warm room at 90 degrees, and the remainder in a room at medium temperature. The rats in the cold room, when tested in a maze, learned their way around three to six times as fast as the rats in the hot room.

The rats in the cold "climate" were larger, healthier, more docile, and had larger litters of young than the "hot climate" rats. The latter had fewer young, were more erratic, emotional, vicious, and less healthy.

Cold and stormy climates are stimulating to man. Coldest and stormiest parts of the United States are the northern States, especially the Northwest, northern Middle West, and New England. Here, both summer and winter, there are frequent changes of temperature and atmospheric pressure.

From these parts of the country, Dr. William F. Petersen of Chicago has found, come the largest proportion of geniuses and outstanding men and women. But the same regions also have a high percentage of insanity and other mental disturbances.

Farther south, he says, where the climate is warmer and less changeable, fewer people become famous, but fewer also become insane. People in the stormy regions, too, are more prone to diseases that result from wear and tear, such as heart trouble and hardening of the arteries. Under the whip of a stimulating climate, they wear out their bodies faster. In warmer regions such diseases are less common.

Weather and Human Moods

Weather changes can affect your mood, make you feel elated or depressed, by altering the chemical composition of your blood, Dr. Petersen says. Usually we feel best on days when the atmospheric pressure is high—when weather is fair.

When the pressure is low, we, too, are likely to feel "low." When a cold spell comes along, several changes take place in the body. Blood vessels near the surface tend to close, forcing the blood inward and causing increased blood pressure. Blood sugar goes up, and the endocrine glands undergo changes. All this produces a feeling of stimulation. Later comes a readjustment, lowered blood pressure, and a feeling of fatigue.

Winter's repeated cold waves swing an individual back and forth many times from the stimulated to the depressed state. By late winter and early spring the process has built up a condition that brings on that feeling of lassitude we call "spring fever."

When a cold spell passed over Chicago early one spring, Dr. Petersen noticed that

Bradford Washburn

Receding as World Climate Grew Warmer, This Glacier Left Curved Heaps of Debris

Higher than normal temperatures prevailing the world over since early in this century have caused glaciers generally to retreat (page 666). Arc-shaped terminal moraines in foreground mark former locations of the front of this glacier, which extends north from Mount Iliamna on the Alaska Peninsula. Moraines are formed from rock and earth carried down by the ice and released by melting along the glacier front. Each line of debris marks a place where the glacier paused in its retreat long enough to build up another moraine.

it caused a definite though different reaction in several of his patients.

One patient's acidity increased; a woman suffered a strong emotional disturbance; a man complained of mysterious fatigue and headache; another patient suddenly gained weight (she retained fluids); another had a fainting spell; a severe infection flared up in still another; and a tuberculosis victim suffered a hemorrhage. He has noted similar weather effects on thousands of people.

The weather at the time you are conceived may affect your whole life. Babies conceived in the spring, especially April and May, are the lightest in weight, and those conceived in the fall are heaviest. The difference results from variation in the utilization of oxygen by the mother, Dr. Petersen believes, and this in turn is affected by the weather.

He finds, too, that boy babies are more likely to be conceived in times of increasing cold, and girls in periods of greater warmth.

In arithmetic tests, people do better when atmospheric pressure is high, less well when it is low. This, says Dr. Petersen, is because the varying pressure alters the amount of blood that reaches the brain.

I asked the Chief of the Weather Bureau, Dr. F. W. Reichelderfer, "What are the newest things in weather forecasting, and what do you see ahead for the future?"

"Charting weather in three dimensions, above us as well as around us, is one of the greatest recent advances," he said. "From the upper-air data obtained by the radiosondes we can compute how much moisture is on hand aloft to form clouds, rain, and storms. We now can forecast with more accuracy the quantity of rain and the time of storms, winds, and icing conditions for aircraft.

AP from Press Ass'n

Jack Frost Paints Windowpanes with Frozen Moisture from Indoor Air

Frost forms on a window when the glass is chilled by cold weather outside. Air near the window is cooled by contact with the glass, and some of its moisture condenses and freezes into tiny ice crystals on the inside of the pane. Designs appear as the crystals grow. Frost usually forms at night, when temperatures are lowest and moisture condenses more readily (page 664).

"Today we make a new weather map every three hours to keep up with the rapid changes in the weather, and extend the forecast every six hours. Twice a week we make a forecast for five days ahead, which is 85 to 90 percent correct the first day but gradually decreases in accuracy toward the end of the period. But these five-day forecasts are good enough so that urgent war traffic on the railroads is often routed according to them.

"A world-wide network of weather-observing stations, sending reports to central offices, will come after the war. Ships and perhaps automatic floating stations will send in reports from the oceans.

"Long-range forecasts will improve. Research may enable us to predict weather trends for six months or a year in advance.

"We'll achieve a better understanding of the laws that govern the circulation of the atmosphere. For example, the Arctic Basin in some winters seems to furnish an endless supply of cold air outbursts. In other years it supplies comparatively little cold air. The cause of this may be tied up with changes in the amount of heat we get from the sun, which in turn may be related to sunspot phenomena."

Weather is as inescapable as death and taxes. It determines when you can hang out the family wash, and how far you can drive a golf ball (they're less lively on cold days). It causes static on the radio, and affects department store sales.

If rain comes early in the day, housewives don't go shopping, but if it starts after they're in the store, they're more likely to stay and buy more. Athletes break more records on hot days.

Everybody complains about the weather.

But remember, if it is of any comfort to you, that the weather you complain about is just what someone else has been wanting!

American Transportation Vital to Victory

By Thornton Oakley

Thornton Oakley, distinguished artist who painted the 16 scenes of American war production in the National Geographic Magazine *for December, 1942, was then assigned by* The Geographic's *Editor to do a series on transportation. To capture the spirit of America's might in moving men, materials, and supplies, Mr. Oakley traveled for months to every vital transport center of the Nation. Below he sets forth the themes of the 16 paintings, done for* The Geographic—Editor.

ON TRANSPORTATION America depends to equip her sons for battle, send armies over oceans, fill skies with argosies. By transportation she launches her increasing might against the enemy.

Oil—Plate I: Oil for food, oil for power, oil for explosives, oil, the lifeblood of ships, of planes, of highway transportation, keeps Democracy's lamp aflame. At America's petroleum fields, the liquid mineral gushes from its prehistoric beds, its deep, mysterious chambers. It flows in conduits to refining stations, passes through catalytic towers, pours into vats, is piped into serried ranks of tank cars. Now, in trains the oil and the gasoline set forth to feed the war plants.

Freight Trains—Plate II: Stupendous is the freight work of the railroads. From plain and highland, from ranch and grain belt, from forest and from lake, from foundries, mills, and furnaces outpouring molten metal, from mines of coal and ore, from refineries and carbide plants, into untold miles of cars flow avalanches of war material. The locomotives tug and push Gargantuan loads. They traverse the prairies, mount the hills, cross the Appalachians and the Rockies. They pass through every barrier, descend to the far shores where wait the cargo vessels.

Barges—Plate III: Down from the watersheds flow the streams that, joining into one majestic current, form the Father of Waters. Through the history of our land the stately Mississippi served the dwellers of his valley. Today, called upon as never in all time, he bears fleets on fleets of barges, making northward, southward, conveying war supplies. Grain and sugar, structural steel, scrap, oil, sulphur, golden in the sun—materials for a thousand needs—are carried on his winding ways. The paddle wheel now beats in rhythm with the sound that echoes through the nation.

Clipper Ship—Plate IV: Sky, harbor, palms, the glistening control tower, melt into one luminosity. Amidst the radiant light, riding on the water as on a mirror, military airplanes tug upon their moorings, awaiting orders to transport their freight to Caribbean stations, to the Gulf, to Panama. Dashing foam, the Clipper ship roars along the waterway. Incredible in size she seems. In her cavernous interior four score passengers—envoys, generals, statesmen—are setting forth on crucial missions. The Clipper mounts into the blue, heads seaward, vanishes.

Trucks—Plate V: Tying State with State, concrete highways cross the farmlands, traverse the hills, joining inland with coastal cities. On them stream vehicles of burden, bent on service to Democracy. Here rumble tanks of gasoline. Army convoys pass. Trucks predominate. They lurch along the lowlands, sway around the curves, with clashing gears cross the higher passes, hastening with their wartime loads to industrial centers. Sumptuous in color are the carriers, shining with metallic high lights, flapping huge tarpaulins, leaving trails of fumes. Night after day, day after night, the turnpikes' lanes are choked with these conveyors.

Skyway—Plate VI: Through tunnels beneath the harbor of America's major city the traffic surges. It emerges to converge into one artery of motion, that, sweeping upward, westward, crosses on a skyway outlying industrial regions. This viaduct of arches and girders looks down on shining rivers, on boats and barges, wartime plants, congested railway yards. Along the bridge's lanes automobiles from every State make to and from the city. Patrols on motorcycles, alert for sabotage, dart among the cars. Burden vehicles are ruled away, but, pressed into continuous lines, cars new and old, cars gleaming, battered, of every color and design, cars of war workers, cars carrying troops, cars olive-drab, all tell of the crisis of the time.

Tankers—Plate VII: Tank ships lie moored to the docks. From their hulls to storage fields, and from storage fields to hulls, their priceless cargoes flow. Conducting pipes cover the piers—pipes interlacing, radiating, pipes hanging overhead in webs of ponderous metal. Mammoth pipes there are and small, red, black, lustrous, dull. Poignantly they and the ships they serve speak of warfare's quenchless thirst for oil. Battered, caked with brine, to the call of Mars for fuel in barrels of increasing millions, the tankers make their answer. They defy the submarine, brave the Caribbean weather hurricane in the Gulf, plunge through storm off Hatteras, deliver their petroleum. Laden with aviation gasoline they push out across

mid-ocean deeps, head for the fighting fronts.

Cargo Ships—Plate VIII: Twenty million tons of cargo—can the mind grasp this weight? United States merchant shipping can hold this and more. Our harbors teem with comings and goings of the fleets. At the piers the hulls gulp freight. The docks are heaped with bales and boxes, crates of food, of clothing, ammunition, guns, engines of destruction. Into the holds they go, swung aboard by soaring cranes. Passing the deep-laden outgoing vessels, arriving ships bring scrap and booty from the battlefields. Soon it will be converted into shells, into Bazookas. Upon fragments of tanks and airplane wings are seen insignia of the warring nations—the star of a free people, the swastika of Hitler.

Electric Locomotives—Plate IX: The cantenary wires of the railroad hang against the sky in interlacing threads, while beyond the right-of-way towers the steelwork of the power station whence comes the current that speeds the electric trains. Beneath the webs of feed lines, insulators, superstructures, the cars rush headlong. Expresses flash by; locals, troop trains, filled with soldier lads and sailors. Svelte and glistening are the locomotives, each with pantograph upstretched to wire charged with power. Through the most densely populated areas of our land at high speed rush these concentrations of motor force.

Cargo Planes—Plate X: Outdated geography that lists but seven seas ignores the ocean of the air encompassing the globe. Today on billows of the sky man sends his fleets on wings. Here are no shores such as those that stop the water craft. All but instantaneous seem the passages of planes between the West and East, between ice and the Equator. From depots where cargoes gather, the transport planes depart to Africa, to Burma, to the tip of the Aleutians.

Subway—Plate XI: Dantesque are the galleries of the subways where, amidst the foundations of the city, human lives in multitudes are swallowed by the trains. Monsters of a nether world are the cars that roar through tunnels, glare with green and blood-red eyes upon the throngs that mill on station platforms, awaiting their turns to crush into the monsters' maws. Engineering, with its reverberating subways, brings swift conveyance for the millions that rush to and from their labor.

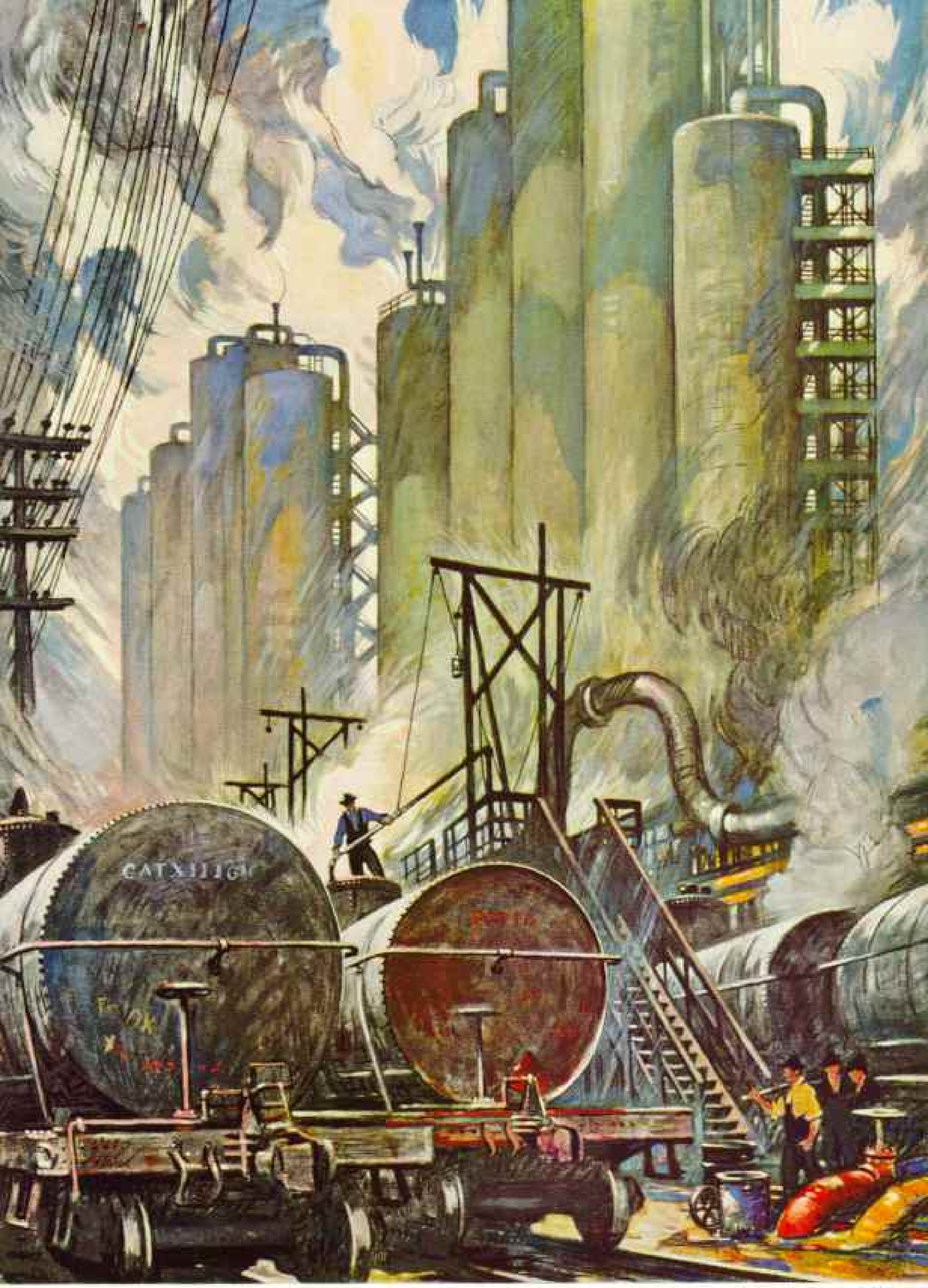
Bus Terminal—Plate XII: Beneath the towers of the city the bus terminals are packed with travelers. Commuters, industrial workers, laborers; WACS and WAVES; sailors, soldiers, and Marines; folk light and dark, rich and poor, eminent and humble; representatives of countless types American climb into the waiting buses of gaudy colors.

Ore—Plate XIII: From Michigan, Wisconsin, Minnesota; from the Mesabi, Vermilion, and Cuyuna Ranges comes the iron ore destined for the furnaces. In long, lean hulls across broad Lake Superior, through the Soo Canals it is conveyed, traverses Lake Huron and Lake Erie to be disgorged at Cleveland. Metallic jaws descend into the steamers' holds. They close upon their prey, swing upward, drop, hover over cars, let loose the ore in torrents. On perches on the clanging cranes men appear like pygmies. Hands on throttles, they are masters of their machines. Mere touches on the levers the giant jaws obey. Now, in hopper cars, the ore is rushed to be transformed to tools of battle.

***Super Chief*—Plate XIV:** The Diesel-powered *Super Chief* sweeps through the Indian country. Agleam with high lights, swift and silent as an arrow, this ultramodern contribution of man's inventive genius to transportation upon rail conveys its hosts of travelers to fateful wartime destinations. Flashing by the sunlit mesas, the Navajos in gaudy dress, the scarlet locomotive and its streamlined cars add central note of color to a realm aglow with splendor.

Stockyards—Plate XV: To central stockyards, from western ranches come cattle, sheep, and hogs to feed the nation. Here herds and flocks are transferred from trains to pens, from pens to trains. Barriers, bridges, towers, fling high their walls and trestles. Gleaming rails and locomotives; cars in line on line, receiving and discharging cattle; platforms which the plunging Hereford and Angus steers traverse in passage to and from the trains, charging through spots of sunlight, prodded by remorseless drovers—all constitute a realm of ceaseless movement. Dynamic symbol are these yards of America's determination to arm her sons with food as well as guns.

Logging—Plate XVI: Douglas fir, red western cedar, West Coast hemlock in the farthest corner of our country lift their soaring heights until they seem to reach the beckoning clouds. Monarchs are these, crowned with majesty, aloof from holocaust of nations. Comes man, threatened by the despot. He swings his ax. Down crash the giants. On trucks along the mountain roads the helpless logs are borne, at mills are flung against the teeth of whirling bands of steel, reduced to lumber. In tons of wood the erstwhile monarchs of the hills now depart to be molded into scaffoldings and hangars, into fabricated parts of ships and planes.



Painting by Thornton Oakley

From Giant Cracking Towers, Gasoline Pours into Tank Cars

Painting by Thomas Hoban

Following Covered Wagon Trails, Locomotives Pull Tanks, Supplies, Soldiers across the Divide

Painting by Thornton Oakley

From Headwaters to Gulf, Old Man River Keeps Raw Materials Rolling to the Fronts

Painting by Thomas Gilkey

IV Like a Magic Carpet, Clippers Whisk Generals, Statesmen, and War Sinews to Far Fields

Painting by Thornton Oakley

V Night after Day, Day after Night, Big Vans, Trailers, and Army Trucks Jam Dual Highways

Painting by Thornton Oakley

VI Built to Speed Peacetime Auto Traffic, Skyways Now Serve as Pulsing Arteries of War Transport

Painting by Thurman Oakley

VII Oil and Gasoline, Saved by Citizens, Flow in Pipes to Tankers to Win Distant Battles

Painting by Thomas Oakley

VIII Cargo Ships Carry Munitions to Fronts; Bring Back Scrap and Booty to Forge New Weapons

Painting by Thornton Oakley

IX. Webs of Wires and Transformers Feed Power to Locomotives that Speed Trains on Wartime Service

Painting by Thomas Hoker

x Bound for Bases in Africa, Europe, and the Pacific, Freight Hurtles in Fleets of Air Transports

Painting by Thomas Oakley

XI Through Roaring, Crowded Subways Hordes of City Dwellers Rush to and from Their Labors

Painting by Thornton Oakley

XII Bus Lines Are Taxed to Capacity: at City Terminals Humanity Throngs and Jostles

Painting by Thomas Gilley

XIII Gigantic Cranes with Clashing Jaws Unload Iron Ore from Great Lakes Steamers

Painting by Thornton Oakley

XIV Like an Arrow, the Streamlined *Super Chief* Flashes through the Country of the Navajos

Painting by Thomas Oakley

Ceaselessly Stockyards Receive Cattle, Send Forth Meat to Feed America and Her Allies

Painting by Thornton Oakley

XVI Logs Trucked from Forests Become Airplanes and Barracks

The World's Words

By William H. Nicholas

"Therefore is the name of it called Babel; because the Lord did there confound the language of all the earth: and from thence did the Lord scatter them abroad upon the face of all the earth."—Genesis XI: 9.

SCHOLARS of the French Academy reckon that the world today speaks 2,796 languages.

Out of this Babel of tongues have grown a few mighty empires of speech. War, colonization, commerce, exploration, science, literature—all have had a share in their vast spread.

With this issue of their Magazine, members of the National Geographic Society receive a new map supplement of the world.* Based on the Van der Grinten projection, this 10-color chart, 41 inches by 26½ inches, presents a unified picture of our planet.

Look at this map and see how the geography of languages looms up in a world where travel is measured in airplane hours and words speed instantly by telephone and radio.

The following table, based on figures compiled by the Office of War Information since the United States declared war, shows the numbers of people who speak the principal languages:

English	260,000,000	Japanese	76,000,000
Hindustani	160,000,000	French	70,000,000
Russian	145,000,000	Bengali	62,000,000
Spanish	115,000,000	Italian	52,800,000
German	98,000,000	Portuguese	50,000,000

About 400 million people speak the nine principal Chinese dialects, some of which are not as much alike as Dutch and English. Most widely used of all the dialects is Mandarin, speech of the official classes under the old Empire. About two-thirds of the Chinese now understand Mandarin, used as a secondary tongue, although they retain their own dialects for local use.

Written Chinese is the same in all parts of the nation, but only about 20 percent of the Chinese can read and write.

If the table above were to show the numbers of people for whom the languages are the mother tongue, it would require radical revision. For example, in the United States census of 1940, only 93 million of the white population claimed English as the mother tongue. Some 22 million citizens of the United States originally spoke a different language.

In India the discrepancy would be even more glaring. Hindustani is the mother tongue for only 50 percent of the Indians who can speak that language. Moslem Hindustani is known as Urdu and is written in the Arabic alphabet. Throughout northern India, usage of Hindustani is spreading widely as the result of improved communications.

About twenty major languages are spoken in that huge land of 400 million people.† Dravidian tongues in the south have no relation to northern dialects. Although only two Indians out of 100 read and write English, it is the unifying language because it is spoken by educated Indians, no matter in what section of the country they may live.

English the Newest Language Empire

The only speech spread over the world is English.* The map on pages 696-7 shows how it blankets the globe.

Principal strongholds are the United States, the British Isles, Canada, Australia, and New Zealand. English also is the government language for nearly 700 million people—one-third of the world's population. Long pre-eminent as the language of commerce, it now has succeeded French as the language of diplomacy and German as the language of science.

English is the most widely read language. Three-fourths of the world's letters are written, and half its newspapers printed, in English. Announcers for three-fifths of the earth's radio stations broadcast in English.

Our language has migrated over the globe in less than four centuries. As recently as 1562 an English grammarian wrote: "The English tongue is of small reach, stretching no farther than this island of ours, nay not there over all."

At that time English was spoken by less than five million people and stood fifth among the European languages. French was first. As late as 1750, English still was fifth.

English started its spectacular growth in the era of exploration and colonization. Such pioneers as Hendrik Hudson, John Cabot, Sir Martin Frobisher, and Captain John Cook led the way. In their wake came British traders, who made English the seaport language of the world.

* Members may obtain additional copies of the new Map of the World by writing the National Geographic Society, Washington 6, D. C. Prices, in United States and Possessions, 50¢ on paper (folded or rolled); $1 on linen (rolled only); Index, 25¢. Outside of United States and Possessions, 75¢ on paper; $1.25 on linen (*postal regulations generally prohibit mailing linen except in Western Hemisphere*); Index 50¢. All remittances payable in U. S. funds. Postage prepaid.

† See "India—Yesterday, Today, and Tomorrow," by Lord Halifax in the National Geographic Magazine, October, 1943.

From United China Relief, Inc.

With a War Poster, Chinese Villagers Keep Up with the News

A Ginling College student explains the meaning of ancient characters. The form of some has not changed in more than 3,000 years. China's millions speak varied dialects. The written language for all of them is the same, but only 20 percent of the Chinese can read and write.

Establishment of English colonies all over the globe did the rest. North America became an English-speaking land as Spanish and French influence on that continent waned.

British and American capital, science, and invention, and the rich English literature made knowledge of the language essential to educated persons in other nations.

Such words as radio, phonograph, telegram, and telephone were borrowed bodily to enrich many other tongues. Names of American institutions such as jazz and cocktail have crept into other languages.

Spread of Spanish and Portuguese

Spanish and Portuguese traders and colonizers, following the courses of Columbus, Cortés, Balboa, Pizarro, and others, carried their tongues to Central and South America. Today Brazil speaks Portuguese and the rest of South and Central America speaks Spanish for the same reasons that we speak English.

North America also received a lasting heritage from the Spanish and French.

Less than a century ago, Spanish was the dominant tongue in our own Southwest. Even today, Spanish is almost as familiar as English in many Texas, New Mexico, and Arizona communities near the Mexican border.

Los Angeles has one of the largest Mexican populations in the world—a Spanish-speaking element greater than the population of Utica, New York. Its Spanish newspaper, *La Opinion*, has a circulation of 11,500 daily and 15,700 Sunday. San Antonio also has a thriving Spanish newspaper.

In New Mexico the lower branch of the legislature and the courts may use both Spanish and English. Laws are printed in both.

The Spanish era in the United States added a host of words to the English language. Examples: adobe, adios, arroyo, bonanza, burro, canyon, calaboose, mesa, mañana, mustang, plaza, patio. The cowboys use bronco, quirt, lariat, rodeo, and rancho.

Spanish-American words represent only a fraction of the foreign words which we have borrowed over the centuries. Latin words, many coming into our vocabulary by way of French, and Greek words now make up three-fourths of our dictionaries, although a vast number are seldom used in ordinary speech.

We have borrowed from nearly every language. Take this sentence, for example:

"The thug loafed at a damask-covered table on the café balcony Wednesday eating goulash

From American Red Cross

Johnny Doughboy Teaches Dunking Technique to Two Moroccan Soldiers and an Arab

He can talk with them slightly in their own language if he has taken the Army course in North African Arabic. Doughnuts and coffee are from an American Red Cross clubmobile canteen, set up deep in French Morocco. The Red Cross worker, left, is Miss Mary Ross Moen, of Onawa, Iowa.

and drinking chocolate with a half-caste brunette in a kimono-sleeved, lemon frock and a crimson angora wool shawl, while he deciphered a code notation from a canny smuggler of tea cargoes on the back of the paper menu."

A Sentence from 21 Tongues

The words come from 21 different languages, thus:

Thug, Hindustani; café, brunette, deciphered, menu, French; balcony, Italian; damask, Hebrew; covered table, code notation, Latin; Wednesday, ugly, drinking, half, while, eating, wool, sleeved, back, Anglo-Saxon; loafed, Danish; crimson, Sanskrit; goulash, Hungarian; chocolate, Mexican; caste, Portuguese; lemon, Arabic; shawl, Persian; kimono, Japanese; angora, Turkish; canny, Scottish; tea, Chinese; cargo, Spanish; smuggler, Dutch; paper, Greek; frock, Old High German.

The English language contains about 700,000 words, half of which are scientific terminology or archaic and obsolete terms.

Today many thousands of our soldiers are studying foreign languages, some in line of duty, most in their spare time. An ambitious educational program prepared by the Army's Special Service Division, Army Service Forces, helps them.

Look at the key map on pages 696-7 and then at the big world map, and you will see why the study of foreign tongues is so important. See how our troops have been deployed throughout the world.

By talking native tongues Americans become goodwill ambassadors and better soldiers. Troops go on furlough to Spanish- or Chinese-speaking cities; they unexpectedly meet Haussas or Nagas; they capture enemy soldiers who speak only German, Italian, or Japanese. In some areas they work daily with French, Chinese, or Russian soldiers.

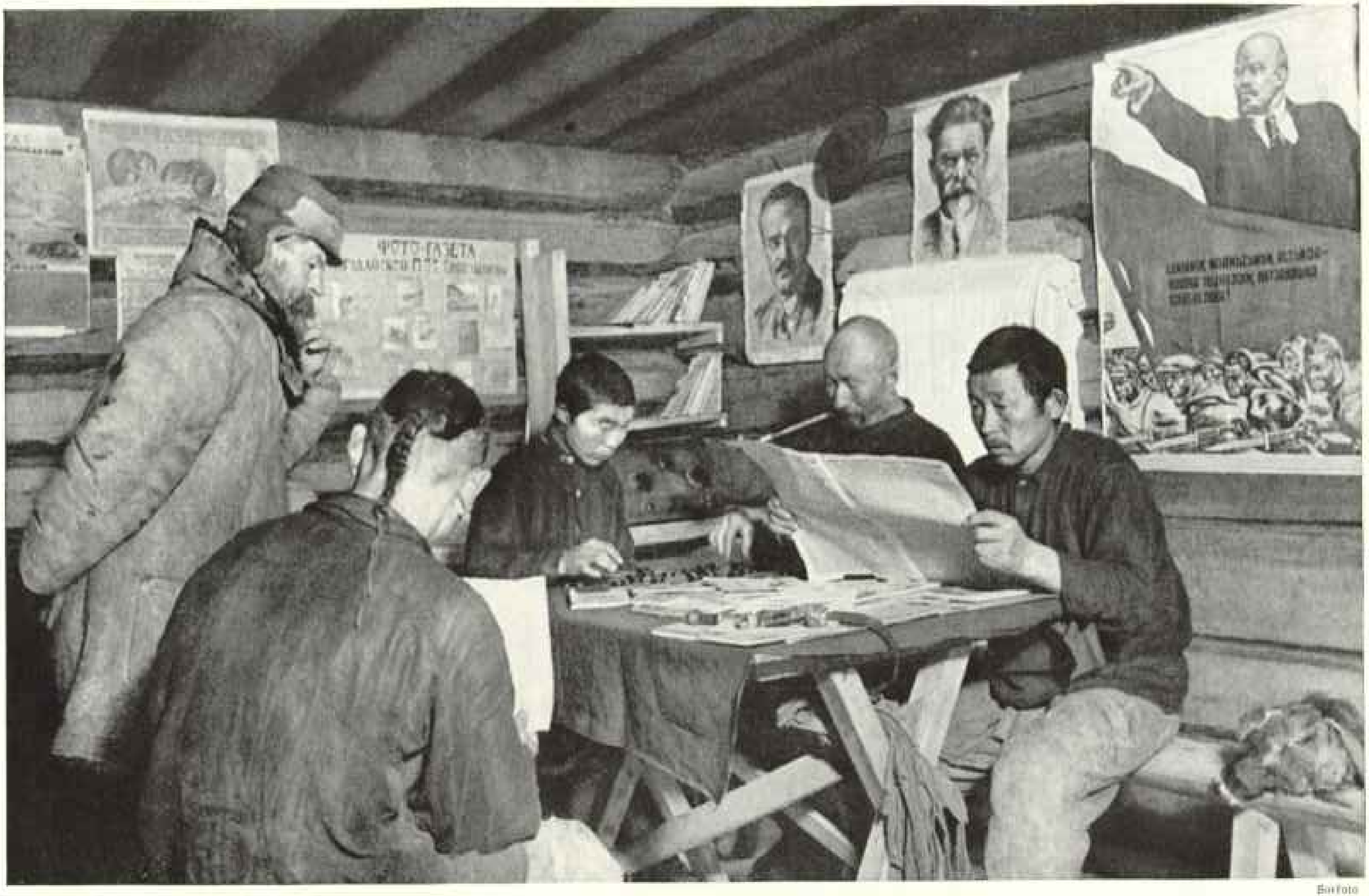
Now soldiers anywhere can obtain Special Service Division phonograph records which teach them to speak useful words and phrases in any of 39 foreign tongues.

These languages are Portuguese, Chinese, French, German, Italian, Japanese, North African Arabic, Russian, Spanish, Greek, Burmese, Malay, Melanesian Pidgin English, Persian, Syrian Arabic, Turkish, Danish, Dutch, Icelandic, Norwegian, Swedish, Fante (Gold Coast of Africa), Hindustani, Hova (Madagascar), Iraqi Arabic, Thai (Siam), Sicilian, Hungarian, Finnish, Annamese, Tahitian,

Dorien Leigh, Ltd.

By Modern "Sign Language" English Spreads in British East Africa

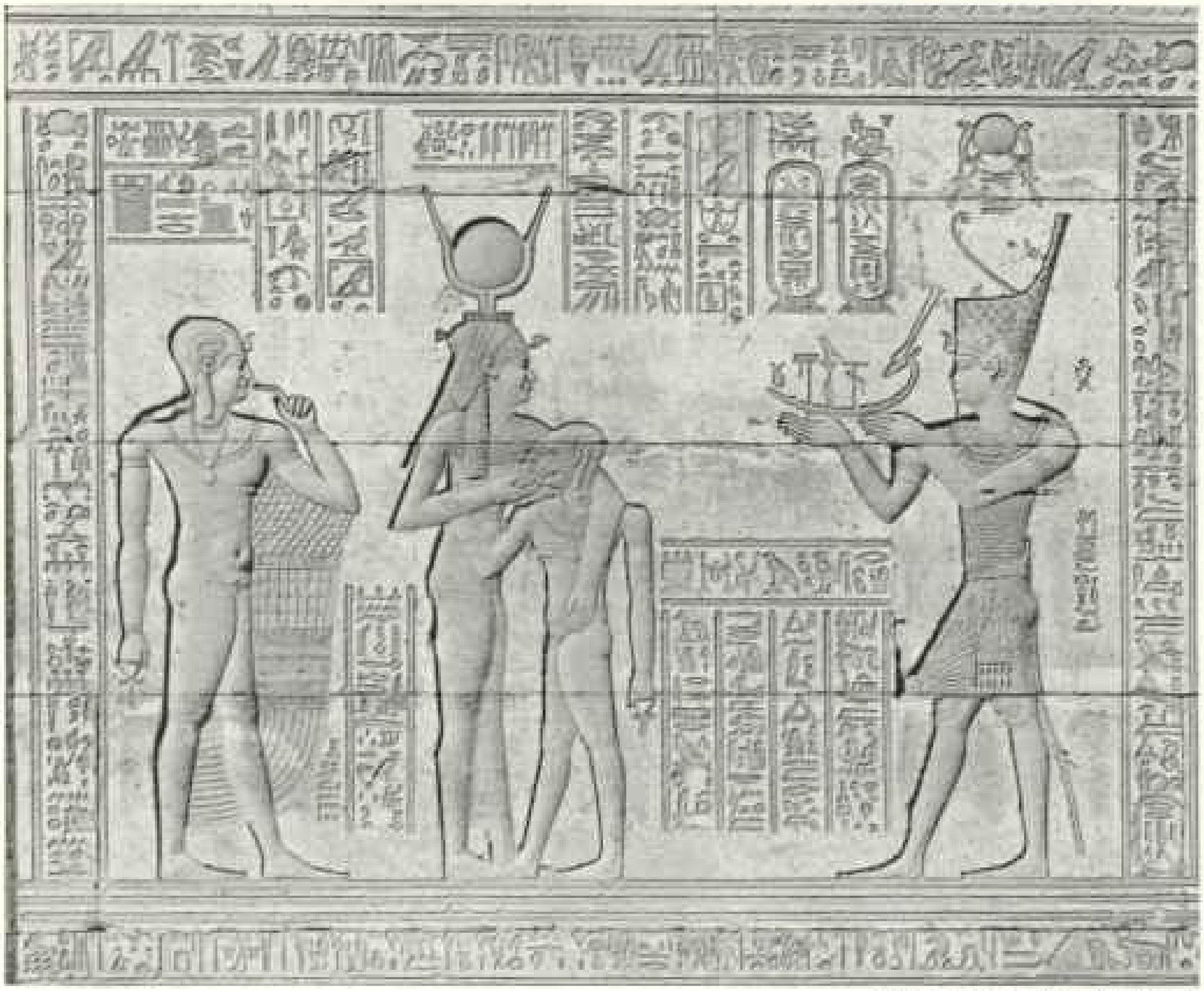
Here at an outdoor class, Kenya Colony tribesmen learn to design public posters in English. A school warning to motorists, a notice for an arboretum, and a "one-way traffic" sign are in preparation. The course is part of Kenya Colony's industrial training program.



Sovfoto

Altai Mountain Hunters Relax with Newspapers at a Soviet Fur Trading Post

Ten years ago this highland district in Oirot had no written language. As in thousands of other Soviet communities, illiteracy is vanishing here with the introduction of schools for children and adults. A corner shelf radio also keeps visitors informed. Molotov, Kalinin, and Lenin look down from posters.



Staff Photographer B. Anthony Stewart

Fifty Centuries Ago Egyptians Knew the Value of Illustrations

Here on a wall of the Temple of Dendera, the ancient scribes carved pictures in bas relief to accompany their writings. Earliest hieroglyphics were series of pictures. Later they came to represent ideas, instead of the definite objects they portrayed. Finally an Egyptian alphabet grew from them.

Tagalog, Korean, Bulgarian, Serbo-Croatian, Romanian, Albanian, Czech, and Polish.

To Learn a Foreign Tongue—Speak It!

Here is the way the soldiers learn Chinese, for example:

Each member of the class, grouped about a phonograph, has a pocket language manual which contains the words and phrases he is about to hear. First the recorded voice pronounces a word in English. Then a Chinese informant translates it correctly in his native tongue and pauses. The entire group, in loud, clear tones, say it for themselves. The phonograph repeats the expression, the class sings it out, and then goes on to another word.

So rapid is this method of teaching that a simple working knowledge of some 300 words and phrases may be acquired in from eight to fifteen hours.

Officers point to one class of soldiers who studied Russian by this method for twelve weeks and then learned to read and write a little Russian after three more days of study.

Sometimes the soldiers' wishes take queer turns. Classes in Iceland did not care to study the Icelandic tongue—they preferred Spanish. Now they have concluded their basic Spanish course and are clamoring for the "second-level" course, which will be rushed to them.

Troops with General Stilwell who will be in contact with the Chinese are required to take instruction in that language. Other soldiers in the China-Burma-India area may study Chinese if they wish.

The Special Service Division reversed its schedule not long ago to teach English to Spanish-speaking soldiers who came into the services from homes along the Mexican border.

Well-equipped recording rooms at the Library of Congress in Washington turn out master records from which thousands of copies are made (page 698). Other recordings come from New York and elsewhere.

Staff Photographer Willard R. Culver

To National Geographic Society Headquarters Come Letters in Scores of Languages

Arnvid Nygaard, chief translator, knows ten languages well and has a working knowledge of some 20 more. Before the war, when the National Geographic Society had members in every country with a postal system, its Washington, D. C., headquarters often received 100 letters a day in foreign tongues.

Getting foreigners with proper speech patterns to cut the records required considerable search. Biggest problem was finding Arabs to record the various dialects of northern Africa. Solving it resulted in compiling an astonishing survey of Arabic dialects.

Dictionary a Best Seller Now

The English language has come in for extensive study, too, in the Army and, in fact, in the entire country. Government employees trying to improve their ratings and war factory workers, preparing for better jobs, have swollen the demand.

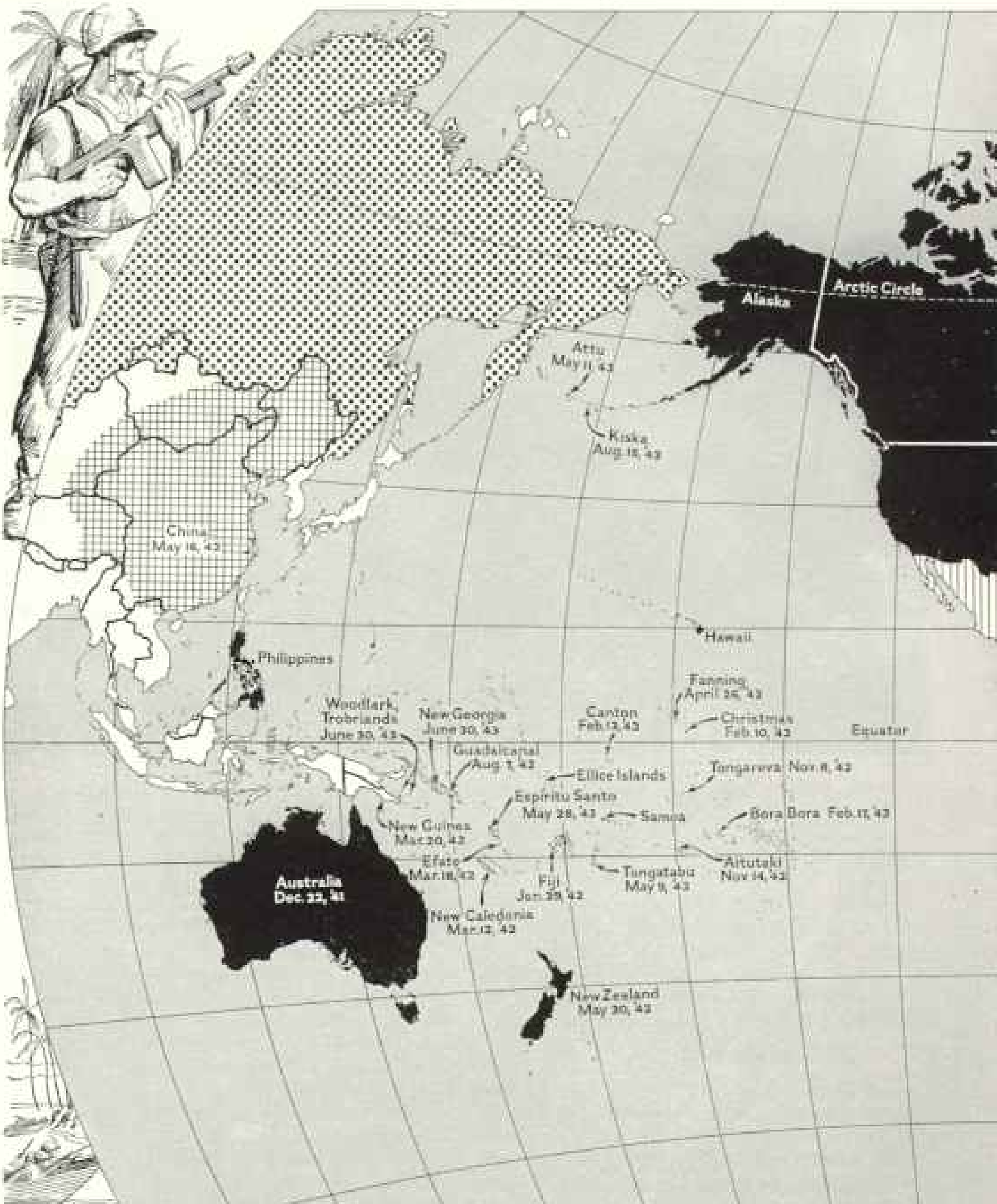
Publishers of Webster's International Dictionary, the G. & C. Merriam Company, say it seems that everybody in the United States is going to school. Demand for unabridged dictionaries has increased so tremendously that the company has, in effect, rationed the big books. Thus far, it has met all orders from government and private schools, but it has had to curtail orders from bookstores and other regular dealers as much as 40 and 50 percent.

Despite the spread of English all over the world, problems of communicating with members of the United Nations who speak a different tongue; broadcasting to enemy countries; and conversing with leaders in countries we have occupied, have taxed more than one Government agency.

Seven men in the translators' office of the State Department can cope with 30 languages. One of them knows 24 tongues well, another 20. This group does not include special translators in the Department's Far Eastern Division, which handles Chinese and Japanese.

Washington also has a central translating office, a clearing house for other Government departments, with a staff of five Spanish, three French, and four Portuguese translators.

The monitoring service of the Federal Communications Commission, which records foreign broadcasts for the Government, handles



English, Mightiest Language Empire, Spreads to the Far Parts of the World

Dominant tongue of the British Isles, North America, Australia, and New Zealand, English also is the most widely used secondary tongue in many sections of the globe. In the bilingual Union of South Africa, it shares honors with Afrikaans. Arabic dialects, not so important numerically as some other languages, blanket a vast section of North Africa and extend over into Asia Minor. Only Portuguese-speaking Brazil breaks the virtual over-all Spanish pattern in South and Central America. Chinese dialects and Russian, spoken by vast numbers, are chiefly confined within the political boundaries of China and the Soviet Union.

U. S. Troops Scattered over the Face of the Earth Must Learn Numerous Languages

Names of areas occupied by American soldiers, indicated on the map, and also the dates of their arrival, are based on the official report of General George C. Marshall, Chief of Staff, U. S. Army, covering the period from July 1, 1941, to July 1, 1943. The Special Service Division, Army Service Forces, sends records teaching any one of 39 foreign languages to soldiers anywhere on earth (page 691). Actually, Yanks are talking in other tongues, too, without benefit of recorded lessons. Troop transports are equipped with sets of records, so soldiers may gain a working knowledge of the tongue in the area for which they are bound.

Staff Photographer B. Anthony Stewart

"Yes, I Understand," Intones Captain Smith. "Doo-OONG," Translates C. Y. Fang

They are cutting a master language-teaching record at the Library of Congress in Washington, D. C. Copies will be sent to soldiers in the field who wish to learn Chinese (page 694). Students repeat the Chinese words, spelled phonetically here, during a pause in the recording. In from 8 to 15 hours, they can master 300 simple words and phrases. Capt. Henry Lee Smith is head of the Language Unit, Special Service Division, Army Service Forces, and Mr. Fang is in charge of the unit's Chinese desk.

33 different languages. Most of the monitors are thoroughly conversant with four or five tongues; some of them know eight or nine well. Chief headaches for the monitor service are Arabic dialect and Japanese broadcasts.

The National Geographic Society must have translators to handle its correspondence with many lands (page 695).

Birthplaces of the Languages

Origins of the world's languages still puzzle philologists. Scholars have long known that English, German, Scandinavian, Russian, Armenian, Persian, the Romance languages, and various Indian tongues, such as Hindustani, belong to one vast family—the Indo-European.

This parent tongue, they believe, grew up some 5,000 years ago in a group of tribes somewhere between central Europe and western Asia. Many scholars place the exact location on the grassy steppes east and northeast of the Caspian Sea.

The world map helps you to picture their later wanderings all over Europe and eastward into Asia. With the passing of centuries, these tribes lost all contact and their speech differed widely. But fundamental word roots and grammatical ideas remained similar.

For example, "father" and "mother" in English are *pater*, *mater* in Latin; *pitar*, *matar* in Sanskrit; *Vater*, *Mutter* in German; *pater*, *meter* in Greek; *hair*, *mair* in Armenian.

A second large family of languages, known as the Semitic, embraces ancient Phoenician, Hebrew, Aramaic, Arabic, and Amharic.

The Old Testament originally was written in Hebrew. The Bible, for centuries the world's "best seller," has been translated, in whole or in part, into 1,065 languages and dialects. Jesus spoke Aramaic, which gradually

replaced its sister tongue of Hebrew in Palestine. Aramaic still is spoken in parts of Syria; even by some Syrians in Chicago, Ill.

Languages of ancient Egyptians, the Coptic Church of Ethiopia, Berbers of the North African mountains, and masked Tuareg of the Sahara belong to the Hamitic, or the third language family.

Elbert Hubbard wrote, "Words are airy, fairy butterflies of the imagination. A philologist is a man who catches words and sticks a pin through them, fastening them to the wall."

When it comes to further language classification, the philologists have difficulty in determining just where to stick the pins.

Some scholars include the Samoyed speech of Siberia; Mongol and Manchu of Asia; Lapp, Finn, Estonian, Magyar, and Tatar of Europe in a fourth group, known as Ural-Altaic. Others disagree. With Chinese, a fifth huge language family, Burmese, Siamese, and Tibetan are allied.

Unrelated to these vast linguistic families is Bantu, widespread Negro language below the Sahara. Bantu is the most widely spoken of Africa's some 700 languages. Other important but unrelated language families are Japanese, Korean, Dravidian tongues of southern India (Tamil, Telegu, Kanarese, etc.), the Malay-Polynesian languages, and the language of the American Indians.

Earliest Writing Was Picture Drawing

Earliest and most primitive writing was picture drawing, such as exists among uncivilized peoples today.

Gradually the pictures became symbols and were always recognized as the signs for certain words. About 5,000 years ago, in Egypt and Mesopotamia, picture drawing evolved into systems of character writing, somewhat along the lines of modern rebus puzzles.

When an ancient Sumerian scribe of Mesopotamia wrote on a wet clay tablet with a square-tipped reed stylus, every picture he made was wedge-shaped. This was because he tilted his stylus as he pressed it into the clay. In Latin, *cuneus* means wedge-shaped; hence this style of writing became known as "cuneiform" or "wedge-shaped" writing.

The Egyptians wrote their hieroglyphics in a vegetable-gum ink on strips of reed called by the Greeks *papyros*, from which we get our word "paper."

The Chinese and the Mayans of America used systems of ideograms. The Mayans also developed a system of numerical signs.

The joint National Geographic Society-Smithsonian Institution expedition to Mexico in 1936 unearthed a stone slab engraved in

Claude F. A. Schaeffer

Wedge-shaped Writing on Clay Slates Records a Study 3,500 Years Old

The ancient scribe pressed his square-tipped stylus into the wet clay at an angle when he wrote. This fragment was unearthed in the ruins of Ras Shamra, in northern Syria.

Mayan numerical signs * with a date which means November 4, 291 B.C. (Spinden Correlation). This slab is the oldest dated work of man in America.†

Today's Chinese characters are still the ancient ideograms, although centuries of writing have so modified their appearance that the original form of many cannot be recognized.

The civilized world owes all its alphabets to the Phoenicians, those amazing manufacturers, traders, and seamen who lived along the eastern end of the Mediterranean in ancient times.

Tyre and Sidon were the Phoenician seaports; Carthage was their colony. The Phoenicians built the Hebrew temple for King Solomon at Jerusalem (I Kings V). They also made the metal work and furniture for the old Assyrian royal palaces. They built ships and sailed all over the Mediterranean.

To keep their books, they eventually devised an alphabet with 22 letters, each a consonant. About 1000 B.C., this alphabet passed on to the Greeks, who added vowels.

The first letter in Greek is *alpha*, the second *beta;* so the whole list acquired its English name from these two characters—"alphabet."

Later, the Greeks and Romans changed the Phoenicians' direction of writing from right to left. They wrote left to right, and we, in common with the Latin languages and others, still follow that practice. Arabs, Persians, and others, who borrowed the same alphabet, write from right to left.

The Phoenicians exported papyrus to Greece. Most of it came from their thriving city of Byblos; so the Greeks started calling the paper itself, *byblos*. Later, when they wrote books on rolls of such paper, they called them *biblia*. From this came the word "Bible," meaning "book" or "books."

Basic English

From Greece the Phoenician alphabet spread to Italy and then all over Europe. Aramaean merchants carried it to India with their trading caravans. The world learned to write.

When Mr. Churchill addressed Harvard University last September, he referred to the future possibilities of Basic English as a world language.

Basic English is a system devised by two Englishmen, C. K. Ogden of Cambridge, England, and Ivor Richards, now of Harvard University.

Chief purposes of Basic, according to its sponsors, are to provide an international auxiliary language for world-wide use in general communication, commerce, and science, and to impart an easy introduction to English.

The inventors picked a vocabulary of 850 words: 600 are nouns, 150 are adjectives. The remaining 100 are "operation" words which put the system to work as normal English.

The "operators" include only 16 verbs. They are "can, get, give, go, keep, let, make, put, seem, take, be, do, have, say, see, send." They take the place of about 4,000 common verbs in the English tongue. Other "operators" are prepositions (directives, Basic calls them), pronouns, adverbs, etc.

By combining one of the operator verbs with Basic nouns or prepositions, etc., thoughts may be expressed which ordinarily would require many other verbs.

In Basic, you do not enter a room, ascend a mountain, descend a hill, climb a tree, leave a building, or cross a bridge. Instead, you go in a room, go up a mountain, go up a tree, go down a hill, go out of a building, or go over a bridge.

Rules of grammar are limited to five, one of which deals with adding *er, ing,* and *ed* to nouns, so they may combine readily with the 16 verbs.

As the new system keeps the natural structure of the language, a person may go on with his education to a fuller knowledge without trouble. Friends of the system see a fertile field for growth in every land.

The two preceding sentences are in Basic English.

Mme. Ivy Litvinov, wife of the former Soviet Ambassador to the United States, taught Basic to classes of Russian soldiers. Generalissimo and Mme. Chiang Kai-shek also are enthusiasts, and classes in Basic have proved popular in China.

The Harvard Commission on English Language Studies has introduced the system into Latin America.

For many years other scholars have studied the possibilities of an international language. Esperanto is the best known.

Whatever the future of international languages may be, the importance of freer communication to world relationship steadily grows.

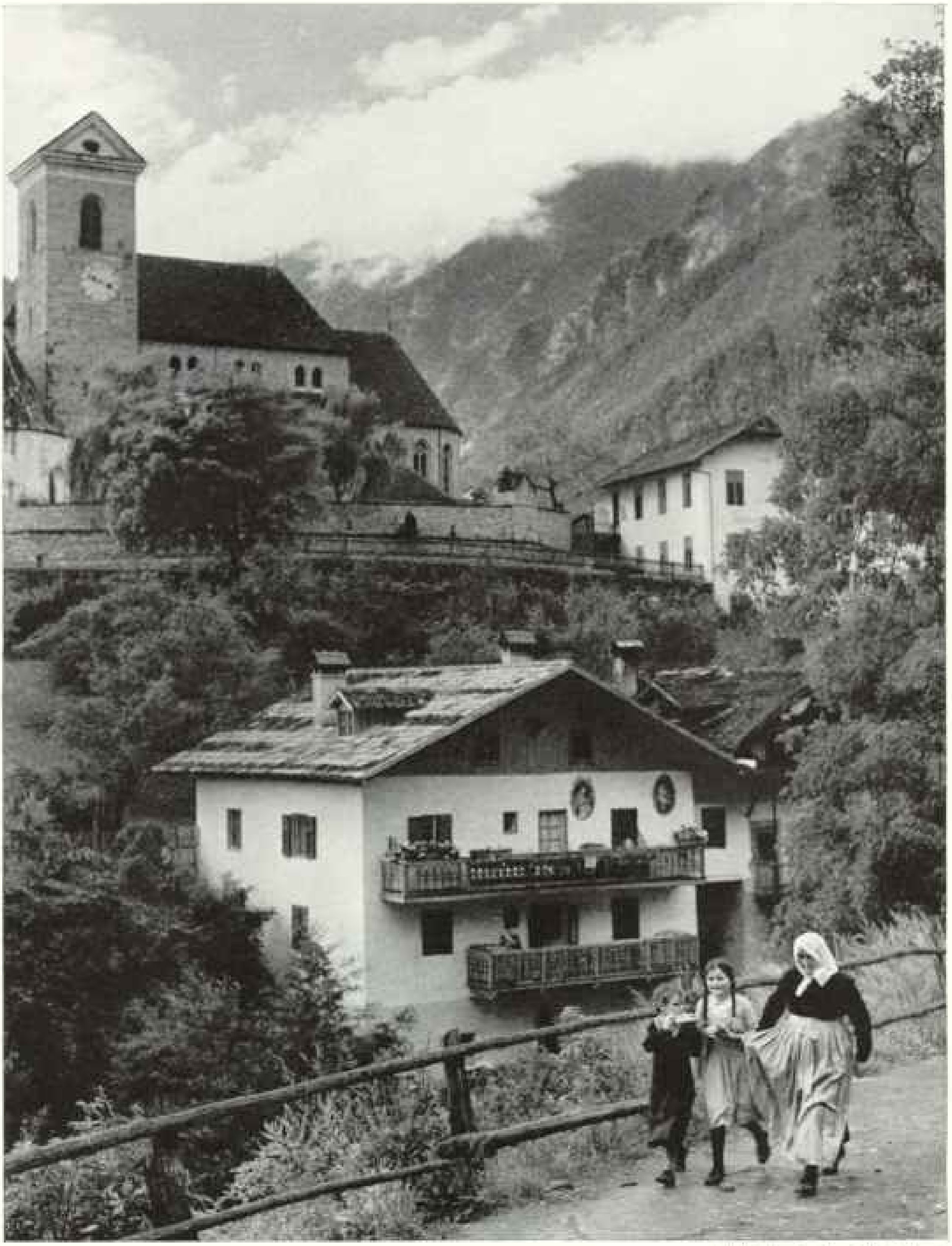
Said Mr. Churchill at Harvard:

"The empires of the future are the empires of the mind."

As ever, the processes of the mind will be expressed in words.

* See "Foremost Intellectual Achievement of Ancient America," by Sylvanus G. Morley, National Geographic Magazine, February, 1932.

† See "Discovering the New World's Oldest Dated Work of Man," by Matthew W. Stirling, National Geographic Magazine, August, 1939.



Staff Photographer B. Anthony Stewart

Austrian Yesterday, Italian Today—What Will the South Tyrol Be Tomorrow?

Granny and girls stroll in peaceful little Scena, a village near Merano in the territory awarded to Italy in 1919 (map, pp. 708-9). The hour was 3:49 by the church clock; the month was August, 1939. In 1943 defeated Italy abandoned sway here and Germany seized the strategic passes. Now American and British armies, driving north, pose this problem for the peace table: Who will get the Tyrol, half in Italy, half in Nazi Germany?

U. S. Army Air Forces, Official

Flying Fortresses' Roar Shakes the Brenner Pass—Once the World Trembled when Axis Dictators Whispered Here

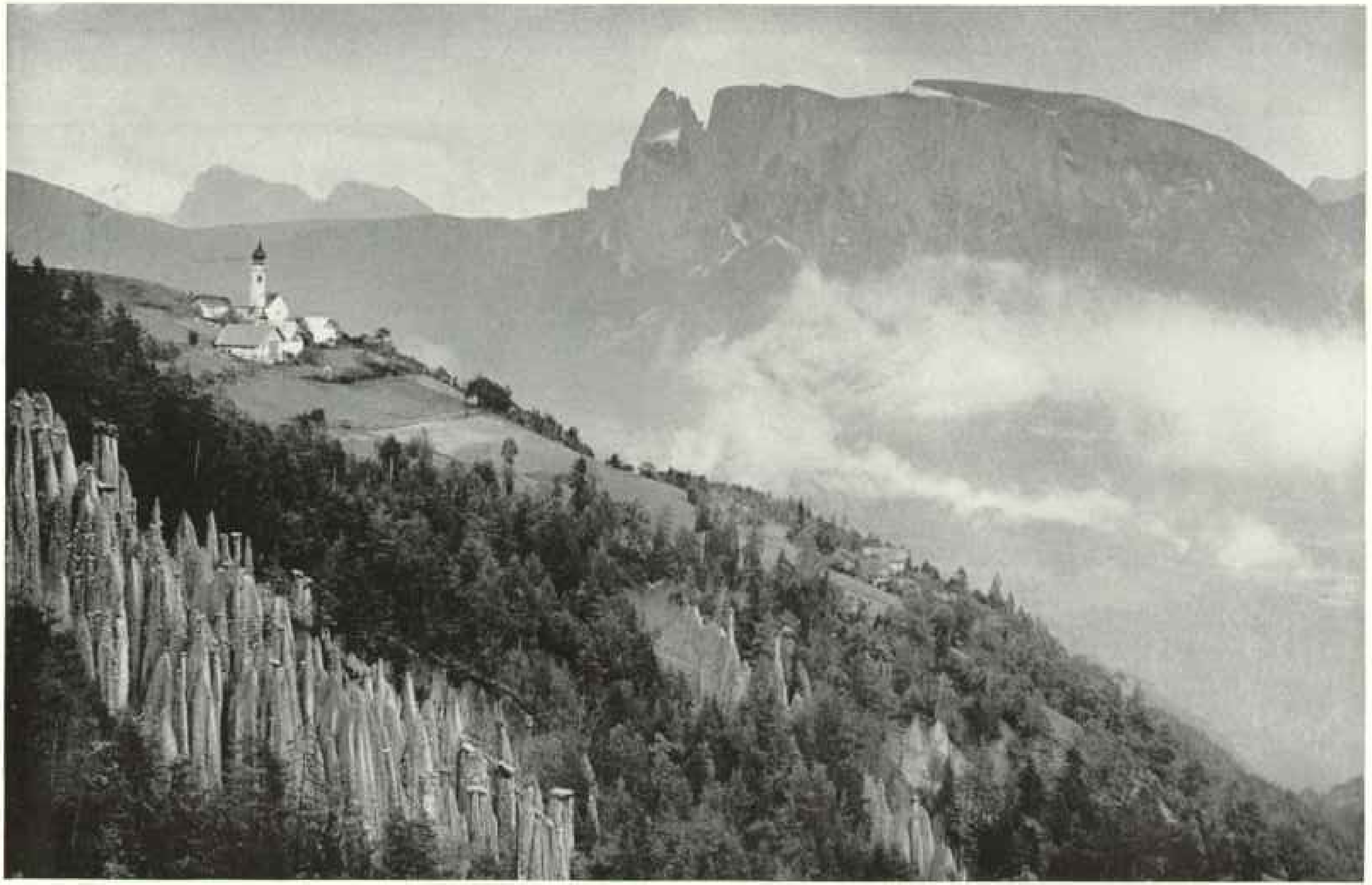
For 2,000 years the pass has been a gate to conquest. Roman legions and barbarian hordes marched this way. Now the heavily fortified gorge presents a mighty barrier to Allied armies. Even if it withstands breaching, its bridges and tunnels are vulnerable by air. Well-placed bombs have reportedly crippled Germany's railroad life line to Italy. In this picture the American bombers had just raided an aircraft plant at Regensburg. Guided now by the Sill River, they are shuttling to North Africa.

Spectators Await a Festival Procession in Pusteria Valley

Two women and a girl wear the Tyrolese black sailor hat with an inch-high crown. To guard it against Alpine winds, black ribbons are tied behind the hair knot. The boy in center wears the "Tyrol," recently popular in America.

Germania Goes on Parade in Italia

What could seem more Teutonic than her blonde braids and costume helmet (left)? Her companion of Pusteria Valley wears Tyrolese jacket, wide embroidered belt, knee pants, white stockings, and heavy mountain shoes.



Donald McLeish

In the Dolomites, Nature Has Carved the Earth Pyramids like a Pincushion and 8,460-foot Schlern like a Fortress

Near Bolzano, clouds sweep the Isarco Valley. Tiny Lengstein's church soars to a bulbous dome. Rain has eroded the earth spires into fantastic shapes. Each column has, or did have, an umbrella of hard stones protecting its soft mass of glacial rubble.

Small Boys Dutifully Hold the Scores for a Tyrol Band

So effectively do mountains divide the Tyrolese that each little valley is almost a separate realm. German and Italian are spoken a few miles apart. Ladin, an ancient Latin dialect, still lingers.

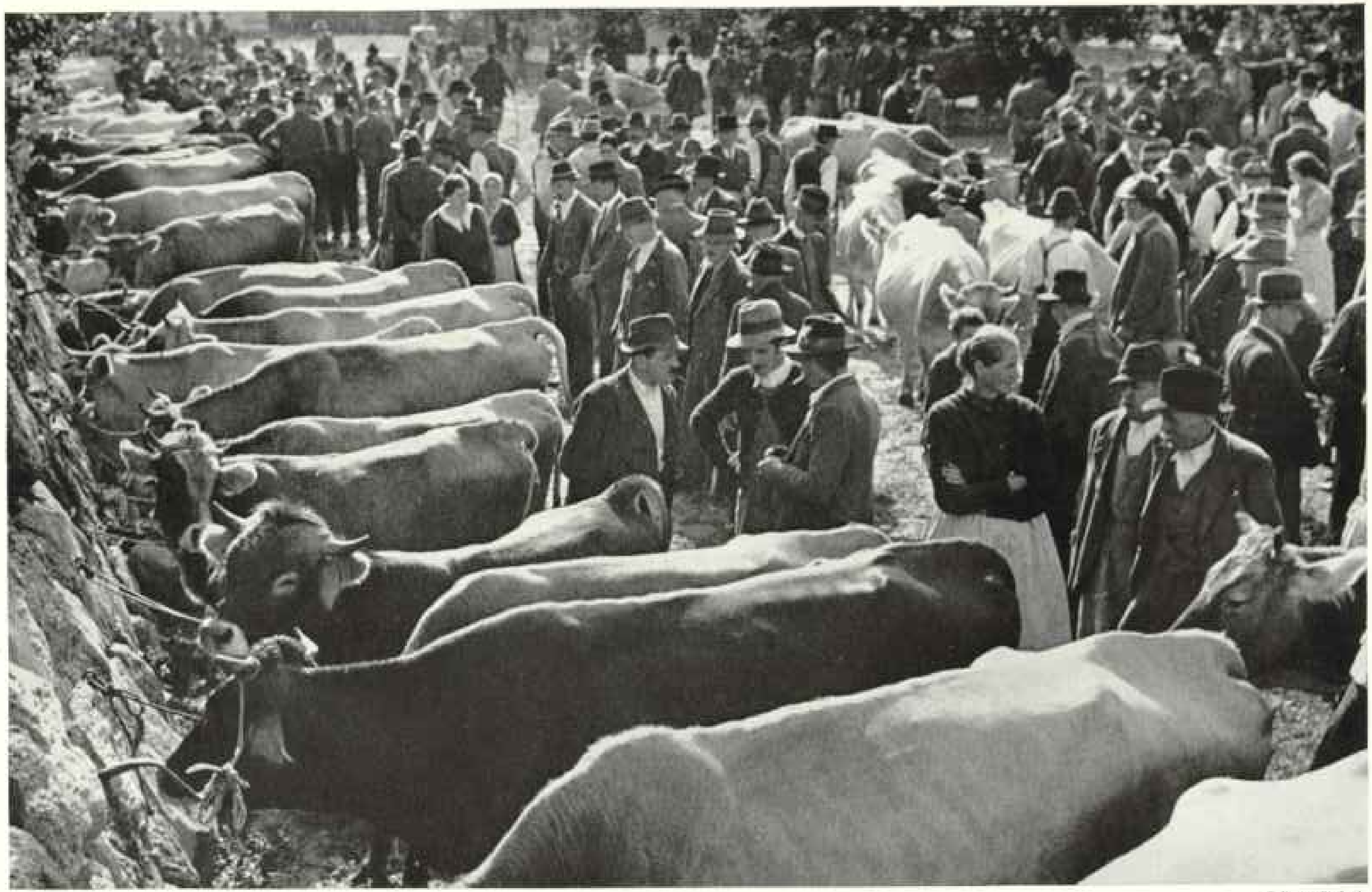
Tyrol Costume and Modern Dress Examine an Italian Uniform

A veteran of Mussolini's campaigns returns to his native village in Sarentina Valley near Bolzano. Although the region speaks German, the bakery sign is in the official Italian. Even names on some grave markers were Italianized.

Leo Barford

A Thousand Feet above Suburban Merano, Brunnenburg Perches Precariously on a Landslip

Battlements and tower, added in 1904, make this a "castle." It stands not many steps from Schloss Tyrol, seat of the Counts who in feudal times gave their name to the entire Tyrol. Last of their line was Margaret Maultasch, the "ugly duchess" whose exploits and scandals shocked the Alps.



© Bruno Bisfeld

From Green Alpine Pastures, Cattle Are Driven to Lagundo to Face a Bare Rock Wall until Buyers Appear

Gone are festival costumes; these are the people at work. Some have the dark eyes and dark hair of Roman origin. Yet on the right the two elderly men might be rural Americans of German descent. Lagundo, Italian name for Austrian Algund, lies almost in the shadow of Brunnenburg (opposite).

Venice
Milan
Turin
Genoa
Munich
Innsbruck
Salzburg
Trieste
Bologna
Verona
Padua
Lake Garda
Lake Como
Lake Maggiore
Lugano
Bern
Lucerne
Zurich
Nice
Monte Carlo
Menton
San Remo
Bordighera
Ventimiglia
Imperia
Savona
Varazze
Albenga
Alassio
Finale Marina
Loano
Rapallo
Portofino
Chiavari
Sestri Levante
Cinque Terre
Gulf of Genoa
Ligurian Sea
Gulf of Venice
Venetian Alps
Dolomites
Julian Alps
Carnic Alps
Lepontine Alps
Pennine Alps
Graian Alps
Maritime Alps
Ligurian Alps
Bernese Alps
Glarus Alps
Appenzell Alps
Lechtaler Alps
Ötztaler Alps
Stubai Alps
Zillertal Alps
Hohe Tauern
Rieserferner Group
Ortler Alps
Adamello Group
Brenta Dolomites
Marmolada Group
Sella Group
Sassolungo Group
Puez Group
Fanes Group
Cadore Dolomites
Ampezzo Dolomites
Sesto Dolomites
Karawanken
Kamnik Alps
Julian Alps
Gulf of Trieste
Istria
Po Valley
Lombardy
Piedmont
Liguria
Tuscany
Emilia
Switzerland
Austria
Germany
Italy
France
Slovenia
Croatia

Tyrrhenian Sea

Adriatic Sea

Corsica

Sardinia

Elba

Pianosa

Montecristo

Giglio

Giannutri

Ponza Islands

Palmarola

Ventotene

Zannone

Gorgona

Capraia

Gulf of Porto

Gulf of Orosei

Gulf of Gaeta

Gulf of Manfredonia

Strait of Bonifacio

La Maddalena

Caprera

Porto degli Aranci

Tavolara

Cape Corse

Cape Camino

Cape Testa

Cape Caccia

Cape Circeo

Cape Linaro

Gargano Head

Tremiti Islands

Pelagosa Islands

Florence

Rome

Naples

SAN MARINO

Railroads ——— ; connecting Alpine highways ═══

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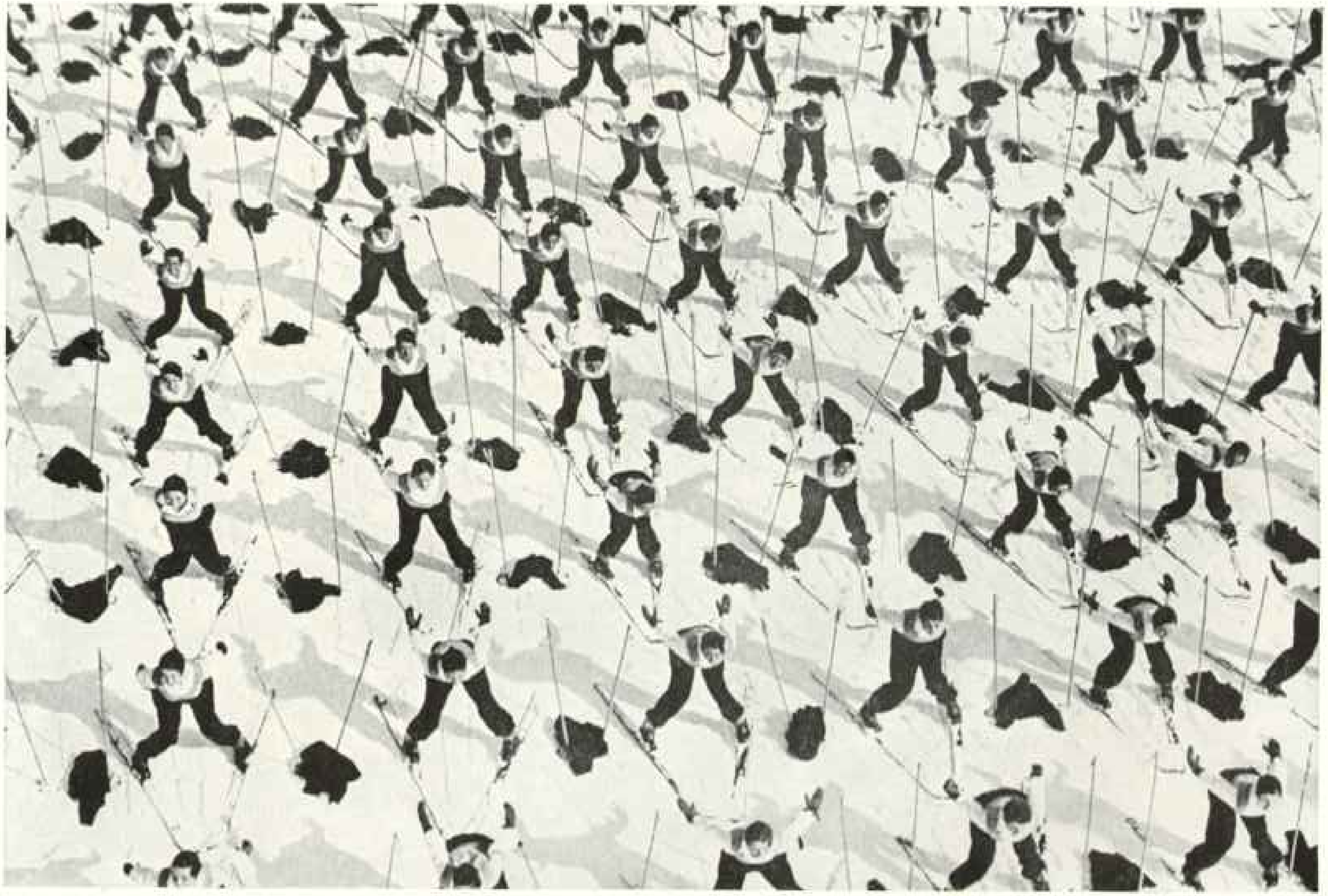
STATUTE MILES

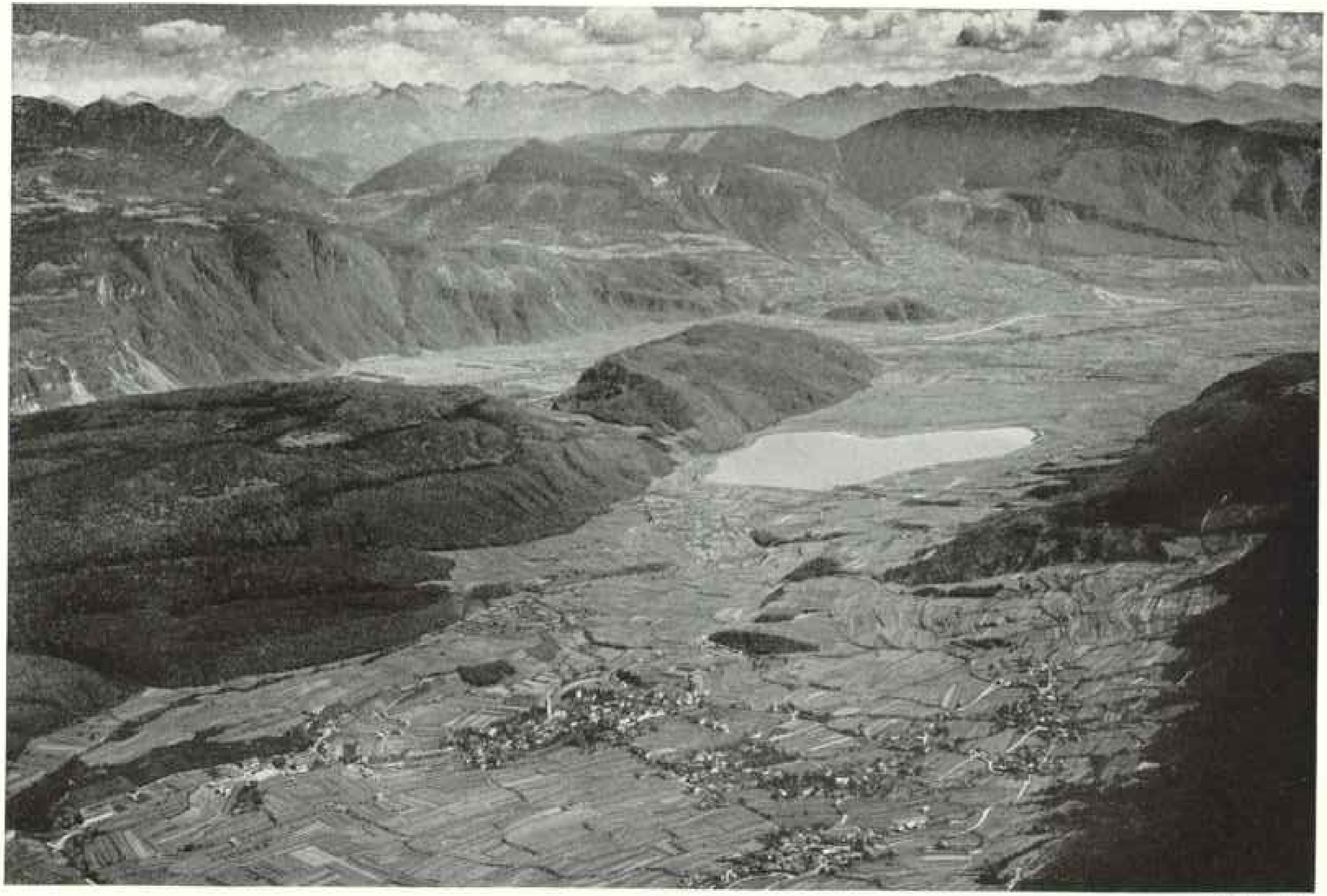


Skiers and Their Shadows Weave a Wallpaper Pattern on the Snows of the Dolomites near Cortina

Staff Photographer B. Anthony Stewart

Slacks and Plus Fours to the Contrary, This Is the Tyrol—Cortina Exists for Its Tourists

This village is one long main street lined by a score of hotels. Lights point out two of them, Vittoria and Concordia. Signs advertising *articoli sport* (sports articles) are witnesses to Cortina's popularity as a ski resort (opposite). In 1809 Napoleon's troops burned Cortina; in 1943 it was Hitler's hostage.



Leo Bartholdt

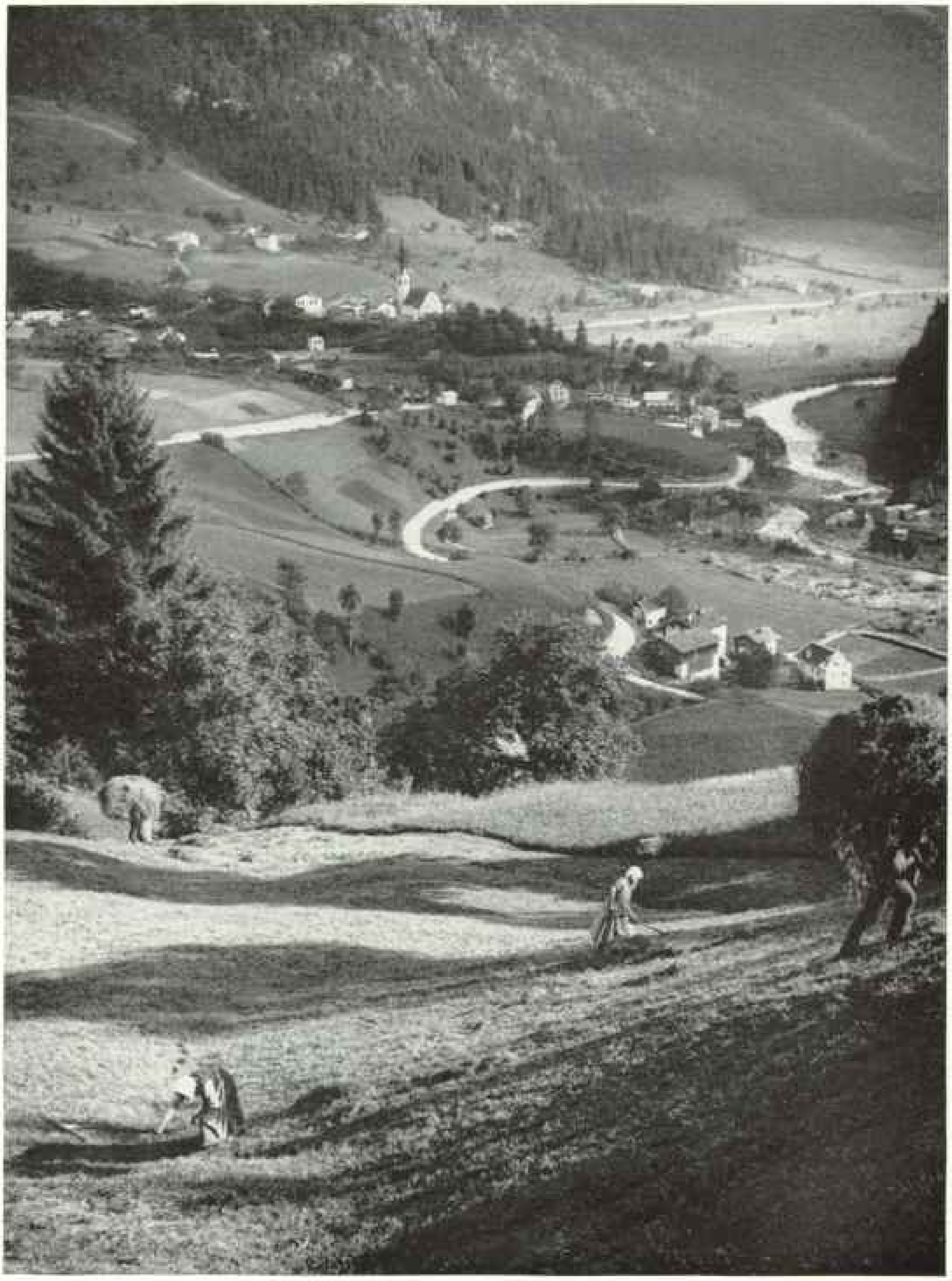
Caldaro Valley, a Crazy Quilt of Plowed Fields, Is Hemmed In by the Dolomites—Beyond Its Lake Is the Silver Adige

Daughters Inherit Mama's Enduring Tyrol Styles

In Sarentina Valley, near Bolzano, women wear the squat black hat of the Pustertia Valley (page 705). A scarf with colored figures circles the shoulders. A bulging skirt drops almost to the ground. Over it is a silken apron.

An Array of Grave Faces Contemplates a Weighty Problem

Sturdy conservatives, Sarentina Valley farmers cling to ancestral dress. Frequently hatbands like theirs tell by their colors whether the wearers are married or single. Roman, Etruscan, Teutonic, and Celtic blood mingles in the Tyrol.



San Leonardo Men Shoulder Huge Heaps of Straw Raked by Their Wives

Here, in Passiria Valley, where the road winds even more than the brook, slopes are too steep for modern binders. This neat little vale was the birthplace of Andreas Hofer, the Tyrolese patriot who defied Napoleon and paid with his life. His wife is buried in San Leonardo's churchyard.

Heroes of Wartime Science and Mercy

By Elizabeth W. King

THE insignia, decorations, medals, and badges of the United States armed forces have been color-illustrated and fully described in the June and October issues of the National Geographic Magazine (page 740).

This issue of The Geographic shows the Government-authorized insignia of the United States Maritime Service, United States Public Health Service, United States Coast and Geodetic Survey, U. S. Army Transportation Corps Vessels, American Red Cross, Air Carrier Contract Personnel of the Air Transport Command, and Civil Air Patrol.

Each of these seven diverse organizations has an honor roll of its members who have sacrificed their lives in service of their country.

For one example, there was Richard Moczkowski, chief mate of a small merchantman, whose ship was attacked by two enemy surface raiders. Wounded in the arm and the chest early in the action, Moczkowski ordered a seaman to prop him in a doorway so he could keep on directing his men. He did so until one of the raiders was sunk and the other withdrew from action.

With her boilers blown up, engines destroyed, masts shot away, and ablaze from stem to stern, orders finally were to abandon ship. His shipmates carried the mortally wounded Moczkowski to the side of the ship. But when he saw the crowded lifeboat was already released and clear of the ship, he commanded his men to leave him rather than further jeopardize their safety.

The men in the lifeboat were saved. The Maritime Commission awarded Moczkowski posthumously the Merchant Marine Distinguished Service Medal.

Men Trained to Be Merchant Seamen

Insignia of the United States Maritime Service, a division of the Training Organization of the War Shipping Administration, are worn by officer graduates of the Training Organization on active duty with the Maritime Service, and at option by licensed officers on inactive duty with the United States Maritime Service but serving actively on merchant vessels.

Petty officers and seamen wear insignia shown on Plate I while in training and on active duty with the Maritime Service and at their option after graduation.

Section 101 of the Merchant Marine Act of 1936, the Magna Charta of our merchant marine, states that this country should have a merchant fleet "composed of the best-equipped, safest, and most suitable types of vessels, constructed in the United States and manned with a trained and efficient citizen personnel."

To carry out this program, the United States Maritime Commission in 1938 established the United States Maritime Service for the training of merchant marine personnel. Officer candidates must have served 14 months at sea to be admitted for training.

The Maritime Commission also established the United States Merchant Marine Cadet Corps, another division of the Training Organization to train young Americans without previous sea experience to become licensed merchant marine officers. These cadets are also midshipmen in the Merchant Marine Reserve of the United States Naval Reserve and are designated as cadet-midshipmen. They are trained at the United States Merchant Marine Academy at Kings Point, New York, and at cadet basic schools at Pass Christian, Mississippi, and San Mateo, California, and on active merchant vessels.

State Maritime Academies, a third division of the Training Organization, jointly financed by Federal and State Governments, also train young men without previous experience to become officers.

The Maritime Service not only trains officers, but also seamen for the deck, engine, and steward departments, and as radio operators, ship's carpenters, etc. There are two officer schools, four apprentice seamen schools, and two radio schools. The Service operates 10 training ships.

The program, sped up and expanded by the war, includes refresher courses for experienced seamen, upgrading courses for advancement in grade, and complete courses for new men who have the required experience at sea to become officers. It also operates schools at shipyards and manufacturing plants for specialized training in different types of propulsion; schools for radio operators, cooks and bakers, assistant purser-hospital corpsmen; signal schools; convoy procedure and communications courses. There are even correspondence courses for men at sea.

Ranks, grades, ratings, and scale of pay in the Maritime Service are identical with those of the U. S. Navy (Plate I).

The War Shipping Administration was established in 1942 to "assure the most effective utilization of the shipping of the United States for the successful prosecution of the

U. S. Army Signal Corps, Official

This Is the Army's Navy, but the Uniforms Are Worn by Civilians

They are members of the Water Division of the Transportation Corps, Army Service Forces. In his blues, the Captain is identified by four sleeve stripes. On his cap he wears an eagle above crossed foul anchors. The Petty Officer in summer khaki wears a wheelman's device inside a wreath (Plate IV).

war." To it the jurisdiction over the Training Organization was transferred by Executive Order on July 11, 1942.

Rear Admiral Emory S. Land, U.S.N. (Ret.), is the Chairman of the United States Maritime Commission and the Administrator of the War Shipping Administration.

"Sailors' Doctors" Guard Nation's Health

The United States Public Health Service was established by Congress in 1798 as the Marine Hospital Service to provide medical treatment and hospital care for sick and disabled seamen.

Since 1889 Public Health commissions have been granted by the President and approved by the Senate. Ranks from assistant surgeon to surgeon general are comparable to those of lieutenant (j.g.) to rear admiral in the Navy (Plate II).

Present-day function of the Service is far broader than the care of sailors. It is the Federal agency responsible for the health of the Nation. Cooperating with the States, the Service carries on research and activities to prevent and control disease and improve the national health.

Ninety percent of the resources of the Service in manpower, matériel, and money have been channeled into direct war work. The Service cooperates with the Army and Navy, and its men have been assigned to armed forces serving in this country and abroad.

Virtually all scientific research at the National Institute of Health—research arm of the Public Health Service—has been turned to war problems.* Diseases of military importance are studied; vaccines are supplied for military and civilian use; and the toxicity of chemicals, metals, and new solvents used in war industries are investigated.

* See "The Healing Arts in Global War," by Albert W. Atwood, NATIONAL GEOGRAPHIC MAGAZINE, November, 1943.

J. Barlow Roberts

Perched on a Sea of Rope, a Veteran of Sail Teaches a Farm Boy to Tie an Eye Splice

After 40 years behind the mast, he instructs at the United States Maritime Service Training Station, Sheepshead Bay, New York. His rating badge shows he is a Chief Boatswain's Mate. His cap bears crossed anchors and Corps Device (Plate I). The apprentice, who wears no insignia, trains to be an ordinary seaman.

Control of occupational diseases and accidents, provision of emergency medical service, and placement of workers in jobs suited to their physical capacity are parts of the greatly expanded Public Health Service industrial hygiene program.

Important war programs of the Service concern the control of malaria, venereal diseases, tuberculosis, and typhus fever. The Service cooperates actively with such agencies as the War Shipping Administration, War Production Board, Office of Community War Services, Office of Civilian Defense, and War Manpower Commission.

In addition, through its newly established Division of Nurse Training, the Nurse Cadet Corps, the Service is administering a program to recruit and train 65,000 new nurses a year. It also retrains nurses in its refresher courses.

Alert for scientific advance, President Jefferson established the Coast and Geodetic Survey in 1807. It is one of the six services of the Government having a commissioned corps of officers.

War Demands Surveys and Maps

Coast and Geodetic Survey officers are appointed by the President and confirmed by the Senate. They hold relative rank with officers of the Navy from ensign to rear admiral (Plate III).

In time of national emergency, Survey officers are subject to transfer by the President to the armed forces. Since this war began, approximately one-third of the commissioned officers have been transferred.

The Survey now engages wholly in work for the Army and Navy. Hydrographic units are surveying in forward areas, gathering data to assure the safe navigation of our naval forces. Shore parties work for the War Department in localities where special surveys are needed. Recently the Legion of Merit was awarded to Comdr. William M. Scaife for

OWI official

For Mrs. Winston Churchill the New Cadet Nurse Corps Uniform Is Modeled at the White House

Lucile Petry (center) directs a division which helps recruit and train student nurses for essential civilian and Army and Navy needs. On her arm she wears the Maltese Cross, on lapel her Corps Device, and on beret the cap device of the United States Public Health Service. Mary Churchill has two shoulder pips, showing she is a subaltern in the Auxiliary Territorial Service.

service while in command of an advance Navy surveying unit in the Aleutians.

Survey work in wartime is frequently for "fire control," that is, in making calculations for artillery fire.

The Silver Star for gallantry was awarded to 1st Lt. David M. Whip of the Survey who, while in charge of an artillery unit establishing control survey under heavy enemy shellfire in Tunisia, was successful in directing the "neutralization of a battalion of enemy artillery."

In peacetime the Survey charts the coasts of the United States and its possessions. It also conducts basic land surveys of the country, compiles aeronautical charts, measures and predicts the tides and currents, and studies gravity, terrestrial magnetism, and seismology.

The Army's Fleet

The U. S. Army has one of the biggest fleets in the world.

Barges, tugs, yawls, lighters, commando boats, crash boats, landing barges, million-dollar mine-planters, 99-foot Diesel cargo boats, ice-breakers, auto ferries, balloon barges, crane barges, tunnel-stern towboats, anti-submarine patrol boats, ramp landing boats, sea-sleds, amphibian landing boats, troop carriers, and marine tractors are some of the 155 types of ships the Transportation Corps procures.

The employes, from master and chief engineer down to scullions, are civilians, but their services, often under enemy fire, are almost unknown to the public.

When the Spanish-American War broke out, the Army did not have a single sea-going vessel fit to carry troops, animals, and supplies to Cuba. To meet this need, the Army Transport Service was created.

After that war, the A. T. S. was almost forgotten, and when the United States entered World War I, the Army had only seven ships of the Spanish-American War fleet in service. By November 1, 1917, it had 312 ships with a total dead weight of 3,251,000 tons.

Rapidly demobilized after World War I, interest in the A. T. S. did not die. It was used to transport 27,000 men and supplies to the Army's overseas garrisons.

Originally under the Quartermaster Corps, the Army's navy is now under the Water

Division of the year-and-a-half-old Transportation Corps (Plate IV).

Tobruch had fallen. The Germans were only 65 miles from Alexandria. An appeal was made for tanks and self-propelled guns from the United States. One ship was torpedoed in the Caribbean, but a replacement ship with a duplicate cargo of 52 tanks and 18 guns crossed the submarine-infested North Atlantic and arrived, without benefit of escort, on the same day the convoy reached Suez. British officials later said these supplies, borne by U. S. Army vessels, helped turn the tide of war.

International

"C" Is for Correspondent—Purple Heart Is for His Wounds

White letter on green brassard is worn by Leo S. Disher, United Press writer, as he was decorated by Maj. Gen. Lloyd R. Fredendall. Covering the North African landing from a Coast Guard cutter, he received numerous injuries. Radio commentators in war areas also wear the "C"; photographers wear "P".

The Red Cross Saves Lives

Henri Dunant, a Swiss philanthropist, saw the inhuman treatment of the wounded soldiers and needless loss of lives when the Austrian and Franco-Sardinian forces met at Solferino in June, 1859.

Dunant wrote a book suggesting a plan for the care of the sick and wounded in battle. His book was the basis for the articles of the Geneva Treaty and the International Red Cross, formulated five years later.

Clara Barton, a New England schoolteacher who became a Government worker, had, in the meantime, been unknowingly incorporating the principles of the Red Cross in her work with the wounded of the Civil War. After a trip to Europe, where she became familiar with the Red Cross, Miss Barton urged the United States to ratify the Treaty of Geneva.

This was done in 1882 and made possible the organization of the American Red Cross as a voluntary agency supplementing Government service. In addition to caring for soldiers and sailors, the Red Cross gives aid to victims of disasters.

Today more than 3,500 men and women represent the Red Cross overseas. They operate service clubs, clubmobiles, and aero clubs, and provide recreation in hospitals and camps. Assisted by many locally employed workers and thousands of volunteers, they operate leave clubs and recreation centers ranging from grass huts in New Guinea to modern London hotels.

Many Red Cross men are assigned to duty with the invading forces and live under the same conditions as the men (Plates V-VII).

A Red Cross field director, doing welfare work with a command which later invaded

Italy, was on a landing barge on August 13, 1943; he was laden down with cigarettes and other comfort articles. The barge maneuvered into landing position; it was hit squarely by a German shore gun.

The cable to the American Red Cross National Headquarters merely stated: "Russell Bullard, American Red Cross field director, missing in action."

Contract Pilots Don't Tell the Sad Ones

Gayest stories of the war are those told by the Air Carrier Contract Personnel of the Army Air Forces' Air Transport Command.

Who hasn't heard some version of the one about the pilot who grew tired of his mother's complaints about wartime laundry service? He volunteered to have the family wash done in Calcutta where the service was good, prompt, and cheap!

Such jokes only cover up the bravery, hardships, and skill of the commercial air lines men who help the ATC handle the training program and the movement of cargo.

In December, 1940, the President directed the War Department to utilize the air lines. Their store of experience in air transportation has since proved extremely valuable in developing a world-wide cargo and passenger air transportation system. Cargoes range from tanks to hypodermic syringes.

Personnel of the Air Contract Carriers serve in virtually every capacity—as pilots, navigators, radio operators and technicians, and mechanics, both in training and in operation. They wear Army uniforms with their own distinctive insignia (Plate VII).

These fliers and their ground personnel are known in every country where there are Allied air bases. They help operate an air line system many times larger than all the combined military and civilian air transport lines of the United States in pre-Pearl Harbor days.

The Navy has a similar service, the Naval Air Transport Service, popularly known as the NATS, operated in part by the Navy, and in part by Air Carriers under contract.

They are now flying over 700,000 miles a week; they carry matériel and personnel to naval establishments and to fleet units in war areas. Already stories of queer cargoes and casual flights to exotic lands are legion—and legendary. As yet the NATS have no special uniform. More than thirty lives lost in their country's service in the first 18 months of the war proves the valor of the Civil Air Patrol.

One week before Pearl Harbor, the Civil Air Patrol was organized as a division of the Office of Civilian Defense. From the beginning its national headquarters has been staffed by a small group of Air Forces officers. Since April, 1943, it has been an officially recognized auxiliary of the Army Air Forces.

More than 85,000 citizens—10 percent of them women—and 30,000 cadets have volunteered their time to the Civil Air Patrol and the Civil Air Patrol Cadets.

The organization provides its own equipment, from airplanes to trailers fitted out as mobile first-aid stations, offices, radio rooms, and kitchens.

No compensation is given members, except an allowance for tours of duty on such work as Coastal Patrol and Courier Service. CAP units operate over 1,000 airfields. Uniforms, approved by the War Department, are individually purchased (Plate VIII).

CAP has served as a training corps for thousands of men and women headed directly for the Air Forces and other branches of the armed forces. However, the CAP is primarily for active duty in the war effort.

Active Duty Units include the Southern Liaison Patrol which flies along the Rio Grande border so low that pilots can read automobile license numbers. The Courier Service flies regular routes between Army posts. Supplies to industrial plants are sometimes dropped by paper parachutes, developed by aid of tests from CAP planes.

The Forest Patrol, cooperating with the U. S. Forest Service, has flown through smoke over blazing forests to direct firefighters and to drop them supplies and equipment.

The Coastal Patrol, permitted to carry bombs after a submarine sighted from a CAP plane got away, has sunk several U-boats and sighted more than 150 for the Army, Navy, and Coast Guard. Rescue of torpedo victims is helped by the constant watch of the patrol.

The Civil Air Patrol now has more planes than the whole Army Air Forces had at the beginning of 1940.

Cap Device—Officer

Button

Line · Supply · Hospital Corps · Radio · Christian Chaplain · Jewish Chaplain

Officers' Branch of Service Marks

Vice Admiral

Rear Admiral

Commodore

Captain

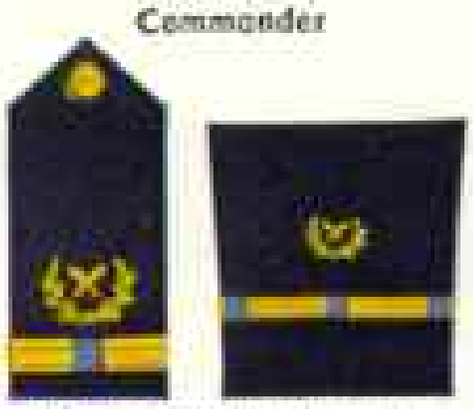
Commander

Lieutenant Commander

Lieutenant

Lieutenant Junior Grade

Ensign



Chief Warrant Officer (Ship's Clerk)

Warrant Officer (Electrician)

Shoulder Marks and Sleeve Stripes

Boatswain · Electrician · Machinist · Carpenter · Pay Clerk · Photographer · Ship's Clerk · Radio Electrician · Pharmacist

Chief Warrant and Warrant Officers' Specialty Devices

(Worn in Wreaths)

Cap Device
Chief Petty Officer

Chief
(Boatswain's Mate)

First Class
(Carpenter's Mate)

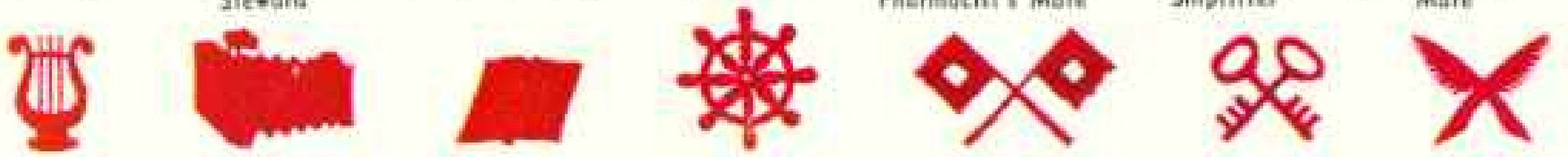
Second Class
(Machinist's Mate)

Third Class
(Radioman)

Corps Device

Rating Badges for Petty Officers

Baker, Cook · Chief Commissary Steward · Electrician's Mate · Gunner's Mate · Hospital Apprentice, Pharmacist's Mate · Metalsmith, Shipfitter · Motor Machinist's Mate



Musician · Photographer's Mate · Printer · Quartermaster · Signalman · Storekeeper · Yeoman

Specialty Marks

Cap Device

Button

Surgeon General and Assistant to the Surgeon General

Surgeon

Medical Director and Assistant Surgeon General

Passed Assistant Surgeon

Senior Surgeon

Assistant Surgeon

Pin-on Miniature Rank Devices

Medical and Engineer Officers

Acting Assistant Surgeon

Dental Officer

Scientific Officer

Corps Devices

Surgeon General and Assistant to the Surgeon General

Medical Director and Assistant Surgeon General

Senior Surgeon

Surgeon

Passed Assistant Surgeon

Assistant Surgeon

Acting Assistant Surgeon

Chaplain

Intern

Pharmacist

Administrative Assistant

Shoulder Marks and Sleeve Stripes

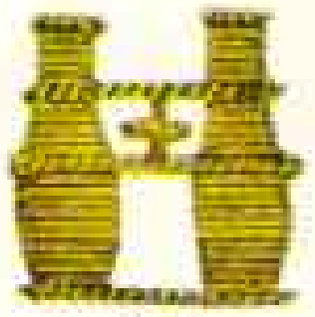
U. S. Cadet Nurse Corps Sleeve Insignia

Cap Device
Officers

Commissioned Officer

Chief Engineer

Surgeon



Mate

Corps Devices

Rear Admiral

Captain

Commander

Lieutenant Commander

Lieutenant

Lieutenant Junior Grade

Ensign

Shoulder Marks and Sleeve Stripes

Device
for Garrison Cap

Rear Admiral

Captain

Button
Officers

Cap Device
Chief Petty Officer

Commander

Lieutenant Commander

Lieutenant

Lieutenant Junior Grade

Ensign

Pin-on Miniature Rank Devices

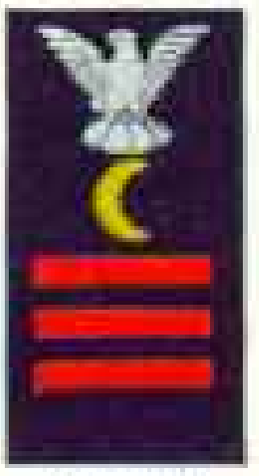
Chief (Yeoman)

Chief (Boatswain)

Radio Technician

Oiler

Coxswain



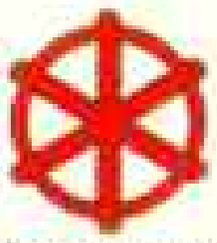
Officers' Steward or Cook

Rating Badges

Cap Device

Officers' Steward or Cook

Electrician



Quartermaster

Master at Arms

Band for Blue Cap

Carpenter

Pharmacist

Specialty Marks

Collar
Marine Superintendent,
Superintending Engineer

Lapel

Superintending Engineer,
Engineer Officers—A.T.S.
Chief & Asst. Engineers—H.B.S.

Officer's Cap
A.T.S.—H.B.S.

Lapel
Transportation
Agent

Collar

Ship Officers, Transportation
Agents and Clerks
(Stewards, silver)

Lapel
Clerks on Piers
and on Transports

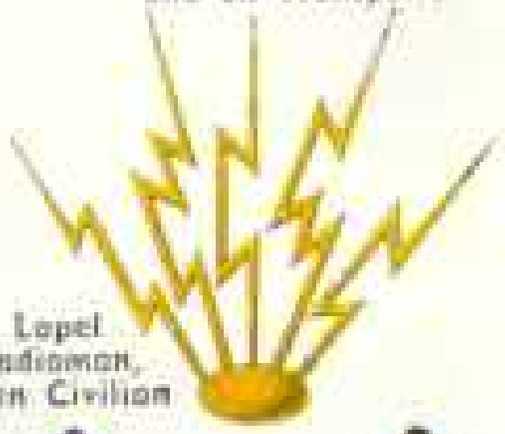
Lapel

Marine
Superintendent,
Master, Chief
Stevedore, Deck
Officers—A.T.S.
Master, Mate,
Pilot—H.B.S.

A.T.S. H.B.S.

Buttons
(Stewards—Silver)

Lapel
Steward



Lapel
Radioman,
when Civilian

Cap, Coller, Lapel Insignia; Buttons

Master

Chief Engineer

Chief Officer

Staff Engineer

First Officer

First Asst.
Engineer

Second Officer

Second Asst. Eng.,
Electrical Eng.

Third Officer

Third Asst.
Engineer

Junior Third
Officer

Junior Third
Asst. Engineer

Transportation
Agent

Chief Steward

Overcoat Shoulder Loops—Ship Officials

Master,
Chief Engineer

Chief Officer,
Staff Engineer

1st Officer,
1st Asst. Eng.,
Tracsportation Agt.

2d Officer,
2d Asst. Eng.,
Electrical Eng.,
Transportation Clerk
(Sr.) on Transports

3d Officer,
3d Asst. Eng.,
Transportation Clerk
(Jr.) on Transports

Jr. 3d Officer,
Jr. 3d Asst. Eng.

Chief Steward

Coat Sleeves—Ship Officials

Machinist, Refrigerating
Eng., Deck Eng.,
Chief Electrician, Plumber,
Boilermaker, Water Tender

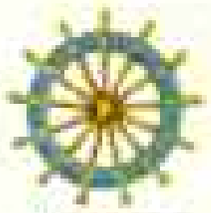
Boatswain

Carpenter

Master at Arms

Cap Insignia—Petty Officers

(Central Designs Used in Wreaths)



Wheelman

Yeoman

Oiler

Wheelman

Boatswain's Mate

Carpenter's Mate

Fireman

Coal Passer

Rating
Devices

Boatswain—H.B.S.

Oiler—H.B.S.

Men's Cap Shield

Men's Lapel or Collar Shield

Men's Light Bronze Initials

Bronze Initials


Cut-out Red Cross


Blood Donor Pins


Sleeve Emblems

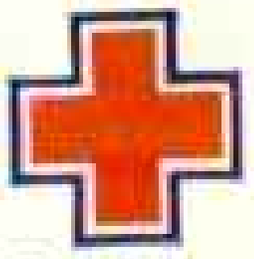
Services to the Armed Forces


Cut-out Red Cross


Sleeve Emblem


Enrollment Badge

Bronze Initials


Cape Emblem

Nursing Service


Administration


Production

Volunteer Nurse's Aide

Staff Assistance

Hospital and Recreation

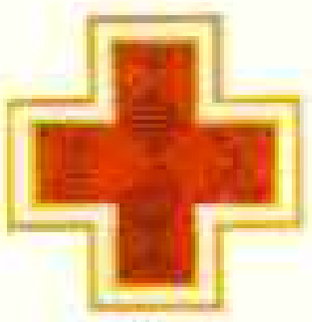

Motor


Home Service

Canteen

Emergency Corps Replacement Pin

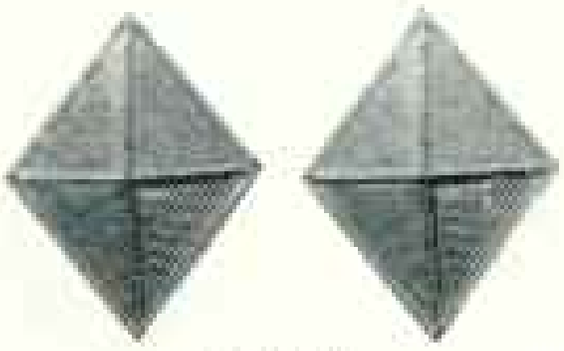
Bar Pins

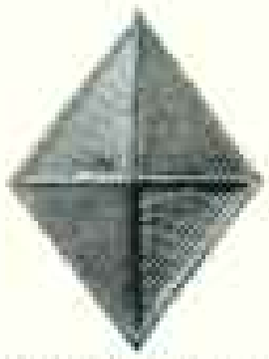

Cut-out Red Cross

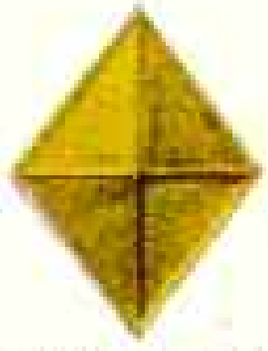
Bronze Initials


Advanced First Aid Pin


Sergeant Motor Corps


Captain Motor Corps


1st Lieutenant Motor Corps


2d Lieutenant Motor Corps

Car Tag


Corporal Motor Corps

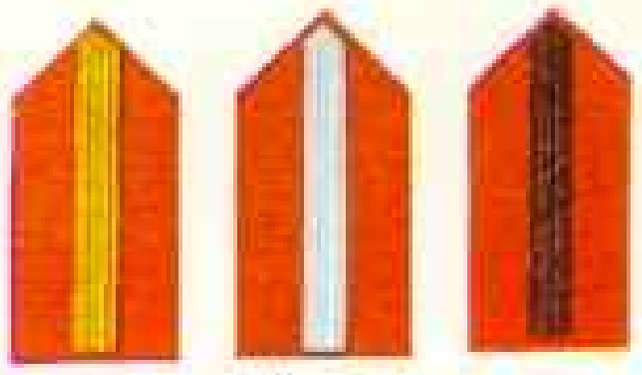
Volunteer Special Services
AMERICAN RED CROSS
(Plates V, VI, and VII)

Sleeve Emblem

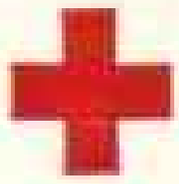
Sleeve Emblems
Motor Corps

Sleeve
Volunteer Nurse's Aide

Cap



Collar Tabs



Dress

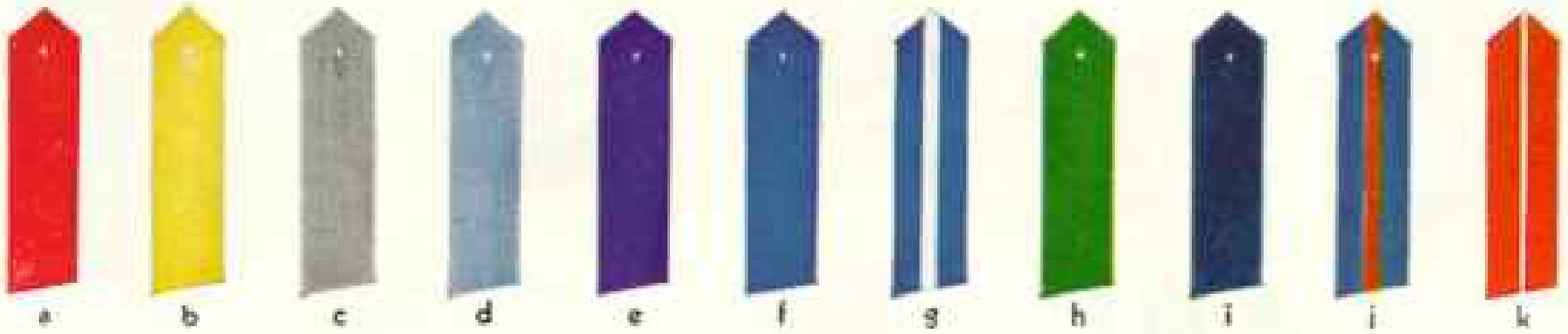
Cap

Indoor Uniform Patches

Service Chevron
and Bar

Production
Instructor

Garment Label



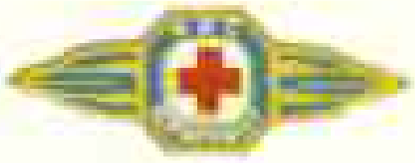
a b c d e f g h i j k

RIBBON EPAULETS—a, Administration Corps; b, Staff Assistance Corps; c, Hospital and Recreation Corps; d, Volunteer Nurse's Aide Corps; e, Home Service Corps; f, Canteen Corps; g, Volunteer Dietitian's Aide Corps; h, Motor Corps; i, Production Corps; j, Camp and Hospital Council Service; k, Activities for Army and Navy Women.

Volunteer Special Services

Canteen Instructor

Nutritionist Pin



Nutrition Instructor

Nutrition Committee

Nutrition Service

Life Saving
Senior

Life Saving
Junior

Emergency Service
Emblem
(Disaster Relief)

Pins

Arm Emblem

Life Saving
Junior

Life Saving
Senior

Cloth Insignia

First Aid
Instructor

Water Safety
Instructor

Car Tag

Sleeve Emblem

Firemen,
Policemen

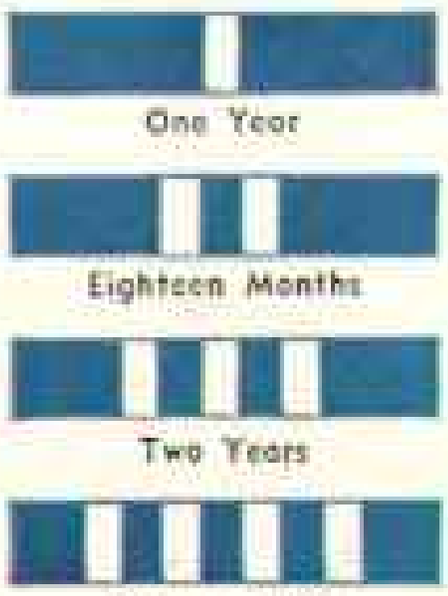
Water Safety
Instructor

First Aid and Water Safety

American Junior Red Cross

Volunteer Five Years' First Aid and Life Saving

Service Pins



One Year
Eighteen Months
Two Years
Thirty Months

Foreign Service
Six Months

World War I Service Medal with Ribbons

Five Years
Ten Years
Fifteen Years
Twenty Years

Service Bars

AMERICAN RED CROSS

(Plates V, VI, and VII)

Service Cap and Fiber Helmet
Shoulder Loop and Caps
Button
Noncombatant—Sleeve Emblem
Chief Pilot (Supervisory Officer)
Pilot (Captain)
Co-Pilot (First Officer)
Flight Navigator
Flight Mechanic
Sleeve Emblem, Ground Personnel (except Supervisory)
Wings
Flight Radio Operator

Chief Pilot, Pilot, Division Supt.
Co-Pilot, Station Manager
Flight Crew, Asst. Station Manager
Sleeve Stripes on Coats
Coat—Worn with All Sleeve Stripes
Chief Pilot, Pilot, Division Supt.
Co-Pilot, Station Manager
Flight Crew, Asst. Station Manager
Shoulder Loops on Trench Coat

AIR CARRIER CONTRACT PERSONNEL

(Air Transport Command, U. S. Army Air Forces)

Officer—Service Cap

Collar Lapel (Silver)

Officer—Collar Lapel (Silver)

Shoulder Loop

All Personnel Garrison Cap

Shoulder Sleeve All Outer Garments

Coat Sleeve Officer

Button (Silver)

Pilot with Private License or Higher

Duck Club

Active Duty Service Stripe (Six Months)

Observer

Aircraft Insignia

Pin for Civilian Dress

Guard at Base

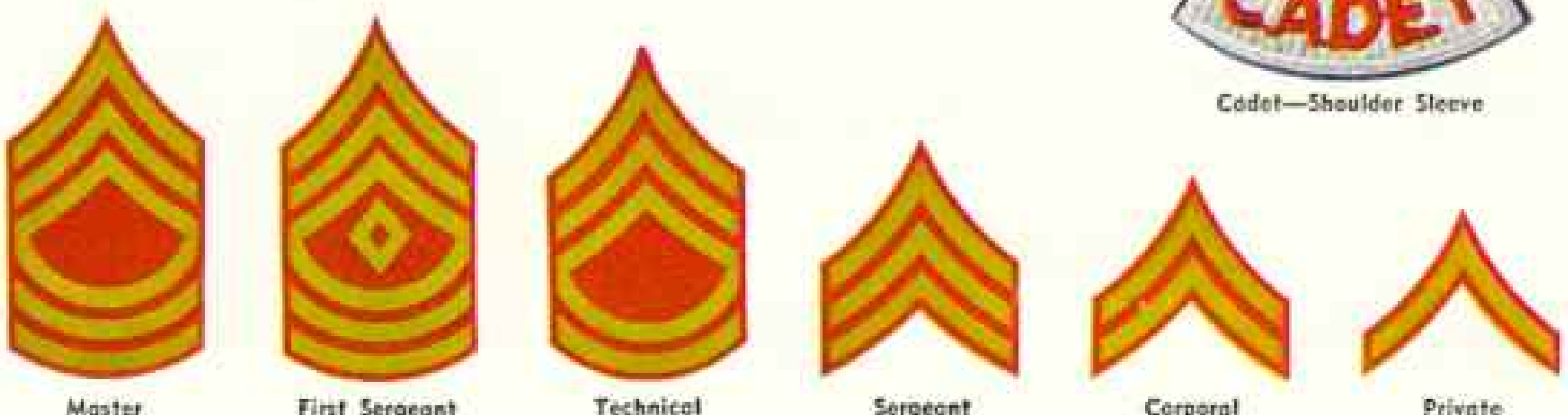
Merit

Commendation

Distinguished Service

Merit Awards

Cadet—Shoulder Sleeve



Master Sergeant | First Sergeant | Technical Sergeant | Sergeant | Corporal | Private First Class

Chevrons

Coastal Patrol

Liaison Patrol

Forest Patrol

Courier Service

Active Duty Units

United States Maritime Service

Training Organization, War Shipping Administration

(Plate I)

Members of the Maritime Service wear uniforms like those of the Navy; they may be identified by the wreaths on cap and sleeve insignia and on shoulder marks.

CAP DEVICE—OFFICER. Eagle standing on shield with foul anchor superimposed. Surrounded by wreath. Worn by commissioned and warrant officers. Miniature device worn on left side of garrison caps (rank devices on right side).

BUTTON. Gilt. Design, Maritime Service Corps Device. Worn by commissioned and warrant officers. Chief petty officers wear same button in smaller size on coats; plain black buttons on overcoats.

OFFICERS' BRANCH OF SERVICE MARKS. Commissioned officers are members either of the "line" or of one of the branches. Line officers, including engineers as in the Navy, wear foul anchor inside wreath. Devices for Supply and Chaplains same as Navy, except for being in wreaths. Medical services are supplied the Maritime Service by U. S. Public Health Service, but there is a Hospital Corps to assist in the administrative details of medical care. Branch Marks are worn on shoulder marks and with sleeve stripes. Wreaths illustrated were adopted just at time color plate was prepared. They differ slightly from those in current use, illustrated on shoulder marks and with sleeve stripes below.

SHOULDER MARKS AND SLEEVE STRIPES. Shoulder marks illustrated are worn on khaki uniforms; sleeve stripes on blue uniforms are like those for Navy officers. Maritime Service buttons are used. Anchor is for line officers. Officers in branches wear same stripes, but substitute appropriate devices within wreaths. Warrant officers use one of Specialty Devices shown below.

Rank is also shown by miniature pin-on rank devices like those for Coast and Geodetic Survey (Plate III). Worn with work uniforms on right collar tip by all officers. (Line and branch devices in wreaths worn on left.)

CHIEF WARRANT AND WARRANT OFFICERS' SPECIALTY DEVICES. Worn in wreaths on shoulder marks and sleeves. Chief warrant officers wear pin-on Specialty Devices in silver (with wreaths) on right collar tip of shirt with work uniforms; line insignia (anchor in wreath) on left; warrant officers have same devices in gold.

CAP DEVICE—CHIEF PETTY OFFICER. Maritime Service Corps Device on silver anchors with Navy style caps. Below petty officer grade, men wear Navy white hat with white uniform and white hat dyed blue with blue.

CORPS DEVICE. Worn by men with ratings below chief petty officer between right elbow and shoulder and on corners of square collars. When worn on collar, device is superimposed on crossed anchors. When worn on sleeve, device is superimposed on crossed anchors and letters USMS are embroidered in red above the device.

RATING BADGES FOR PETTY OFFICERS. Chief petty officers wear uniforms like those of Navy; others wear undress Navy jumper but chief petty officers' style trousers. Except chief petty officers of deck branch, who wear them on right, badges are worn left for seaman branch and right for other branches. Rating badge, worn between shoulder and elbow, consists of anchor between letters USMS, chevrons, arc, and specialty mark.

Backgrounds of chevrons for blue uniforms, blue; for white uniforms, white. On both backgrounds rating badges are red.

SPECIALTY MARKS. When the enrollee has earned a "rating," he wears a rating badge, which shows by his Specialty Mark his particular job, and by his chevrons his class. Before earning a rating, branch is shown by "watch mark"; white braid around right sleeve at shoulder seam for blue and blue braid for white uniforms of deck branch; red braid for both uniforms at left shoulder for engine branch.

Licensed officers of U. S. merchant marine who qualify for appointments in Maritime Service may wear Maritime Service shoulder marks and sleeve stripes appropriate to their rank and branch of service. Only in one case is there a difference in these devices: an engineer who holds the rank of captain uses a three-bladed propeller instead of foul anchor in the wreath.

When officers of a merchant ship hold Maritime Service appointments, confusion between master and chief engineer is avoided by cap visors, which are embroidered in gold for the master and plain for the chief engineer, regardless of rank.

United States Public Health Service

(Plate II)

Public Health Service uniforms are distinguished by the Corps Device.

The Public Health Service uniform is navy blue. Summer uniform for the metropolitan district of Washington, D. C., and other specified areas is khaki. Olive-drab uniforms are worn by liaison officers with Army Service Commands, and by officers detailed to the Army, the Office of Civilian Defense, or State health departments. White uniforms are worn in the tropics and for formal or semiformal occasions in summer.

CORPS DEVICE. Corps Device is a horizontal foul anchor with a winged caduceus erect in center of a shank. Foul anchor, signifying a sailor in distress, represents operation of the Marine Hospitals, oldest function of the Service; caduceus represents public health duties of the Service.

Medical and engineer officers wear the Corps Device without a superimposed letter. Dental and scientific officers wear the Corps Device with a D or an S superimposed; acting assistant surgeons and acting assistant dental surgeons (civil service positions) wear the device with an A superimposed.

Corps Device is used on cap device, shoulder marks, and sleeves of blue uniforms. Worn in miniature on left side of garrison caps and left tip of collars of working uniforms.

SHOULDER MARKS AND SLEEVE STRIPES. Gold lace sleeve stripes are worn on both sleeves of blue uniforms. Gold-embroidered Corps Device

Staff Photographer Edwin L. Wisherd

Proudly These Brother Officers Display Insignia of the U. S. Public Health Service

They could switch uniforms and remain in the same Service. They wear blue or olive-drab, according to assignment. The Passed Assistant Surgeon, with the two stripes of a senior lieutenant, is with the Coast Guard. With the Army is the Assistant Sanitarian, wearing a first lieutenant's bars. Both display their Service's cap device. Corps insignia on blue sleeve and olive-drab lapel are identical (Plate II).

is set above upper stripe. Shoulder marks are worn on blue overcoats, white and khaki uniforms, but not on olive-drab uniforms.

Ranks indicated by stripes and shoulder marks illustrated are: Surgeon General and Assistant to the Surgeon General, Assistant Surgeon General and Medical Director, Senior Surgeon, Surgeon, Passed Assistant Surgeon, and Assistant Surgeon. From Medical Director down, there are corresponding ranks for dental, engineer, and scientific officers. Public Health Service ranks correspond with those of the Army and Navy medical corps. Pay, allowances, and rate of promotion in these three commissioned corps are the same.

Certain noncommissioned personnel wear uniforms when so directed by officer in charge of their station. Some of them have special insignia. Interns at Marine Hospitals are appointed by the Surgeon General; their insignia, worn above Corps Device, is the staff of Aesculapius. Pharmacist's insignia is a winged caduceus; Administrative Assistant's insignia is a crossed key and pen. Chaplains at Service or Federal prison hospitals may wear uniform with a cross above Corps Device.

CAP DEVICE. U. S. shield, surmounted by spread eagle, superimposed on Service Corps Device.

BUTTONS. Gilt. Service Corps Device.

PIN-ON MINIATURE RANK DEVICES. Worn on right tip of shirt collar of working uniforms and on right side of garrison caps.

U. S. CADET NURSE CORPS INSIGNIA. Student nurses enrolled in the Cadet Nurse Corps wear a special gray uniform, with the Corps Device and buttons of the Public Health Service. Sleeve insignia, worn on upper left sleeve, is a Maltese Cross in silver against a dark-red background. The cross has been associated with nursing since the first Crusade when worn by Knights Hospitalers. Cap device of Public Health Service is worn on a Montgomery beret.

United States Coast and Geodetic Survey

(Plate III)

Commissioned officers of Coast and Geodetic Survey wear blue, white, gray, and khaki uniforms. Khaki will be discontinued when present stocks are no longer serviceable. The distinguishing service device worn on shoulder marks and sleeves is a silver globe with inscribed gold triangle, indicative of the triangulation methods used in geodetic surveys.

CAP DEVICE. Globe with meridians and parallels, symbolic of geodetic nature of land surveys; and anchors representing marine surveys.

CORPS DEVICES. Commissioned officers wear silver globe with gold triangle, described above.

The Survey employs civil service ships' officers in grades of chief engineer, surgeon, mate, and deck officer. Devices shown for the first three are worn on shoulder marks and sleeve stripes. No new appointments are being made in grade of surgeon, because legislation now author-

izes the assignment of U. S. Public Health Service officers to vessels of the Survey. Grade of mate, a holdover from days of sail, will also be discontinued when present incumbents are retired. Deck officer grade is a cadetship. From this group commissioned officers are selected; they wear no corps insignia.

SHOULDER MARKS AND SLEEVE STRIPES. Rank is indicated on blue uniform by bands of gold lace on sleeve; on white and khaki uniforms and on overcoat, by shoulder marks with similar stripes.

DEVICE FOR GARRISON CAPS. Miniature cap device, similar to standard device but without shield, worn on left. (Rank devices on right.)

PIN-ON MINIATURE RANK DEVICES. Worn on both tips of shirt collar with gray and khaki uniforms, and on right side of garrison cap. Devices are similar to those of other commissioned services.

BUTTON, Brass. Eagle on segment of globe. Worn by commissioned and ships' officers on uniforms and overcoats. Chief petty officers wear buttons of same design in smaller sizes on uniforms, and black buttons on overcoats.

CREW INSIGNIA. Crews of Survey vessels wear uniforms similar to those of Navy and Coast Guard. A distinctive Coast and Geodetic Survey device, a red triangle within a white circle embroidered in silk on a blue background, is worn on right sleeve of uniforms and overcoats midway between elbow and wrist. Crews are under civil service, except seamen, firemen, and certain members of the mess force, shipped for one year.

CAP DEVICE—CHIEF PETTY OFFICER. Vertical gilt anchor on shaft of which is superimposed Coast and Geodetic Survey service device.

RATING BADGES AND SPECIALTY MARKS. Chief petty officers and petty officers wear Coast and Geodetic Survey Rating Badge, consisting of eagle, segment of globe, chevrons, and specialty marks. For chief petty officers with 12 years' meritorious service, chevrons are gold. For others chevrons are scarlet on blue and blue on white uniforms.

Specialty Marks indicate class of work and in most cases are self-explanatory. Marks for electrician, an armature; master at arms, a shield indicative of his police duties; coxswain, a fouled arrow, symbolic of his ability to steer a launch in a straight line.

As in the Navy, officers' cooks and stewards wear bars instead of chevrons on rating badges.

CAP DEVICE—OFFICERS' STEWARD OR COOK. Gold letters for U. S. Coast and Geodetic Survey.

HAND FOR BLUE CAP. Petty officers and nonrated men wear white hat and blue cap, the latter with silk band with initials of the Survey.

U. S. Army Transportation Corps Vessels (Officers and Crew)

(Plate IV)

Insignia worn by officers and crew of the Army Transportation Corps Vessels, operated by the Water Division of the Transportation Corps, Army Service Forces, are illustrated. Since engraving of plate, the title Army Transport Service has been dropped, and insignia bearing letters "A.T.S." may be changed. Harbor Boat Service insignia are indicated on plate.

Two groups of officers serve with Transportation Corps vessels—Ship Officials and Port Officials. Ship officials use gold and silver stripes and colored piping on shoulder marks for white and khaki uniforms and blue overcoats, and gold and silver stripes on blue uniform coat sleeves.

Port officials wear sleeve stripes of lustrous black braid on blue uniforms, white braid on white uniforms, and brown braid on khaki uniforms. These are:

Marine Superintendent, Superintending Engineer—1½-inch band with ½-inch band spaced ¼ inch above.
Associate Marine Superintendent, Associate Superintending Engineer—1¼-inch band.
Assistant Marine Superintendent, Assistant Superintending Engineer, Chief Stevedore, Assistant Chief Stevedore, and Port Steward—four ½-inch bands, ¼ inch apart.

Harbor Boat Service officers indicate rank by stripes of lustrous black braid ½ inch wide on sleeves of the uniform coats, as follows:

Master and Chief Engineer—2 bands.
Mate, Pilot, and Assistant Engineer—1 band.

OFFICER'S CAP, A.T.S. AND H.B.S.—Eagle, with enameled shield on breast, on crossed anchors.

COLLAR INSIGNIA—MARINE SUPERINTENDENT, SUPERINTENDING ENGINEER. Ship's steering wheel; 13 stars on rim. Block letters A.T.S. 7/16 inch high. Worn on both ends of collar, half inch above notch.

COLLAR INSIGNIA—SHIP OFFICERS, TRANSPORTATION AGENTS AND CLERKS. Letters A.T.S. 7/16 inch high. Stewards wear same insignia in silver. Worn on both ends of collar.

LAPEL INSIGNIA—MARINE SUPERINTENDENT, MASTER, CHIEF STEVEDORE, DECK OFFICERS, A.T.S.; MASTER, MATE, PILOT, H.B.S. Gold foul anchor, one inch high. Worn on both lapels.

LAPEL INSIGNIA—SUPERINTENDING ENGINEER, ENGINEERING OFFICERS, A.T.S.; CHIEF AND ASSISTANT ENGINEER, H.B.S. Gold propeller, 1⅛ inches in diameter. Worn on both lapels.

LAPEL INSIGNIA—TRANSPORTATION AGENT. Insignia of Transportation Corps. Worn on both lapels.

LAPEL INSIGNIA—CLERKS ON PIERS, CLERKS ON TRANSPORTS. Crossed gold quill pens, one inch high. Worn on both lapels.

LAPEL INSIGNIA—STEWARD. Silver increscent, one inch high. Worn on both lapels.

LAPEL INSIGNIA—RADIOMEN, WHEN CIVILIANS. Five gold rays of forked lightning, 1 7/16 inches in height. Worn on both lapels.

BUTTONS. Block letters A.T.S. or H.B.S. above foul anchor. Gold except for steward's crew, which uses same design in silver.

OVERCOAT SHOULDER LOOPS—SHIP OFFICIALS. Loops are of dark-blue cloth. At center of pointed end, a small regulation Army Transport Service Button. Ratings are indicated by stripes of gold or silver lace. Stripes are ½ or ¼ inch wide. Engineering officers are identified by red between the gold stripes or piping in case of single stripe.

Civil Air Patrol

As Michigan Wing Mobilizes, Each Plane Bears the Civil Air Patrol's Emblem, Red Propeller and White Triangle on Blue Disk

CAP's 85,000 volunteers operate from 1,000 fields. Since Pearl Harbor some 30 have given their lives doing war work. At sea, CAP pilots have spotted some 150 U-boats, bombing several, and have located shipwrecked sailors. Over land, they have patrolled forest fires (Plate VIII).

U. S. Public Health Service

Corps Device on Uniform and Thermometers in Civilians' Mouths Tell the Story of Quarantine Checkup by Public Health Service

At a United States airport, arrivals from Latin America undergo inspection to guard against yellow fever. On the shoulder of his summer whites, the health officer wears the two stripes of a Passed Assistant Surgeon. On his cap are foul anchor, caduceus, shield, and eagle (Plate II).

Transportation Agent has blue between stripes. Transportation Clerk, senior (not illustrated), has two ½-inch stripes with light blue between stripes. Transportation Clerk, junior (not illustrated), has one ½-inch stripe piped with blue.

Chief Steward has three silver stripes; second and third stewards (not illustrated) have two and one stripes, respectively.

COAT SLEEVES—SHIP OFFICIALS. Bands of half-inch or quarter-inch gold lace for all except stewards, who use silver. Second and third stewards, two and one stripes, respectively.

CAP INSIGNIA—PETTY OFFICERS. All wear a wreath with a central design or with words to indicate specialty. All designs are shown. Propeller design used by group listed under the illustration, plus assistant machinist, refrigerating engineer, deck engineer, electrician, and plumber. Assistant master at arms also wears crossed batons of master at arms.

An example of the words is shown in the yeoman's insignia. Other words not illustrated are: storekeeper, assistant storekeeper, baggagemaster, watchman, porter, and barber.

Oilers and bath stewards, who are petty officers, have no insignia on their caps.

RATING DEVICES. Scarlet chevrons are ⅛ inch in width and 1¼ inches across.

American Red Cross

(Plates V, VI, VII)

The variety of types of insignia used makes it difficult to illustrate them in relative sizes. In general, metal insignia are reduced slightly; cloth insignia usually shown a little less than one-quarter actual size. Unless otherwise stated, sleeve emblems or patches are worn one inch below shoulder seam.

SERVICES TO THE ARMED FORCES. Services to the armed forces are the most important duties of the American Red Cross. At the request of the military and naval authorities, Red Cross personnel, whose responsibilities are defined by Army and Navy regulations, are available to assist soldiers and commanding officers at military posts and hospitals in this country and abroad. Men in Military and Naval Welfare Service wear Army officers' uniforms with insignia of Red Cross. Bronze cap shield worn on center front of service cap. Light bronze A.R.C. initials worn on both ends of collar, half inch above notch; lapel shield half inch below.

When uniform is worn without coat, lapel shield is on left side of collar; light bronze initials, on right. Cut-out red cross is worn on left side of garrison cap.

Uniforms of women working in Military and Naval Welfare Service are authorized by Army. Black bronze A.R.C. pins are worn on outdoor uniforms in center of each collar tab; sleeve emblem, left sleeve.

Cut-out red cross is worn on left collar tab of indoor uniform; at neck of outdoor uniform blouse; on left side of women's garrison cap and winter hat. On indoor hospital uniform, black bronze A.R.C. is worn on right collar tab.

Volunteers in Camp and Hospital Council Service wear woven shield on left sleeve of Volunteer Special Services outdoor uniform. Epaulet, blue with red stripe, is worn by Chairman of the Chapter Committee on Camp and Hospital Council Service and delegates to the Council.

BLOOD DONOR SERVICE. This Service is responsible for recruiting donors of blood for plasma.

Woven bar emblem is worn by members of Volunteer Special Services and other volunteers in this work on left sleeve of outdoor uniform, half inch below sleeve emblem, and above left pocket on indoor uniform. Volunteer nurse's aides, however, wear this insignia on left sleeve of blouse, below nurse's aide emblem.

Blood donor pins: bronze pin for one or two donations; silver, for three or more; silver, with blood-red streamer, for members of the "Gallon Club"—eight or more.

NURSING SERVICE. By Act of Congress, April 23, 1908, the American Red Cross is charged with maintaining a reserve of nurses on which the Army and Navy can draw. This Service assists in disaster-relief work and conducts a nation-wide program of instruction in home nursing.

Each nurse is presented with an Enrollment Badge upon enrollment. It is worn at neck of outdoor uniform blouse, or, if tie is worn, halfway down the tie; worn at neck or over left breast of nurse's indoor hospital uniform, or over left breast with regular dress.

Cut-out red cross worn on uniform of enrolled Red Cross nurses; in center of hatband and on epaulets of outdoor suit and summer dress.

Black bronze A.R.C. initials are worn by enrolled Red Cross nurses on each end of collar of outdoor uniform and overcoat.

Woven sleeve emblem bearing words "American Red Cross Nurse" worn on left sleeve of all Red Cross Nurse uniforms.

Woven red cross (2½ inches high) is worn on Red Cross nurse's capes nine inches below left shoulder seam, centered over left breast.

Home Nursing pin is worn over left breast of pinafore or civilian clothes by persons with Home Nursing Certificates.

Registered nurses, serving as instructors of Home Nursing courses or of volunteer nurse's aide training courses, are issued Nurse Instructor's pins worn over left breast of uniform.

Student reserves in senior classes of nursing schools, who meet Red Cross requirements and wish to enroll, may wear Nursing Service Student Reserve pin on left side of uniform or at throat fastening; over left breast with regular dress.

VOLUNTEER SPECIAL SERVICES. More than 3,000,000 volunteers, organized into corps, serve through chapters under regulations prescribed by the national organization.

Outdoor uniform of all Volunteer Special Services is a gray-blue suit with white blouse. Uniforms are worn only by persons approved by individual chapters, areas, or national headquarters.

Red collar tabs (2½ inches high) denote administrative officials of Red Cross. Tabs with center gold stripe are worn by women members of

Staff Photographer B. Anthony Stewart

Red Triangle on White Globe Is the Sign of Coast and Geodetic Survey

Above his stripes, Rear Admiral L. O. Colbert, Director of the Survey, wears a small silver globe inscribed with gold triangle (Plate III). His high-ranking guests are representatives of Uruguay's armed forces.

Central Committee and the national director of Volunteer Special Services; silver stripe, by assistant national directors and area administrators; dark-blue stripe, by chapter chairmen. Tabs are worn on both ends of outdoor uniform jacket collar, points up.

Volunteer Special Services are made up of nine distinct corps, designated by individual colored ribbon epaulets (Plate VI). Each corps, with exception of Dietitian's Aides, has its own enrollment pin, worn at neck of uniform blouse or over left breast with civilian dress. Because of metal shortage, one plastic pin serves for all Volunteer Special Service Corps for the duration; this is the Emergency Corps Replacement Pin.

Black bronze A.R.C. pins are worn on collars of all Red Cross outdoor uniforms; red cross cut-out pin is worn directly in center of visor cap bow by all, and at neck of uniform blouse by unenrolled volunteers and paid staff.

Sleeve emblems (Plate VI) are worn on left sleeve on all Volunteer Special Service outdoor uniforms. The three-inch American Red Cross Service patch is worn by all volunteers and paid staff, except members of the Motor Corps or Mounted Unit, a subsidiary of the Motor Corps, who have their own sleeve emblems (Plate VI).

Motor Corps indicates rank on outdoor uniforms by diamond-shaped pins placed on shoulder (Plate V). Sergeants' and corporals' patches, a little less than three inches high, are worn below three-inch Motor Corps sleeve emblem (Plate VI), and on right sleeve at corresponding distance from shoulder seam. Metal car tag (3½ inches

Staff Photographer B. Anthony Stewart

Contract Carrier Men Are These Fliers in Olive-drab with Black Sleeve Stripes

Bearing the letters "ATC," their cap devices say they are with the Air Transport Command, Army Air Forces. Flight personnel wear bronze wings on their breasts. On shoulder loops all have the Kitty Hawk device. Here a three-stripe Captain briefs his flight crew. To his right, two stripes identify a co-pilot. One stripe is for flight crew members (Plate VII).

wide) is affixed to front license plates of cars.

Anyone who has completed both standard and advanced first-aid courses may wear on left sleeve, half inch below Service Emblem, the Emergency First Aid sleeve emblem (2½ inches long).

All corps, except Hospital and Recreation and Nurse's Aide, wear same indoor uniform of commando-blue seersucker. Services are differentiated by epaulet colors. On indoor uniforms a two-inch woven cross is worn on upper left pocket and a one-inch cross in center front of the cap. Cut-out red cross is worn on indoor uniform by all unenrolled volunteers or the paid staff.

Area Instructor and Chapter Instructor emblems (Plate VI), three inches long, are worn by qualified members of Surgical Dressing unit of Production Corps on left sleeve of indoor uniforms. Blue bar is worn on cap, veil, or coif of instructors, other than surgical-dressings instructors, in Production Corps; red bar in same position denotes supervisor of workrooms. This Corps sews garment labels (Plate VI) with name of individual chapter in all garments.

Dietitian's Aides wear their emblem (Plate V) on left sleeve, four and one-half inches below shoulder seam, of indoor uniform.

Volunteer Nurse's Aide Corps, sponsored jointly by American Red Cross and Office of Civilian Defense, wears a three-inch woven arm patch two inches below left shoulder seam of white blouse of the chambray hospital indoor uniform. A similar emblem on front of cap. Uniforms worn by nurse's aides after completion of 35 hours of the 80-hour course. The cap is worn on completion of course.

The Hospital and Recreation Corps wears a gray princess-style seersucker indoor uniform.

Red cloth bars and chevrons (Plate VI) indicate periods of service on both outdoor and indoor uniforms. Service time is counted from January 1, 1928. Bars represent one year's paid or volunteer service. First bar is placed three and a half inches from bottom of left sleeve on outdoor uniform and one inch above left cuff on indoor uniform; additional bars are placed above. After four years' service a chevron replaces

three bars; it is placed to allow space beneath it for the next three bars, at which time a second chevron is used.

Volunteers engaged in Activities for Army and Navy Women but not enrolled in Volunteer Special Services may wear Volunteer Special Services uniform with service patch on left sleeve, cut-out red cross at neck of blouse, and plain epaulets. National and area volunteer representatives, chapter committee chairmen, and auxiliary chairmen wear same insignia with exception of epaulets, which are red with white stripe down center.

NUTRITION SERVICE. The Red Cross Nutrition Service came into existence in 1921, although a few chapters were conducting Dietetics and Household Economy classes as early as 1912.

Nutritian Service trains volunteers to become nutrition aides; it also trains members of the Canteen Corps and Dietitian's Aide Corps.

Volunteers who have fulfilled Nutrition Service requirements wear woven nutrition aide pin (Plate VI) at neck of uniform collar if worn closed; if open, pin is worn half inch above upper left pocket.

Authorized canteen and nutrition instructors wear the woven insignia; members of nutrition committees in chapters wear prescribed nutrition committee pin, either at uniform neck or over left breast with civilian clothes.

Nutritionist woven emblem is sewed over upper left breast pocket of indoor uniform; nutritionist pin is worn either at neck of uniform blouse or one-half inch above upper left pocket of uniform. Nutrition pins worn on uniforms or civilian clothes.

FIRST AID AND WATER SAFETY. In 1910 the Red Cross undertook to teach methods of first aid to the injured. On June 30, 1943, nearly 10,000,000 certificates had been issued.

Water Safety was added at a later date, stressing prevention of water accidents and teaching rescue skills. Today a course in functional swimming is offered to the armed forces and to youth of pre-induction age.

The Accident Prevention phase of the program was started in recent years.

Senior and Junior Life Saving Pins (Plate VI) are issued only to persons who have completed the Red Cross courses; to be worn on any clothes.

Members of ski patrol, Motor Corps, scout leaders, and others in occasional uniform who have completed both standard and advanced first-aid courses wear the Emergency First Aid Sleeve Emblem on left arm.

Volunteer First Aid Detachment Arm Emblem is worn on left arm by first-aid detachments.

Woven Junior and Senior Life Saving and Water Safety Instructor insignia are worn either in center of bathing shirt or on front of left thigh of trunks.

First Aid and Water Safety Instructors' Pins are worn by instructors on civilian clothes.

Emergency First Aid car tag, attached to license plate, is used to designate automobiles, trucks, etc., as mobile Emergency First Aid Units.

Policemen and firemen who have completed both first-aid courses may wear woven American Red Cross First Aid disk on left uniform sleeve.

Emergency First Aid pin is worn on completion of both standard and advanced courses.

First Aid and Water Safety service medal is awarded to volunteers who have given 500 hours of service in a consecutive five-year period.

Emergency Service Emblem is worn on left arm by Red Cross disaster workers not otherwise identified by Red Cross uniforms or insignia when they are on duty at a disaster or in civilian war-aid work.

AMERICAN JUNIOR RED CROSS. (Organized 1917.) More than 17,000,000 members serve their communities in service programs.

Small shield (Plate VII) signifying membership in Junior Red Cross, is worn by girls on uniform coronet and by boys on their caps. Larger woven shield, also denoting membership, is worn on left breast pocket by boys and girls.

Junior Red Cross members enrolled in Staff Assistance or Canteen Corps wear Junior Red Cross woven Staff Assistance or Canteen Emblem on left pocket of standard uniforms of the Corps to signify membership. After graduation from high school Junior Red Cross members of Staff Assistance and Canteen Corps automatically become members of these corps.

SERVICE PINS. Gold eagle with spread wings, enclosing blue shield with red cross on white background and word "Service." It may be worn by all actively engaged in Red Cross work, paid or volunteer, foreign or domestic. There is a small button adaptation of this pin for men.

Another pin, ⅜ inch wide, in white enamel, with red cross center is made for men and women in Red Cross service.

SERVICE BARS. Length of service in Red Cross is shown by bars worn over left breast by either men or women, paid staff or volunteer, who have been active in the Red Cross for 5, 10, 15, or 20 years. Only one bar is worn at a time.

WORLD WAR I SERVICE MEDAL WITH RIBBONS. For domestic service during World War I a plain blue ribbon is affixed to the medal which was awarded for a minimum of 800 hours, or six months' service. Ribbons containing additional white stripes were awarded for each successive six months' period. For foreign service same medal and ribbons are used, and a metal bar with the words "Foreign Service" is placed at top.

Air Carrier Contract Personnel

Air Transport Command, Army Air Forces
(Plate VII)

Since Air Carrier Contract Personnel may be sent abroad on a moment's notice, they all wear a similar uniform, rather than those of their individual air lines. Uniform for contract personnel, prescribed by Secretary of War, is identical with Army uniform, but is distinguished by insignia. Following descriptions apply to flight officers and supervisory ground personnel. Information on insignia of nonsupervisory ground personnel is given at the end of this section.

AP from Press Ass'n

Not of the Red Cross Are These Ambulance Drivers, yet They Wear Its Mercy Symbol

From North African front lines these members of the American Field Service hauled the wounded. Many dodged Rommel's Stukas and 88's. For all this they got a $30-a-month commissary allowance. Organized in France in 1914, the service operated there again until the surrender. Now its volunteers are with the British.

The National Memorial at Kitty Hawk, North Carolina, to the first flight of the Wright brothers in 1903, appears in much ATC insignia.

SERVICE CAP AND FIBER HELMET. Bronze with letters ATC. On shield (⅞ inch high) is representation of the Kitty Hawk Memorial tower.

SHOULDER LOOP AND CAPS. Worn on shoulder loops of coats and on left side of garrison caps. Background, bronze; Kitty Hawk Memorial has red light rays, forming a cross. Blue enamel words, from inscription on the memorial, "Achieved by dauntless resolution and unconquerable faith."

BUTTON. Bronze. Letters ATC.

NONCOMBATANT—SLEEVE EMBLEM. Worn on left sleeve, two inches below shoulder, of all outer garments. Size, 4½ inches square. Worn in overseas operations.

WINGS. Based on small lapel insignia worn on civilian clothes by the "Ancient and Secret Order of Quiet Birdmen," social organization of pilots. Wings were "blown up" to appropriate size for wear on uniforms (3½ inches between wing tips). Letters ATC were substituted for the QB of original. Dissimilarity from Air Forces wings is emphasized by bronze metal.

Half-wings attached to one-inch disks are worn by flight crew members. Disk for navigator shows Western Hemisphere; for radio operator, zigzag lightning flashes; for mechanic, a propeller.

All wings are worn on left pocket of coat and on shirt when worn without coat.

SLEEVE STRIPES ON COATS. To differentiate insignia from that of Army, contract personnel adopted Navy system of sleeve stripes to show grade. No rank is higher than three full bands, which would be equivalent to a full commander in the Navy (or lieutenant colonel in Army).

Kitty Hawk disk, shown in large size above, is worn on shoulder loops of coat, no matter what grade wearer shows by his sleeve stripes.

SHOULDER LOOPS ON TRENCH COAT. Rank is indicated by silver-edged black bars. Colors, size, and shape distinguish bars from those of Army. When shirt is worn without coat, rank bars are worn on shoulder loops and Kitty Hawk disk halfway between button and bars. ATC contract personnel wear bars on shoulder loops

American Red Cross, by Atkins

Red Cross Doughnuts Light Smiles on Hungry Ranger Faces in Sicily

The Red Cross field director, not the familiar woman volunteer, is the noncombatant morale builder of our forces abroad. He lands with the troops on D Day. His major job is helping service men with their personal and welfare problems. In a pinch he distributes doughnuts, cigarettes, razor blades, and many other comforts.

of shirt, Army personnel on collar tip of shirt.

NONSUPERVISORY GROUND PERSONNEL. Uniforms like those issued to Army enlisted men, with regular ATC button. Kitty Hawk Memorial Disk worn on service and garrison caps. Noncombatant sleeve insignia worn on right arm in overseas operations; on left arm, embroidered Kitty Hawk Memorial insignia of same colors as disk. Below is embroidered in bronze color a numeral designation by which supervisory ground personnel can tell to what air line the mechanics and others who are not in a supervisory capacity belong.

Civil Air Patrol

(Plate VIII)

Civil Air Patrol, now an auxiliary of the Army Air Forces, was originally a division of the Office of Civilian Defense. OCD origin of CAP is shown by use of OCD basic insignia, white triangle on blue disk, with addition of a red propeller.

The 85,000 CAP members wear Army uniforms when on duty, distinguished by touches of red. Women, ten percent of membership, wear WAC uniform with the same distinctive features.

Officers and noncommissioned officers are appointed in CAP with rank corresponding to their duties. CAP is organized with a Wing Command in each State. Wing Commanders serve in the grade of major, CAP, as do commanders of CAP Coastal Patrols. Wing Staff officers are captains and lieutenants. Each Wing is subdivided into Groups, Squadrons, and Flights; their officers are captains, first and second lieutenants, and warrant officers. They wear regular Army insignia of grade on their red shoulder loops, but not on shirt collars and garrison caps, to avoid confusion between Army and CAP officers.

OFFICER—SERVICE CAP. Basic insignia of CAP centered between silver wings.

COLLAR, LAPEL (SILVER). Letters worn on both ends of coat collar in place of gold U. S. of Army officers. When shirt is worn without coat, silver CAP is worn on right side of collar. Enlisted personnel wear CAP on both tips of shirt collar.

OFFICER—COLLAR, LAPEL. Air Forces wing and

propeller, but in all silver (not gold and silver). Worn on both lapels of coat below silver CAP, or on left collar tip when shirt is worn without coat.

SHOULDER LOOP. Worn by all CAP personnel except cadets.

ALL PERSONNEL GARRISON CAP. Embroidered or enamel CAP basic insignia.

BUTTON. CAP insignia in silver. Enlisted personnel wear same button in brown plastic.

COAT SLEEVE. OFFICER. Red stripe.

SHOULDER SLEEVE. ALL OUTER GARMENTS. Worn by all personnel, below left shoulder seam. U. S. added to basic insignia to insure that a member of CAP captured by the enemy would be treated as a prisoner of war, rather than as a civilian or a guerrilla.

DUCK CLUB. Pin worn by CAP personnel who have made a forced landing at sea.

WINGS. PILOT WITH PRIVATE LICENSE OR HIGHER. Eagle standing on CAP disk. Worn over left breast.

WINGS. OBSERVER. Half-wing attached to CAP disk. Worn over left breast.

ACTIVE DUTY SERVICE STRIPE. Indicates six months' active CAP duty. Worn on left sleeve.

PIN FOR CIVILIAN DRESS. Metal CAP insignia.

GUARD AT BASE. Letters CAPG stand for CAP guard. Worn on left sleeve at shoulder.

MERIT AWARDS. Acts of heroism recognized by triangles on left pocket; blue is highest.

CHEVRONS. Noncommissioned officers wear Army chevrons, but on red background.

ACTIVE DUTY UNITS. Local squadrons serve as local aerial home guards, going into action at times of flood or on lost plane searches. CAP Operations Active Duty Units are made up of qualified volunteers for tours of duty ranging from two weeks to the duration. Emblems worn on left sleeve above cuff show service performed.

Coastal Patrol emblem consists of bomb ready to strike submarine.

Southern Liaison Patrol pilots watch the Rio Grande to check irregularities along the border.

Courier Service, with its winged foot of Mercury, flies regular routes and schedules daily to carry urgent shipments for industrial plants, and matériel, mail, and dispatches between Army posts. Towing aerial gunnery targets and tracking to give aiming practice to antiaircraft guns and searchlights are related duties.

Forest Patrol, cooperating with U. S. Forest Service and State forestry departments, has prevented heavy losses of timber.

CADET—SHOULDER SLEEVE. Worn on left sleeve below shoulder seam. CAP Cadets are selected boys and girls in last two years of high school. Cadets wear shirts without shoulder loops. Neckties are black instead of khaki. Cap insignia is red, two-bladed propeller and white wings on blue disk. There are more than 30,000 cadets.

AIRCRAFT INSIGNIA. CAP aircraft, property of members of the Patrol, are marked with regular CAP insignia without the U. S. Many of the outfits have their own insignia. Three are illustrated.

Complete Reprints of Insignia Available

With this issue the NATIONAL GEOGRAPHIC MAGAZINE completes its full-color presentation of the insignia, decorations, medals, and badges of the men and women in our fighting forces and in other official organizations participating in the war effort. Previous presentations appeared in June and October.

All three presentations have been bound together in a separate booklet of 150 pages. Featuring 1,701 color illustrations, this convenient book is the most comprehensive encyclopedia of insignia, symbols, and decorations yet published in full color with authentic notes and descriptions.

It contains identification insignia of men and women in the United States Army, Navy, Marine Corps, and Coast Guard; aircraft insignia; decorations, medals, service ribbons, and badges; and insignia of the United States Maritime Service Training Organization, War Shipping Administration; Public Health Service; Coast and Geodetic Survey; American Red Cross; Air Carrier Contract Personnel, Air Transport Command, Army Air Forces; Civil Air Patrol; and the United States Army Transportation Corps Vessels.

This timely reprint, bound in heavyweight cover paper, is available to members of the National Geographic Society beginning about December 6. It will be ideal for personal reference or as a Christmas gift to men and women in the armed forces and to their relatives and friends.

Copies ordered promptly can be mailed in time for Christmas to addresses within the United States. *Government regulations prohibit mailing to Army Post Office addresses unless at the direct request of the addressee.*

Members who desire copies for themselves or for *use as Christmas gifts may obtain them for 50¢ each in the United States and Possessions, including APO addresses; elsewhere, 75¢. Postage is prepaid. All orders should be addressed to the National Geographic Society, Washington 6, D. C., and should be accompanied by remittance in U. S. funds.* The reprints are obtainable only from The Society's headquarters.

The Society will be glad to send the booklet direct to your gift recipients with an appropriate presentation card in your name, if your order is accompanied with complete and clear instructions to this effect.

Home Folk around Historic Cumberland Gap

By Leo A. Borah

With Illustrations from Photographs by Joe Clark from Three Lions

THIS is a simple story of a people humble in station yet proud in spirit—the descendants of the 18th-century pioneers whose "wagons broke down" at Cumberland Gap. With profound respect for honest poverty and wondering admiration for courage that laughs at adversity, I tell of these "hillbillies" as they are.

The mountaineers who live near Cumberland Gap in Tennessee, Kentucky, and Virginia ask no pity. Although some of them live at what the average American would consider hardly a subsistence level, they scorn charity. They are the most self-reliant people I have ever met.

Until the coming of the railroads and highways a few years ago they were isolated from the rest of the country, wresting a living from the rugged hills, cherishing the traditions and customs of their Scotch-Irish and English ancestors, happy despite the lack of almost everything regarded as necessaries of life by more fortunate Americans. Only smugness can laugh at them; understanding laughs with them.

"Just Ask for Joe"

When photographer Joe Clark, scion of one of the oldest Tennessee mountain families, learned that a Geographic writer was coming to visit his people, he wrote, "Tell him just to ask for Joe or Pappy's Boy at Cumberland Gap; or if he'll tell me when he is coming, I'll have my brother Junebug meet him. All anybody needs to locate a Clark at Cumberland Gap is the first name" (page 742).

With no more information than that, I got off the Knoxville-Lexington bus at Cumberland Gap and stood beside my bag on the sidewalk. A car passed hurrying in pursuit of the vanishing bus. Just as I was picking up my bag to go in search of a hotel, the car returned.

"Are you from the Geographic?" a young woman in the car asked.

I said I was, and Joe Clark got out to greet me.

"We'll go out to the house," he said. "But first we thought we'd stop over at Brooks' place to get a shower. You see, we don't have running water at the farm."

The young woman said, "I'm Mrs. Clark. Joe hasn't got used to introducing his wife yet."

Joe was apologetic. "We were just married a week ago today," he grinned.

Two mountaineer brothers operate a garage in Cumberland Gap. Here Joe stopped to have a leaky tire repaired.

"This is Junebug's car," he explained, "and it doesn't carry a spare. Junebug has an order for some new tires, but they haven't come in yet. It's a little risky driving with only four tires, and all of 'em about worn out."

From what Joe had written, I expected his father's home to be a log cabin. It turned out to be a trim white bungalow on the paved highway.

As we stepped across a cool porch into the comfortable living room, a young-looking woman came from the kitchen to greet us.

"Well, mama," said Joe, "this is Mr. Borah."

Joe's mother is only 16 years older than her eldest son.

At a bountifully laden table in the kitchen I "returned thanks" at Joe's request. There was a platter of beefsteak flanked by a half dozen dishes of vegetables, gravy, corn bread, and homemade butter. For a sweet there was a bowl of apple butter.

"We Grow 'Most Everything We Use"

"How does rationing affect you?" I asked Mrs. Clark.

"Well," she said, "we sell some butter, but no one has told us what to do with the ration tickets we collect. We get along pretty well on sugar and meat. There are so many of us that we have points enough for all we have to buy. We grow 'most everything we use."

As Joe and his wife and I started out that afternoon, Mrs. Clark urged me to come back to stay the night. She had prepared the "best room" for me, but if I stayed Joe and his wife would have to move into other quarters. I refused to oust the bride and bridegroom from their proper place and insisted on going to town for the night.

No matter how humble the home or how meager the sleeping space, every mountaineer we visited invited us to come in and stay.

To Joe's city-bred wife the formula her husband used in taking leave of the farm folk was a source of amusement. She could not understand why Joe didn't just say goodbye. Instead, he went through a sort of ritual.

Joe Clark, H.B.S.S., Is "Jailed for Wearin' Shoes"

No honorary degree, the letters mean "Hill Billy Snap Shooter." Joe got his start at photography with Cumberland Gap pictures. "They were exclusive," he says, "because my kinfolk ran the stills." Of course this bit of satire ridicules the popular belief that hillbillies go barefoot. Actually the mountain people dress much the same as farmers in other parts of the United States.

"Let's go over into the valley," he would say.

"Can't. You stay with us."

If only the farmer's wife and young children were at home, the woman would say, "When the menfolks git in from the fields, there'll be quite a gatherin' in. I wish you folks could stay and eat with us. We can put you all up for the night."

The Home of a "Ridge Runner"

It was the same story wherever we went. One early afternoon we drove along a precarious road to a particularly ramshackle farmhouse. This was the home of an elderly "ridge runner." (Ridge runners are farmers who live on the poorest land where fields are hillsides so steep that virtually all cultivation must be done by hand.) It was the poorest abode we had seen.

We stopped the car at the roadside and made our way through a gate and across a rocky field. To reach the house, we had to cross a creek by a narrow plank bridge. A rakishly tilted building for family use was built over the creek just above the bridge—mountain ingenuity's invention to take the place of a bathroom with running water!

A Family of Natural Musicians Furnishes Tunes for Molasses "Stir-offs" and Socials

Asking no pay, they perform for the sheer joy of making music. The boy in the center, an orphaned cousin of the others, plays any kind of stringed instrument he can get his hands on. The two girls sing while the boys accompany them on violin, banjo, and guitar.

Up a winding path we climbed to a dilapidated frame house. Chickens of all sizes, some pigs, and a dog were all over the yard.

At Joe's halloo the screen door opened on the porch and a middle-aged woman came out followed by several children of assorted sizes.

"Thought maybe you'd all be out in the fields," Joe called. "Is your husband about?"

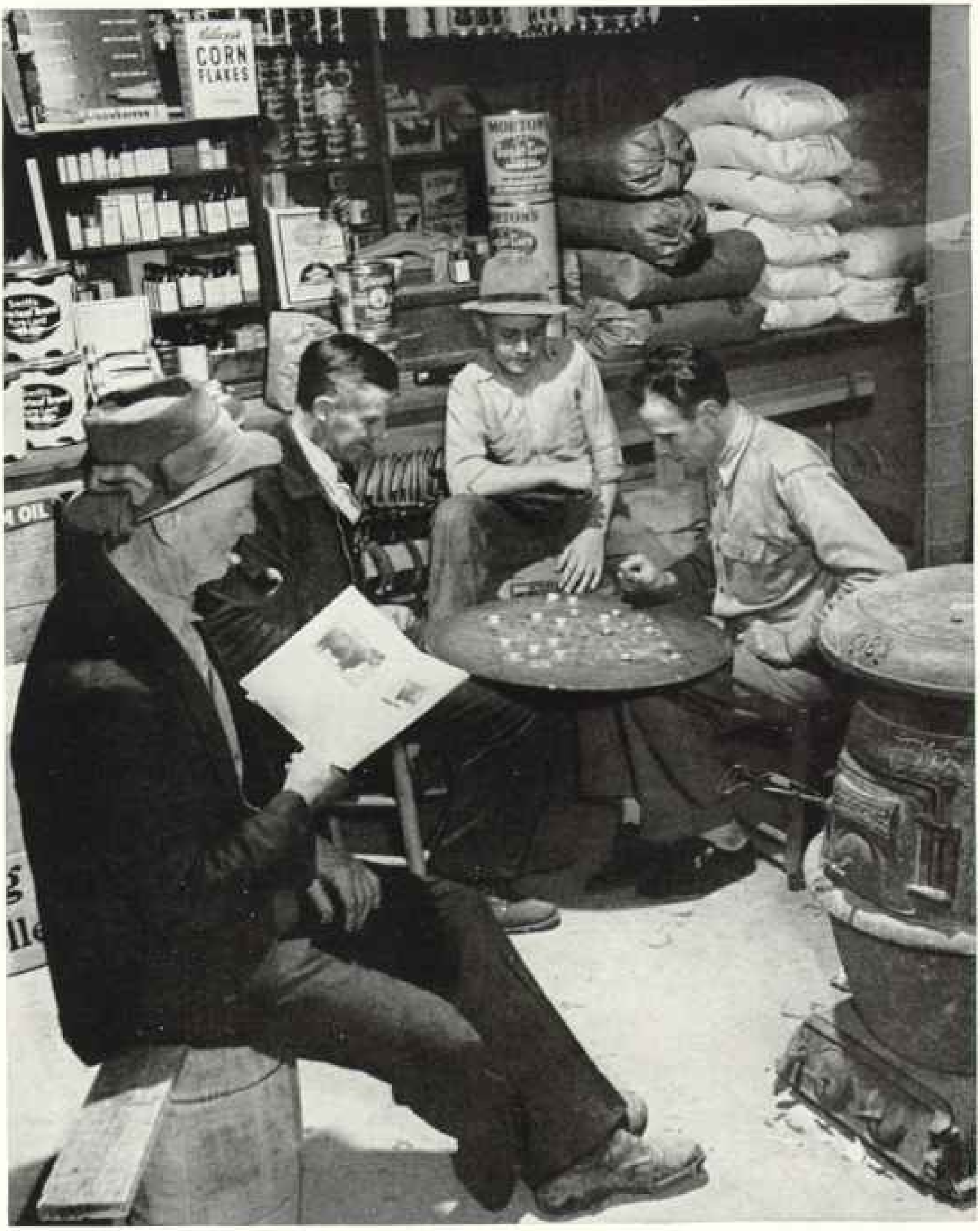
"Yes," the woman said, "he's hyar. We all been workin' a little in the corn patch and just come in fer a late dinner. Won't you all come in an' eat a little?"

"No thanks," Joe told her, "we just ate."

At this point a lank, wiry man, grizzled of hair but straight as an arrow, came out of the house. Homemade hickory-bottomed chairs were brought, and we all sat down under some trees in the yard to "do a little shadin'."

"Come hyar, Patty Rose," the woman said to the youngest child, a pretty little girl. "Yer har ain't been combed nary a bit this day." Then to us, "She's been a wallerin' in the field and is dirty as a pig."

The while this conversation was going on, Patty Rose's hair was neatly combed. She sidled shyly over to her father, who had tilted his chair against the shady side of a shed near the porch.



The Country Store Is a Jolly Clubhouse

Here Wade Clark, father of the photographer whose pictures illustrate this article, sits on a piece of board laid over an empty nail keg and studies a book on cattle. Clark Bruce, the proprietor, plays checkers with Bob Clark. The merchant's son "kibitzes" at the contest between his dad and uncle. Kinship in the mountains is far-reaching. Most families are related somehow; and even when no blood tie exists, elderly people are called aunt and uncle. The heaped counter and laden shelves give only a slight idea of how merchandise is crowded into small space. Behind the stove are tables piled almost to the ceiling with all sorts of goods (page 768).

"Doin' much farmin'?" Joe asked the old man.

"No, I ain't doin' nothin' much," was the reply. "Got high blood pressure; just got a couple acres of corn an' a little truck."

The day before, Joe had asked the old fellow to bottom a chair for him. Not having suitable wood for the purpose, the old man had climbed a half mile up a steep ridge, cut down a hickory tree thicker than a man's leg, trimmed off the branches, and carried the heavy pole back to the house without putting it down or even shifting it to the other shoulder.

Father of 22 Children

He is 70 years old, though he looks about 50. He is the father of 22 children, the youngest, Patty Rose, age 5! By his present wife he has had 16 children, 10 of whom are living.

"How many acres do you have here?" Joe asked.

"Don't know rightly, never had it run out since I bought it 'way back yonder."

Few of the mountain farmers know the exact acreage of their land. Even Joe's father, who owns a fertile farm in Powell River Valley, says he "reckons he has about 130 acres." They all know where their boundary lines are, but little thorough surveying has been done.

"Tell us that story about what your friend said about your family," Joe urged our host.

The old fellow chuckled. "Why, I went to church the other Sunday, and got to talkin' with a feller. He says to me, 'John, you've had a powerful big family, ain't you?'

"I told him, 'Yes, the Lord says fer us to multiply and 'plemish the earth.'

"That feller looked at me kinda funny and says, 'But the Lord didn't mean fer you to try to do hit all!' "

This family was the poorest we visited, yet when Joe's wife gave the children some sticks of gum from her purse, the mountain mother sent a youngster to the store to buy a few pennies' worth of caramels to return the treat. No mountaineer will accept a favor without reciprocating.

This mountain woman went to Middlesboro about a year ago and studied first aid in a Red Cross class. She suffered a severe attack of neuritis some time later and temporarily lost the use of her hands. Stoically she endured the pain, working her fingers daily as much as possible.

While she was still partly crippled, her husband had an accident on the hillside field a quarter mile from the house. He fell and

Cumberland Gap Was the First High Gateway to the West

Thomas Walker discovered the pass in 1750, then Daniel Boone and his axmen slashed the road, and thousands of settlers followed to build Kentucky in the wilderness. Here Henry Clay once stood "listening to the tread of millions yet to come."

struck his head on a sharp rock, cutting a deep gash. Blood gushed from the wound as the old man lay helpless.

One of the older children, a girl, saw the accident and became so frightened that she ran away to the home of her married sister. She was afraid to tell what had happened and feared to come home to find her father dead.

An 8-year-old son ran to tell his mother. The courageous woman got together what bandages she had and somehow reached the stricken man. With her almost helpless hands she applied first aid and then carried or dragged her husband to the house. Meantime one of the little boys had gone for help, and fortunately a doctor soon arrived.

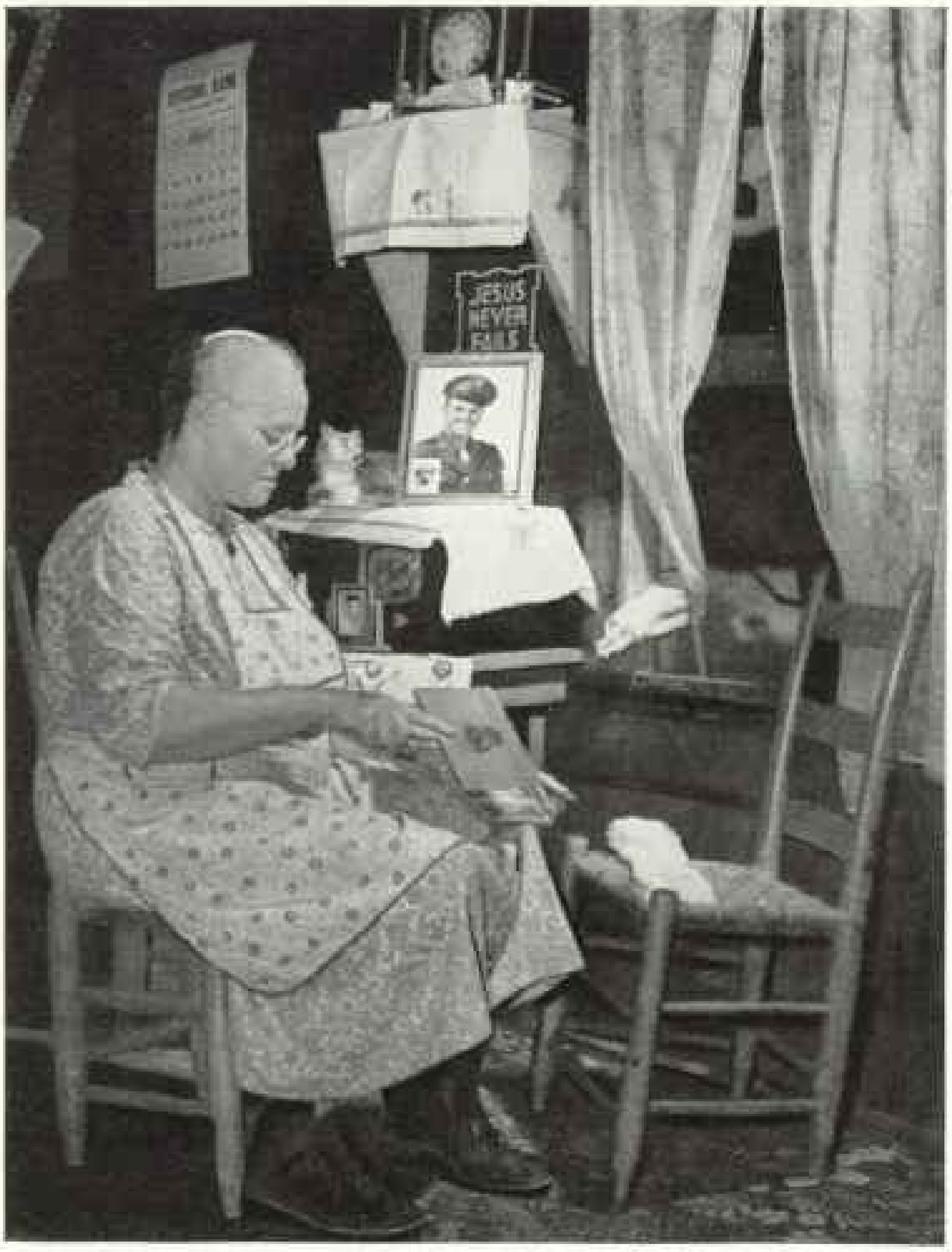
The doctor said the woman had done exactly the right thing. She had saved her husband's life.

One son of this family is in the Army in Alaska. When his officer, appearing with a

Cutting the Sorghum Cane Is a Family Affair

Father and mother and the girls chop off the stalks and pile them on a sled. As soon as the load is ready, young brother swings around and drives the load to the press where the juice is extracted and poured into the kettle or vat in which it is boiled down.

As the Cane Juice Is Boiled Down and "'Lasses Is Nearly Done," the "Stirring-off" Guests Sample It with "Sop Sticks"



Photograph of Her Soldier Son at Side, Aunt Nora Cards Wool

She had not heard from him in the month before this picture was taken, but a few days later he wrote from North Africa that he would be back to take care of things. With the aid of her other children, two girls and two small boys, she works a 93-acre farm. Her husband is an invalid (page 751).

bad haircut done by a fellow officer, asked the mountain boy how it looked, the boy replied, "Hit looks like a haystack the cows had been at."

"Maybe you could do better," the officer suggested.

"Reckon I could," said the mountain boy. He found a pair of scissors and gave the officer a fairly respectable haircut, though he had never done any barbering before. Now that mountain boy is making about $7 a day in spare time cutting hair for the whole camp. He recently wrote his wife asking her to get him a pair of clippers.

"I should think they'd have clippers in Alaska," old John said as he told us the story. "Seems like they orter have more things up north thar than we do."

Native ingenuity is the mountaineers' salvation. One of John's boys, a lad of about 9, told us about a little wagon he had made. He sawed some segments off the end of a log to make wheels, and used sticks for axles and tongue. The wagon body was a miniature hayrack made of sticks.

"He hitched the calf to his wagon the other day," his mother told us. "Hit shore was funny. Thet thar calf tuk off up the holler, an' scattered that wagon all over the place. The boy didn't dast tell his pa at first; he was afraid his pa wouldn't like it."

"I was agoin' to git on an' ride," the boy put in, "but that calf hit didn't gimme no time. Hit shore high-tailed it with that wagon.

"But I fixed the wagon back, all 'ceptin' one wheel. I had lots more wheels, but I couldn' find that'n."

Thoughts of the adventure of the calf and the wagon overcame the boy's shyness, and he and his younger brother showed us a slingshot they were making.

The parents were "mighty glad" their neighbor's daughter was "fixin' to git herself married." She was "agettin' herself a good man," they said.

Upon inquiry we learned that the girl is 12 years old and the "good man" 19. Child marriages are the accepted custom in the hills, particularly on the Kentucky side of the Gap.

Over in a mountain forest fastness known locally as "South America," a 75-year-old man was talking to Joe in his back yard one day when a young girl—evidently about 16—

came out to hang up some clothes. The old fellow paid no attention to her.

Someone asked, "Who's that?"

"Oh, that's my wife," the patriarch said. "I had three die on me an' this time I figgered I'd git me one that'd last me as long as I live."

The farm of the big family man on the Kentucky side of the Gap was rough, rocky timberland, almost worthless for farming.

On better farms we found better conditions, more prosperous people. These folk reflect their surroundings. As the land goes up in elevation, it goes down in fertility and its tillers go with it.

Electricity in Humble Homes

All the mountain people need is opportunity. Now that T. V. A. electric power is available at low rates, many of the valley farmers and even some of the mountain dwellers have electric lights.

Mrs. Clark has an electric washing machine, electric iron, electric refrigerator, and a good radio. For my comfort she had placed an electric fan in the room she had prepared for me. She is only waiting the necessary priorities to obtain an electric pump and install a bathroom with running water.

Eagerness for the better things of life is not confined to the most prosperous families. On the porch of a mountain shack with a roof swayed almost to the point of collapse, we saw a new electric washer in operation.

With pride Mrs. Clark showed me her pile of NATIONAL GEOGRAPHIC MAGAZINES and commented on several of the articles.

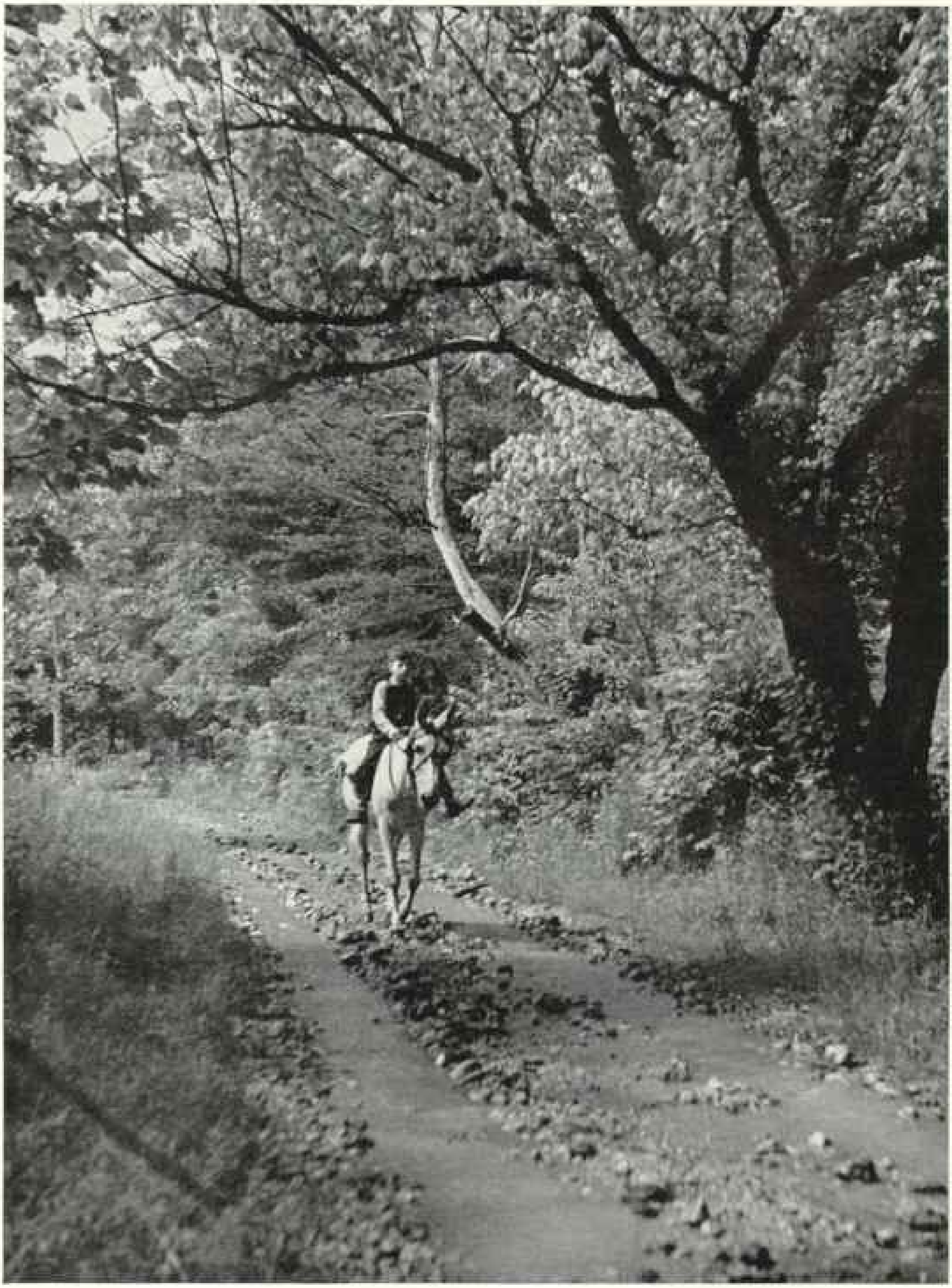
Joe Clark had little early education. He finished the fifth grade by going to school three months each winter. When he was 14, he became ambitious to learn carpentry and took a correspondence school course in the trade. With a few tools bought by mail order he set to work, and, his elder half brother helping him, built the fine bungalow his parents now occupy.

"We lived in a lot of houses in the valley before that," Joe told me; "we even lived in Middlesboro for a while, but this one's the first house we ever had that had a roof tight enough to keep me from seeing the stars when I was in bed. Most of our houses were just log cabins.

"After we built our house, we hired out to build the schoolhouse. I got 10 cents an hour—a dollar a day for that work and I certainly thought I was in the money."

Singing Hymns, Primitive Baptists Wash One Another's Feet

This service at Simmons Chapel is a solemn religious ceremony based upon the scriptural account of the Last Supper. Among the hill folk religion is taken seriously, but fanatic cults find few followers (page 768).



Carrying a "Turn" of Corn to Mill Is a Lark for a Hill Boy

Riding bareback with the full sack balanced behind him, he guides his horse down Mill Hollow on a "road" which is also at times the bed of a running stream (page 759). Daily mail deliveries have been made over this route for 40 years, though, as Miller Jim says, "the going is a little rough in places."

No Track Coach or Fancy Equipment, but It's Fun

Pupils of a mountain school practice high jumping over a piece of grapevine. As the first contestant "clears the bar," others wait their turn.

Joe has taken several correspondence courses and has obtained a pretty good education the hard way. His brother Junebug (nickname for Junior; he is Wade Clark, Jr.) and one of his sisters have finished high school. Junebug had one year at Lincoln Memorial University at Cumberland Gap (page 767) and the sister three. The sister led her class in everything. She dropped out of college at the end of her junior year to take a business course. Just now she is secretary to an Army general.

The area around Cumberland Gap was all but trackless wilderness 50 years ago. Even now conditions a few miles from the highway are those of the backwoods. To the W. P. A. goes credit for opening the door of progress to many mountain people by making passable side roads connecting with the main highways.

The Saga of "Aunt" Nora

Joe took his wife and me visiting among his neighbors. After hearing him greet a score or more people as aunt and uncle, I could not control my curiosity. "Are you related to everybody in these hills?" I asked.

Joe laughed. "No, we just call older people aunt and uncle," he said.

As the heroine of this story I unhesitatingly select "Aunt" Nora, who lives on a 93-acre hill farm perhaps 15 minutes' drive from the Clarks. Aunt Nora's claim to distinction is best summed up in the words of a neighbor, "I reckon they ain't nothin' Aunt Nora can't do if she puts her mind to hit."

Aunt Nora's husband, "Uncle" Wiley, suffered a paralytic stroke four years ago and since that time has been an invalid. He can shuffle about the house, but is unable to do any work. With great effort he can say a few words in a whisper.

There are five children in the family—a son 22 years old, two grown daughters, and two little boys, 14 and 11. With the eldest son at home, the farm work was taken care of; but when he was drafted, all the toil fell on the women and children.

"It just broke us up when they took Ray," Aunt Nora said. "The board wouldn't even listen when I told them how much we needed Ray to work the farm. You see, I'm kinda crippled. I have just one ankle on my right foot [she has a stiffened ankle joint], an' I can't git around to work in the field. The girls and the two young boys has all the farmin' to do."

Joe got out his camera to take Aunt Nora's picture as she sat talking to us.

In Pouring Rain the Two Miles Home from School Seem Doubly Long

Mountain districts around Cumberland Gap seldom provide transportation for pupils, and many children have to walk long distances over bad roads. Nevertheless, the attendance record is remarkably high. The coming of the paved highway started a rush of trail building.

Locust Grove Pupils "Choose up Sides" for a Ball Game

The leader who gets top grip on the bat wins first choice. As the issue is decided, two of the onlookers raise their hands and shout, "Me first!"

Homework Makes Prize Pupils

By the light of an oil lamp set on an old trunk two mountain brothers prepare their lessons for the next day. Educational advantages reached the remote mountain districts only a few years ago.

"Boy! Won't Jane Jump When We Put That Down Her Back!"

Sent to the spring for a bucket of water for the school, two boys find a little lizard that gives them an idea for a prank. The question is whether to put it in the teacher's desk or use it to scare the girls.

"Don't you go takin' my picture, Joe Clark," she said. "My har ain't been combed this day." The eternal feminine!

She went into the house and got a comb. While she was putting her hair in order, Joe snapped the picture.

Uncle Wiley, roused by the sound of conversation, hobbled out to the porch. "He's been sleepin' most of the day," Aunt Nora said. "Seems this warm weather makes him drowsy."

Uncle Wiley was dressed in overalls, the invariable mountain costume. They were faded from much washing but spotless. Everything about Aunt Nora's house was clean, though the place showed marks of poverty.

"How is Viola?" Joe asked.

"She got a ketch in her leg yesterday settin' 'baccy," Aunt Nora answered. "Reckon she worked hit out, though. She an' her sister an' the boys is gone alookin' for wild strawberries. They can't finish settin' the 'baccy till hit rains."

"I'd like to see you and Uncle Wiley gin some cotton," Joe suggested.

A Homemade Cotton Gin

Obligingly Aunt Nora brought out a homemade gin, and she and Uncle Wiley, sitting with the contraption supported between their chairs, turned the handles and removed the seeds from a handful of cotton grown on the farm. The gin is a simple device—two rollers set close together and turned by hand cranks in opposite directions so that the cotton which Aunt Nora fed between them was slowly cleaned of seeds.

"Some folks has 'brought-on' [factory-made] gins," Aunt Nora explained, "but a friend of ourn made this'n."

"To the Foot of the Class You Go"

The boy who has just "missed his word" in the Friday afternoon spelling bee at Locust Grove is shown to his lowly place by a girl competitor. Among cherished memories of "the days of real sport," the old-fashioned "spelldown" takes high rank.

Joe's wife had never seen raw cotton before, and had not known how the seeds are imbedded in the fiber.

"Mama got in a hurry once," Joe told her with a twinkle, "and made a comforter without taking out the seeds. She put it on my bed and that night rain came through the roof and the cotton sprouted and grew right up to the rafters. We had to pick it before breakfast!"

Before they had left Detroit for their honeymoon trip to Tennessee, Joe had led his bride to believe she would be lodged in a one-room log cabin with straw pallets for beds, and the family sleeping end to end around the walls. She had therefore learned to discount his hillbilly stories.

After the ginning, Joe suggested a wool-carding picture. He wanted to take this by flashlight within doors, with Aunt Nora sitting in front of a picture of her soldier son (page 748).

"Now, Joe," Aunt Nora protested, "you ain't agoin' to go in thar. There ain't nary a bed been made in this house yit today, 'cause I been workin' in the garden all mornin'."

Joe said he wouldn't look at the beds, and Aunt Nora relented. She got out her home-made wool carders and some wool clipped from her own sheep. Placing a bunch of wool on one toothed carder, she combed it with the other, making soft, fluffy wisps ready for spinning.

As she seated herself on a chair facing a chair on which she had placed the lower carder, Joe said, "Now someone say something to make Aunt Nora smile."

"Tater Digging" Is a Busy Time in the Hills

Although tobacco is the main money crop, the farmers raise many vegetables and fruits. Land in the valleys is fertile and suitable for diversified agriculture; that on the ridges produces barely enough for subsistence. As the ground rises, prosperity falls (page 749).

Her face lighted. "Joe Clark," she laughed, "you're enough to make a body laugh any time 'thout sayin' anything."

After the photograph had been taken, Joe gathered up the used flashlight bulbs and handed them to Aunt Nora.

Flash Bulbs for Nest Eggs

"She's the only one who ever found a use for used flash bulbs," he said to me. "She uses 'em for nest eggs in place of the china ones she used to get at the store."

"Yes," said Aunt Nora, "they're right good nest eggs. I tried 'em first on the turkeys, and they like 'em fine. Now I put 'em in the chicken nests, too."

The 11-year-old boy had made a toy wagon with thin segments of log for wheels and a hayrack body. Every morning he used this handy vehicle to haul "pusley" and other weeds to the pigs.

As we were about to leave the place, a neighbor drove up in a light truck. Five or six children were with him. He wanted to borrow Aunt Nora's "gig to do some fishin'."

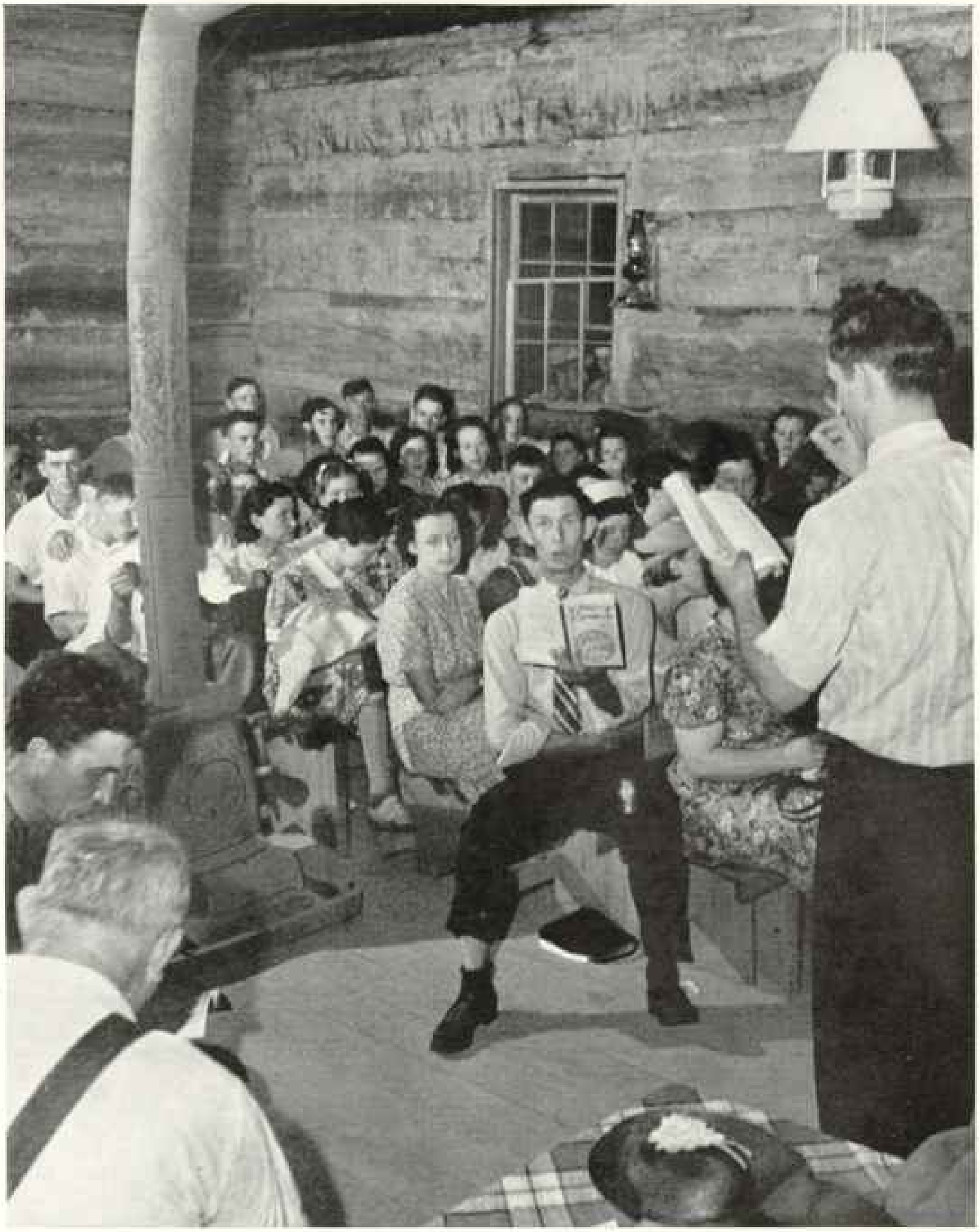
"If you want that gig," Aunt Nora told him, "you'll have to wade out in the middle of the duck pond to git it. One of the boys throwed hit in thar last week."

The fisherman waded out and retrieved the gig—a stick with a sharp spike attached to one end. The idea of gigging is to attract the fish to the surface by use of a lighted lantern and then spear them.

"You'll not git any fish in that lake tonight," Aunt Nora said. "Water's been muddy ever since that rain Saturday."

"Well, Aunt Nora, we have to be going," said Joe. "Can't you come along with us?"

"Reckon not," Aunt Nora said. "The girls and boys'll be back with some strawberries, and I promised to cap 'em. You all better stay an' have some shortcake. Or if they



Hill Folk Worship in True Fellowship at Leatherwood Church

From miles around they come—men, women, children, and babies in arms—some in cars, buggies, or wagons, others on horseback or afoot, and make a day of it. Service is at 10, but the "gatherin' in" starts much earlier. Neighbors who seldom see each other during the week get together. After meeting there is a picnic dinner under the trees. Despite the lack of an organ, the music is "on the key," the leader sounding the pitch with a tuning fork. Hill folk nowadays sing modern tunes from paper-backed Sunday School hymnals (page 768).

don't find no berries, I made some fresh apple butter."

Joe had showed me Aunt Nora's apple-butter apparatus—a long pole fitted with a stirring paddle attached at a right angle. The apple butter is cooked out of doors in an iron pot over a bonfire, and stirring is done from a distance so that the wielder of the stirring stick may escape burning when the kettle spits.

Aunt Nora seems to me the finest type of mountain woman. Uncomplaining, she and her daughters and little boys are actually farming 93 acres of land. Most of their furniture and the utensils they use are home-made. They work early and late and have little time for play; yet somehow they have real fun.

The older daughter, who has had little schooling, is like her mother in speech and manners; the younger has gone through high school and is just as modern as a city-bred girl. Yet both have buckled down to do a man's work.

Aunt Nora had not heard from her soldier son for several weeks, and she thought he might have been sent overseas. Two weeks after my visit she received a letter from him. He wrote from North Africa, "Hang on to everything, mama, 'cause I'll be back to help take care of it."

"Of Such Stock Is the True American"

These are the sort of Americans that conquered the wilderness. All they need is opportunity. If opportunity is not offered, many of them make it for themselves. Such people scorn charity and condescension. They are proud of the strength that is their heritage and resent being held up to ridicule as curiosities. When progress comes within their reach they seize upon it eagerly.

Aunt Nora has no electricity, but she does have a washing machine driven by a gasoline motor. She raises broomcorn and makes her own brooms, fashions chairs with splint bottoms, takes care of her garden despite her lame ankle, makes her own bedding, keeps her family clean and happy. Until a few years ago she spun and wove all the cloth for clothing. She asks no favors. Of such stock is the true American.

We went over into the hills on the other side of Powell River Valley the next day to see Jim, the miller. As we turned off the highway on a dirt road, Joe remarked, "When I was a boy the only way to get through these hills was on horse- or muleback. This road the W. P. A. built isn't much, but we can drive over it."

The "road" became rougher as we went along, and I shuddered at the thought of Joe's four badly worn tires. Up and up the forest trail wound past rail-fenced fields of tobacco and corn, occasional log cabins, and frame houses. Tobacco setting and corn hoeing were under way, and whole families—husbands, wives, and youngsters—were busy in the sun-drenched fields.

Once we paused while Joe took a picture of three men cradling, binding, and shocking wheat. One man rhythmically swung the heavy cradle, a scythe with wooden pieces above the steel cutting blade to catch and hold the falling wheat.

After each stroke he tossed a cutting to the binder, who gathered it up and quickly tied it into a bundle with a wisp of the green stalks. The third man stacked these bundles in neat shocks built to turn rain. No modern labor-saving machinery here. The hand cradle had been made by the mountain blacksmith.

A Labor-saving Tobacco Setter

In a roadside field a man and his wife and little daughter were setting tobacco. They used an ingenious adaptation of the hand corn planter to save the back-breaking toil of crawling on hands and knees to put out the plants.

The device looked something like a bellows, with a chute for plants on one side and a water container on the other. The two parts were hinged together at the bottom like a V, with metal points for breaking the soil. As the man struck the points into the ground, his wife dropped a plant into the chute near the left handle.

The man then spread the handles apart, releasing water from the container on the right into the hole made by the points. At the same instant the plant dropped into the hole, the handles were pushed together, and the planter was lifted, the points pushing earth around the roots.

"That's a new one on me," said Joe. "I always had to crawl on my knees to set tobacco. Well, let's go over to the valley."

"Can't now, we've got to git this 'baccy in. Looks like rain. Stay with us."

It was the regular parting ceremony. How those people could have accommodated three overnight guests I could not guess, but Joe assured me they would take care of us if we wished to stay. They would give us their own beds and make shift as best they could for themselves.

Our road began to wind down the ridges. Soon it turned boldly into a running creek,

and the car splashed along in the water for several hundred yards (page 750).

"The creek made as smooth a road as the farmers could dig in the hillside," commented Joe.

Nobody was in sight as we stopped the car in front of the miller's house, but the front door was open. We walked down a sharp incline through the tree-shaded front yard to the wide, cool porch. At Joe's hail Jim, the old miller, appeared.

"Howdy, Joe," he said.

Joe introduced his wife and me.

"How'd you git such a good-lookin' woman?" the miller asked.

"Did my courtin' in the dark," Joe replied.

"Ain't grindin' today," the old gentleman said. "Help's hard to git, and I don't grind any day but Saturday. There's a customer now with a 'turn' [a sack of corn to be ground], but he won't stop today. [A man was passing with a sack of shelled corn slung over his shoulders.] Got me a new hog. Want to see her?"

They Listen to What Teacher Says

At Locust Grove school members of the primary class listen with rapt attention while their lesson is being explained. Hill youngsters are almost invariably bright-eyed and eager.

He produced a registry certificate which showed that the sow was a fine Hereford.

Leading us around the house, he gave a hog call, and a splendid brood sow came grunting to the rail fence.

"She'll make a lot of meat for you this winter," Joe remarked.

"'Deed she won't," the miller snorted. "I paid $50 for her. Give her two years, and her pigs'll make all the meat I need."

Blooded Cattle and Fancy Chickens

These mountain people take pride in their stock. Even on the infertile ridge farms, blooded cattle and fancy chickens are common.

The miller has a hobby. He sets hens on the eggs of wild mallard ducks. Several broods of little mallards were following their chicken mothers about the farmyard or swimming in the spring-fed creek back of the house.

"They're bad about stealin' nests away," he commented. "The place is gettin' overstocked with ducks."

From a spring gushing out of the roadside in the front yard, water is piped to a tank beside the kitchen door (page 765). The miller's wife came out of the kitchen with a glass, and we all had a drink of the clear, cold water.

"It's good water we have up here and good air, too," the old gentleman said as we all went back to the porch and found chairs. "You know, some northern folks try to make us southern folks look like idiots, but this is our home and we like it. We don't have so much, but we just kinda live a long time on this good air and water.

"Feller come here a while back and com-

Hitchhiking Is Better Than Walking

Back in the hills children often trudge several miles to school through fair weather or foul. Joe Clark says he got through the fifth grade by going three months a year.

plained about how rough the country is. Well, it is a little rough, but we've had daily mail delivery on this road for 40 years. You ain't hardly got out of the sooburbs here. That feller had no business complainin' about the rough country. He was born up thar in the briars where he had to swing on a grapevine to git out of his pappy's front yard.

"I don't hold with fellers going away to the cities an' then comin' back and throwin' down on the place where they was born."

The reason for this plain talk was not hard to guess. A few weeks earlier an amateur photographer had come to the mountains with a lot of comic-strip hillbilly "properties," such as ragged overalls, peak hats, corncob pipes, and liquor jugs. He had tried to induce the farmers to pose for him in supposedly typical hillbilly style. Naturally, the miller had resented the smart aleck and his attempt to picture the mountain folk in ridiculous attire.

The miller's family have operated mills on the same creek for a hundred years or more. Our host's father and grandfather had ground grain here before him (page 761).

"We don't have much trouble gettin' along," the old gentleman continued. "We have all the good meat and butter and eggs and vegetables and flour we can use. Rationing don't bother us much."

The miller has a son in military service. The boy quickly demonstrated mechanical ability and won promotion as an Army engineer. As the miller talked, I remembered that it was these mountain people who, by siding with the Union, split the South and probably had much to do with the preservation of the United States as a nation.

Despite lack of formal education, Miller Jim is a sound and intelligent thinker. He has a keen sense of humor and a deep scorn for people who put on airs. Like all the other mountaineers I met, he is genuine through and through.

Declining the invariable invitation to stay overnight, we took to the road again and,

Jim's Daughter June Sacks the Meal as It Pours from the Mill

Turned by power of a spring-fed mountain stream, the millstones grind the neighbors' "turns" of corn. Help is hard to get in wartime, and the miller closes down except on certain days (page 759). As a hobby, he raises wild mallard ducks, which disport themselves on the millpond in the back yard.

To Pupils of "Pappy" Frakes' School, Old Glory Truly Means Freedom from Want

The backwoods area called locally "South America" was a place of lawlessness and squalor with no opportunity for education until the coming of Hiram Frakes. The preacher converted the "king" of the "blockaders" (moonshiners) and built a tiny log schoolhouse which has grown to 8-room Henderson Settlement School (page 767).

"Pappy" Frakes' Children Learn "Singing Games" and Old-time Dances

For years it has been a custom of the preacher who founded Henderson Settlement School in "South America" to hold a party for the young folk every Saturday night, winter and summer. His theory is "Give them a chance to enjoy themselves and they'll keep out of mischief of their own accord."

A Comely Hill Girl "Surrounds" Two Young Miners

Near Cumberland Gap these boys work a small lead and zinc deposit. The principal mineral product of the region, however, is coal, Middlesboro, Kentucky, just a few miles away being the center of the industry. In that city the Chamber of Commerce building is constructed of slabs of coal.

chugging up the hills, soon came to a white farmhouse set in a yard bright with roses and larkspur.

The "menfolk" were all in the fields, "Aunt" Tilda, who came to the door, told us, but if we'd stay for supper and overnight, there would be quite a "gatherin' in." She apologized for not shaking hands, saying she had been feeding the chickens.

"You should a been over to the cemetery Decoration Day," she said. "Hit was the best day we ever had, finest singin' I ever heard, and good speakin'. All the folks from around here was there."

On our way back to the highway we passed the cemetery. Tables and a speaker's stand had been erected near the road. Near by was a lodge hall. Fenced against straying stock was the cemetery, graves still covered with wilting flowers placed there a few days earlier. The mountain folk are never lonely or forsaken even in death.

Feuds in "South America"

Much of this mountain area has been feud country. Even now, clan hatreds sometimes cause violence, but the days of general lawlessness are past. Perhaps the worst of the feud country of this area in earlier times was the isolated mountain pocket "South America," about 20 miles from Middlesboro, Kentucky.

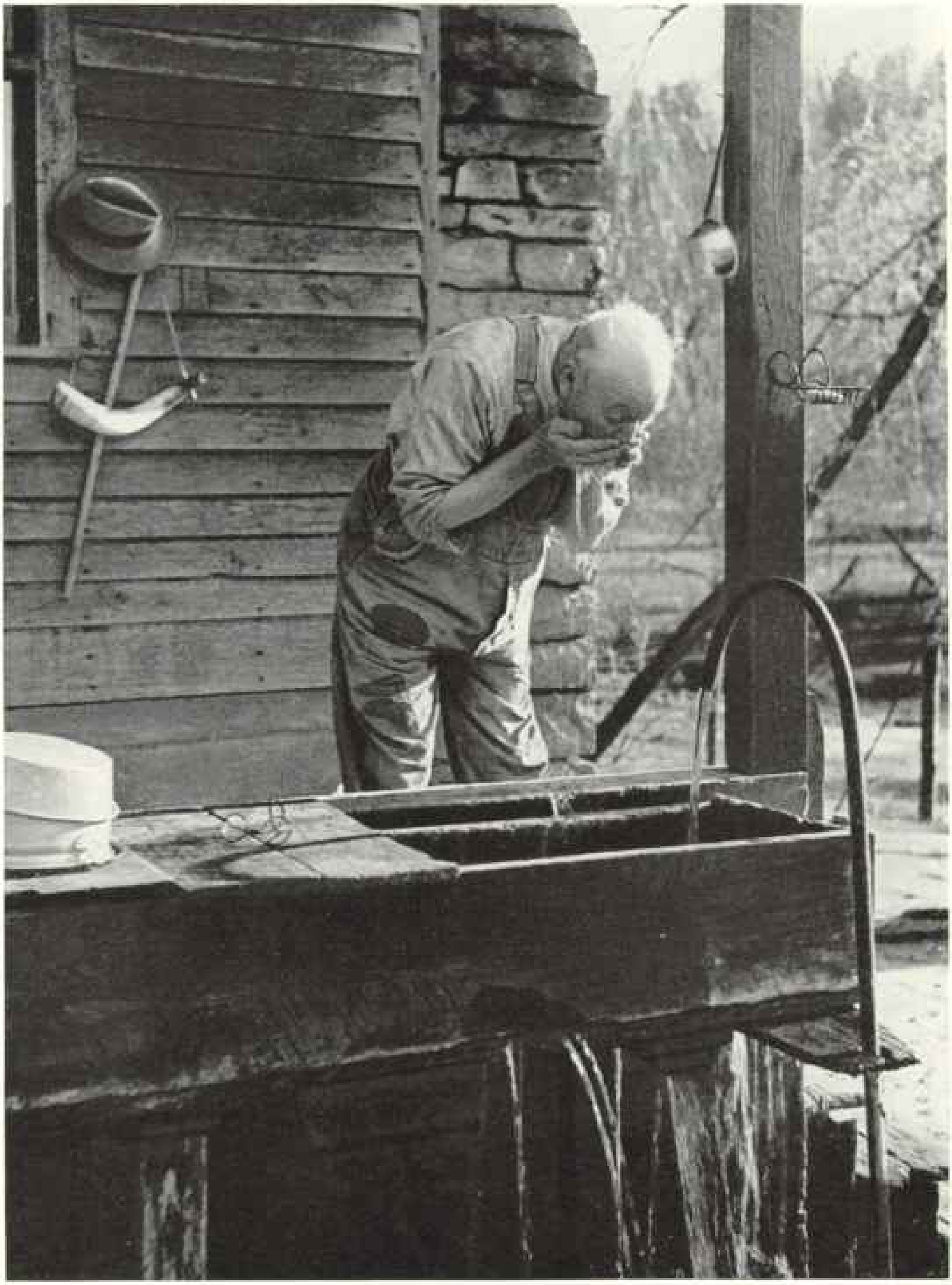
Here lived and ruled "King" or "Wild Bill" Henderson. After conviction as a participant in several fatal shooting affrays, Henderson was sent to the penitentiary for life.

Hiram Frakes, a struggling preacher from Indiana, a man of little schooling who had studied hard to become an ordained minister, visited Henderson in prison and converted him.

Because of his genuine change of heart and through petitions of Frakes and others, Henderson was pardoned after serving a few years. He went back to his "South America" home.

There Frakes was working among the people. He told Henderson the greatest need of the community was a school. Determined that his children should have better opportunities than he himself had enjoyed, Henderson gave Frakes his farm to start a school and moved to a poorer place.

Frakes and some of the mountain people built a schoolhouse and organized a school district. The county then was obliged to



Morning Chores Done, Miller Jim Washes Up for Breakfast

The cold, clear water is piped from a spring in the front yard (page 759). For three or four generations the family has ground grain here. A fireplace built into the old stone chimney in the background still heats the room where the miller was born 73 years ago.

Playing "Shoes in a Circle" by Moonlight Is Mirthful Sport

After sides are chosen, the competitors take off their shoes and mix them willy-nilly on the ground. A signal starts a wild scramble in which everybody tries to find and put on his own footgear. The team first properly shod wins.

furnish a teacher. Frakes himself had insufficient education to teach the three R's.

In these mountain districts the county authorities are slow to establish schools. It is only when the residents take the initiative and build schoolhouses that public education is assured.

Naturally Henderson in his "blockading" [moonshining] and feud-war activities had made many enemies. Some of them waylaid him not long after his return from prison and shot him through the body. Near death for weeks, he finally recovered and went on as Frakes' strongest supporter.

Henderson's second wife had had an illegitimate son born before she married Henderson. This "woods colt" hated his stepfather, and one day after the old man's recovery from the wound received from ambush the two quarreled. The stepson shot and mortally wounded Henderson while the wife looked on unconcerned.

Henderson's 11-year-old daughter and 8-year-old son witnessed the shooting. As the old man fell, the girl fled the place and ran for miles through the brush to report to the authorities. The little boy did what he could for his father, pillowing the dying man's head on his hat.

The girl, clothing torn to rags by the briars she had run through, reached the sheriff. The murderer was caught, convicted, and sentenced to life imprisonment. At the trial the testimony of the little boy so moved the crowd in the courtroom that there was not a dry eye in the place as he left the stand.

Frakes took Henderson's young children into the dormitory he had built on the school grounds. Today the daughter, a college graduate, teaches school in the very mountains where her father was murdered.

Hiram "Pappy" Frakes is an unassuming, earnest man with a noble mission in life. He cares for about 30 homeless or orphaned

"Touch Me and You Get the Boy"

Among the most popular games of mountain young people is "bronco tag." The girl who has her hands on her partner's waist must keep him between herself and her competitor or lose him. Old-time country fiddlers furnish music.

children, sends them to the school he started, and brings them up to be Christian gentlefolk.

His original one-room school has grown to an 8-room consolidated school with seven teachers. Four of the teachers are graduates of the school (pages 762, 763).

After the pupils have been graduated from Pappy Frakes' school, many of them go to Berea College and work their way to degrees in the arts and sciences. Berea, through its home industries and farm activities, gives such students opportunity to earn all expenses while attending college.

Lincoln Memorial University at Cumberland Gap is another college attended by mountain folk. At Lincoln no home industries are carried on. Instead, the school farms a large tract of land, offering students jobs in the fields to help pay for their schooling. This is the school said to have been founded in response to a plea by Abraham Lincoln to educate his people.

I visited the university at the invitation of President Stewart W. McClelland and Vice President Robert L. Kincaid. On a spacious campus with fine buildings, the school offers standard higher education courses as well as primary and high-school training for youngsters who have not had access to graded schools.

Campus life is much the same as at old colleges in the East. There are fraternities and sororities, and the students enjoy a happy social life. Many of them work their way through. At luncheon one day in the college dining hall one of the girls seated at my table reminded me that she had served dinner to the Clarks and me at the Cumberland Gap restaurant the night before.

Although there is no mountain handcraft in the generally accepted sense at Cumberland Gap, the hills are full of homemade things. The people cannot often go to the store and buy what they need, and for that

reason they have learned to make all sorts of articles. Every house has its patchwork quilts, hand-woven coverlids, hand-bottomed chairs, home-woven rag rugs. No one makes souvenirs to sell, but the country is a treasure house of genuine folk handcraft.

As in pioneer days, these people make Sunday a day of rest and worship. Services in the little log churches scattered through the mountains begin at 10 A. M., but the "gatherin' in" starts at 6 A. M., when families begin to arrive by all sorts of conveyances from automobiles to saddle horses or mules. They bring along their lunches and make a day of it.

The "Foot-washin'" Ceremony

One of the most interesting services is the "foot washin'" of the Primitive Baptists. This ceremony takes place once a year. There was one not far from the Clarks' home the Sunday I was there (page 749).

In the Communion service bread and grape juice are taken first, and then enamelware washbasins of water are brought out for the "foot washin'." While hymns are sung, the worshipers wash one another's feet as the Bible records Christ washed the Disciples' feet at the Last Supper. Men sit on one side of the church, women on the other. The men wash the men's feet; the women, the women's.

Nowadays the hymns used are mostly modern, the catchy tunes published in new Sunday School music books (page 757). The tunes of yesterday, however, were directly from the old Gregorian chants. Many of the mountain people still speak the Elizabethan English of their pioneer ancestors.

Jean Thomas, "the Traipsin' Woman" of Ashland, Kentucky, has made a collection of these old hymns and ballads, and has held several annual folk singing festivals at the Traipsin' Woman's Cabin in the mountains near her home.

No such elaborate gatherings are conducted at Cumberland Gap. Several sects are represented among the people, Methodist and Baptist predominating. There are, of course, some extremist congregations who go in for weird practices, such as letting snakes bite them to prove their faith, but these people are as much a curiosity to most of the mountaineers as to city dwellers.

The "hillbillies" are just normal, likable, honest Americans. Considering their lack of advantages, their centuries of isolation, the poor quality of the soil many of them till, I marvel at their success in life. A visit among them makes a man who is honest with himself search his soul and wonder whether under similar circumstances he could do as well.

One of the most interesting sights in the mountains is the typical general store. We visited several. Joe Clark said he was taking me to see them so that I wouldn't think he had posed his store pictures (page 744).

A boyhood friend of Joe's is the proprietor of the first store we saw. It is a low frame structure located at a turn so sharp that motorists are obliged to slow down before passing it.

"Gives 'em time to think if they need something," the storekeeper told us.

How the storekeeper ever finds anything in that hodgepodge is beyond me. Dresses, overalls, machinery, foodstuffs, hats, shoes, harness, plows, pumps, clocks, farm tools, electric fans—everything imaginable is piled on counters or on the floor. There is an iron coal stove somewhere near the middle of the room and close by a checkerboard on which customers on cold winter days play checkers with pop bottle tops for "men."

The proprietor showed us his device for handling ration coupons. He had a carton of empty glass jars, with slots cut in the top and labeled according to the type of coupon each was to receive.

"It's hard to get merchandise these days," he sighed, looking dolefully at the tons of goods piled about him. "Can't even get any sweet candy, except some stuff that tastes as if it was half sawdust."

Joe asked him if he had anything cold to drink, and he produced three bottles of pop from a huge electric refrigerator.

"Got any alarm clocks?" Joe asked, noticing several clocks on a shelf above the counter.

"No, just regular clocks. That'n's electric."

Everywhere I turned I saw evidence of the progressive spirit of these mountain folk. They like to try new things. One family living in an abandoned mine on a wild hillside near Middlesboro had a shiny new automobile parked under a tree at the entrance of their dug-out home!

Roads and schools are opening up the fastnesses. In another decade the mountain folk will have advanced till they are on an opportunity level equal with residents of more favored regions. Then let people who have been taking the gifts of science and invention as a matter of course look to their laurels. The hillbilly who can meet life smiling with nothing save what he can wrest from the backwoods will go a long way once he has the advantages of modern civilization.

NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDINGS

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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 researches 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, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

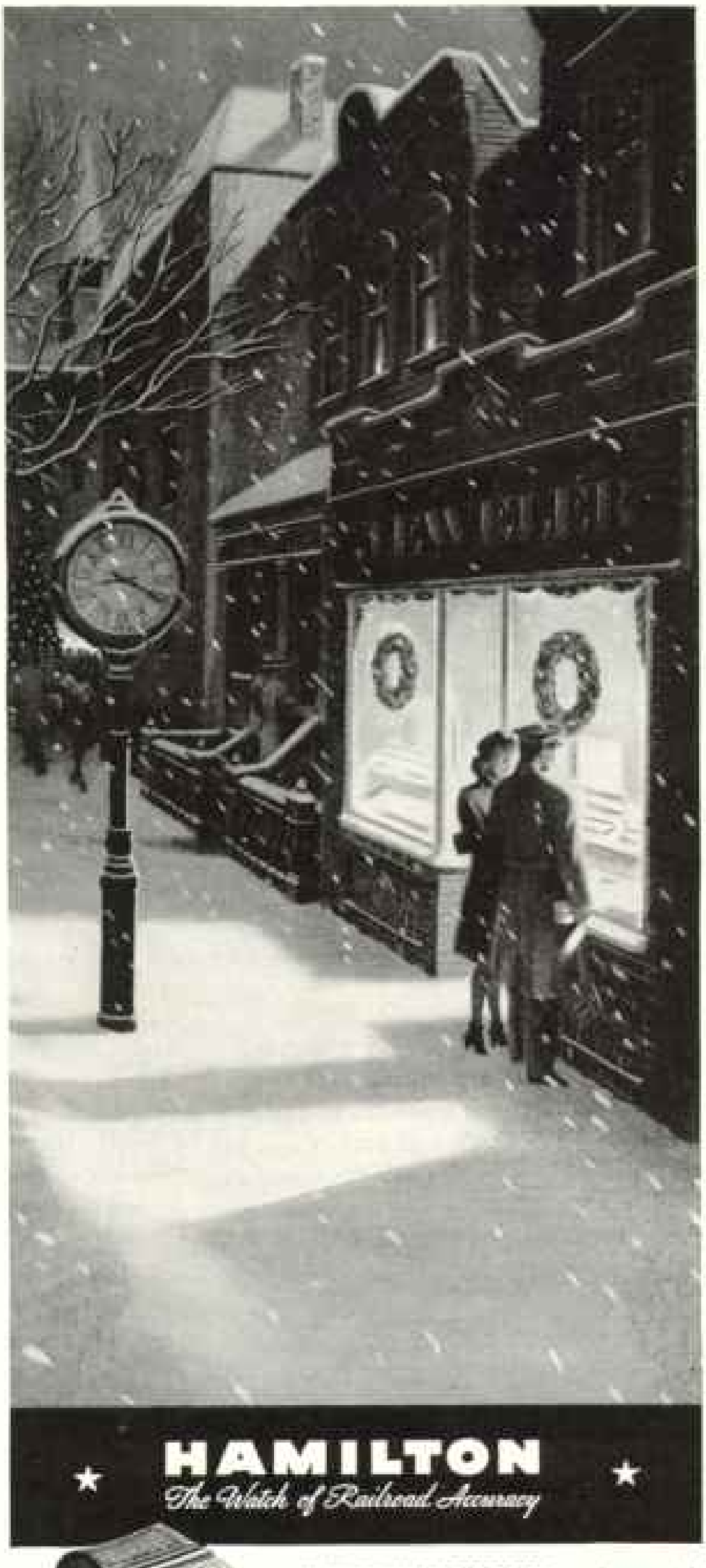
The National Geographic Society-U. S. Navy Expedition camped on desert Canton Island in mid-Pacific and successfully photographed and observed the solar eclipse of 1937. The Society has taken part in many projects to increase knowledge of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

The store that *love* built



UNDER THAT CLOCK your father paused a moment, ran his finger between his neck and collarband, then plunged inside to buy a wedding ring. One Christmas long ago you stood before that window. From all the gold, the precious stones, the rows of watches, you picked a tiny silver pin. (Your mother's worn it every Christmas since.)

Your graduation watch—that anniversary bracelet—the battered baby spoon you're saving for a grandson.

They all came from that store. And the love behind them built that store and thousands like it in America.

For fifty Christmases a fine Hamilton watch has expressed the love of one person for another with greater eloquence than words. But because the Hamilton Watch Company is now totally converted to war, you will find few, if any, Hamiltons in your jewelry store this Christmas.

But you will find a man whom you can trust—your jeweler. His experience assures you honest advice about available watches, and many other gifts for your loved ones.

So if you must buy a watch, buy it from your family jeweler. But if only a fine Hamilton will do, buy a War Bond. When peace comes, your jeweler will have a postwar Hamilton that will more than deserve to be called "America's Preferred Gift Watch." Hamilton Watch Company, 3123 Columbia Ave., Lancaster, Pa.

HAMILTON WAS THE FIRST American watch company to win the Army-Navy "E." It was earned for building such precision timepieces as the marine chronometer, chronometer watch, master navigation watch and other timing devices for our armed forces.

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Scene from "Captain Caution," a United Artists release, available to approved non-theatrical locations through B&H Filmosound Library.

Hometown Christmas Eve . . .

in Salamaua

White, hot beach and steaming jungle instead of snow and spangled Christmas trees . . . K-rations instead of duck and stuffin' . . . yet even here, in the midst of war . . . on a strange, unfriendly strip of land six thousand miles away . . . one familiar, well-loved bit of *every* man's home town helps fighting men keep Christmas. *Movies!*

Out there . . . and on a dozen other fronts . . . in camps . . . on fighting ships, Christmas Eve will be a busy night for Filmosound Projectors. They'll be flashing familiar Hollywood faces on countless screens reminding fighting men that the *spirit* of Christmas still *lives* in the world they're fighting for.

This is *morale*. It is part of the job that B&H film equipment is doing in this war. Millions of men are trained thoroughly and swiftly with Filmosound-projected movies. Battles are recorded by Filmo Cameras . . . and special devices built by B&H are giving our forces the *winning* edge. Bell & Howell Co., Chicago; New York; Hollywood; Washington, D. C.; London. *Est. 1907.*

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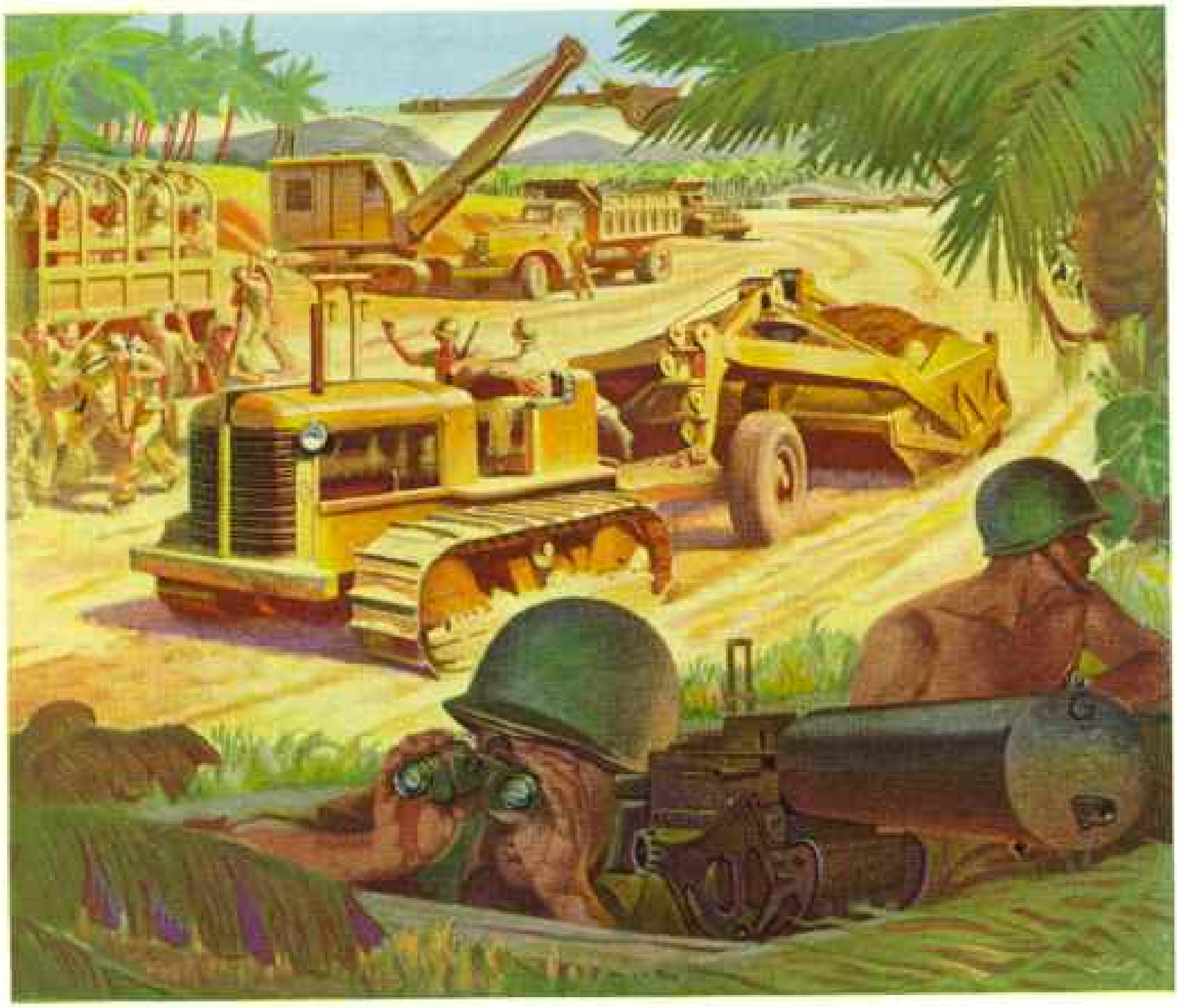

PREVIEW OF TOMORROW'S POWER

If you want a glimpse of how tomorrow's hard jobs will be done, look at what is doing the tough war jobs today—such jobs as building airfields in the jungle.

Look in tanks and trucks, in landing barges and patrol vessels, in tractors and auxiliaries. You'll find General Motors Diesel Engines packing them with power.

This grueling service is emphasizing the virtues of GM Diesels—highlighting their ruggedness—showing how little fuel they use, and low-cost fuel at that.

With the war won, our expanded facilities will be turned to peacetime needs, and these engines will be available for many applications where America will need dependable, economical power.

New eras of transportation follow in the footsteps of war. Another new era of transportation is assured in the wake of this war. General Motors Diesel Locomotives already are establishing new standards.

BACK THE ATTACK — WITH WAR BONDS

GM GENERAL MOTORS DIESEL POWER

ENGINES.....15 to 250 H.P.....DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

ENGINES..150 to 2000 H.P...CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

LOCOMOTIVES.....ELECTRO-MOTIVE DIVISION, La Grange, Ill.

Now the Army gets its gas through SYNTHETIC RUBBER "sleeves"

NOW it can be told how our invading armies are kept supplied with the thousands of tons of gasoline and oil their trucks, tanks and airplanes consume in every day's advance. It is delivered through a revolutionary new portable pipe line that can be laid *many times* faster than conventional fuel lines.

This speed is possible because the pipes are neither bolted nor welded together. They are quickly joined by a patented coupling called a "Gruvagrip" — sealed with a leakproof gasket of Goodyear's oil-resistant synthetic rubber Chemigum.

This gasket slips over adjoining ends of pipe like a sleeve, holding them in firm grip. It is then locked in place by the "Gruvagrip" coupling that keeps that gasket from ballooning under pressure. The joint is sufficiently flexible to permit laying the line over rough ground, without trenching.

Due to Chemigum's impermeability to gasoline, the gasket does not disintegrate in contact with high-test fuel, as natural rubber would. In Africa, these portable pipe lines delivered upwards of 700 tons of aviation gas per day to advanced air-dromes many miles inland, releasing fleets of trucks for other duties.

CHEMIGUM

Today Goodyear's entire Chemigum production is required for this and other military uses. But the day is coming when there will be enough of this war tested synthetic rubber to produce many civilian and industrial needs that require a truly oil-resistant rubber for dependable, lasting service.

Back the attack with WAR BONDS

Chemigum (pronounced Kem-e-gum)—T. M. The Goodyear Tire & Rubber Company

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"You purr just like those engines Dad builds!"

They're Studebaker-built Wright Cyclones for the famous Boeing Flying Fortress

SOLDIER HARRY RYAN and his father were fellow craftsmen in the Studebaker factory prior to Pearl Harbor. They comprised one of the many father-and-son teams that have made the quality of Studebaker craftsmanship famous since 1852.

Today, large numbers of younger men, who once were Studebaker craftsmen, are using instead of building military equipment. In many instances, their fathers, and other older members of their families, are producing Flying Fortress engines, multiple-drive military trucks and other war matériel in the busy Studebaker plants.

Studebaker craftsmanship is now at work in behalf of our Nation and its Allies. It will provide finer Studebaker motor cars and trucks than ever, after Victory comes.

"Always give more than you promise" That Studebaker watchword has been observed for 20 years by craftsman Henry C. Ryan. He is helping to build Cyclone engines for the Flying Fortress in one of Studebaker's aircraft engine plants. Some day, he and his soldier son, Harry, hope to build Studebaker cars again for you.

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Your child and your neighbor's . . . the youngster down the street . . . the kid from across the tracks . . . the boy and girl on the next farm—from their imagination and intelligence and energy the future will be created.

The Science Talent Search is a systematic attempt to discover potential scientists while they are still in high school, and to help them complete their education. It is sponsored by Westinghouse and conducted by Science Clubs of America.

Westinghouse has assumed this responsibility because its activities are based on continued scientific research and development, and because Westinghouse feels that wider public interest in science will contribute to the future progress of the world.

The Third Annual Science Talent Search is now under way. It is open to young men and women in 1944 graduating classes in all high schools and preparatory schools. The examination period begins December 3, ends December 27. There is still time for high schools to arrange for this examination if teachers will act at once.

On the basis of examinations, essays, school reports, and other records, forty students are selected as finalists. They are brought together as a group in Washington with all expenses paid. They meet each other, talk with noted scientists, visit museums and places of scientific interest. There are personal interviews with the judges, and a final examination.

Westinghouse Science Scholarships ranging from $100 to $2400 are awarded. Winners select their own college, their own field of study.

Every student having the requisite ability deserves an opportunity to qualify in the Science Talent Search. Teachers may write for information and examination forms to Science Service, 1719 N Street, N.W., Washington (6), D. C.

For a copy of the booklet, "Scientists for Tomorrow," write to School Service, Westinghouse Electric & Manufacturing Company, 306 Fourth Ave., P. O. Box 1017, Pittsburgh (30), Pa.

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The Oboe is a strange, shy instrument in the orchestra, lending a distinctive "flavor" to fine music with its peculiar moody note. Because its range is so elusive, few radios have been deft enough to capture it truly, to the annoyance and despair of radio technicians. But if you are a Scott owner now...or later when you will be one...you can hear the Oboe in its matchless voice, with all the fleeting grace notes and overtones of a "living performance."

Today there is sterner work for a Scott than bringing the wonder and glory of music into your home. On all the oceans, wherever our tankers move, or convoys sail, Scotts are providing our seamen with favorite programs from home, or vital messages of war. And the Scott is engineered so that no telltale "leak-back" can reach a lurking submarine. The millions of men who have heard the Scott under these conditions will want one after-the-war because it "gets everything." You will yearn for a Scott, too, if ever you hear one.

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"I WILL COME HOME AGAIN..."

Out here, I hope . . .

Out here, I think . . .

Out here, I dream of peace—and coming home to showers and clean sheets and Christmas trees and my job . . . and the girl I love.

I *will* come home again . . .

But not until my brother's eyes no longer watch a red sun rising on Bataan. Not until men I've marched and eaten with no longer sleep beside forgotten beaches. Not while men who bled and died for me are unavenged.

No . . .

Not yet, before we strike down the enemy . . . and gut his ships and strip his guns, and break his will to hate and lust and kill.

No terms . . .

No paper peace put down by foes who, lacking guns, will still fight with pen and ink—can rob me of the victory I've bought with heart's blood and sweat and grief.

I'll come home again when this war's won . . .

I'll turn to the job I want to do, when I'm done with this job that *must* be done . . . and not before. I'll come home again, when I'm free of war and the restraints of war . . . when I'll be free to plan a future of my own . . . free to build an even better America—an even better world—than the one I've always known. Free to work and be honored for my work in a land where there will always be for me and *every* man liberty, security and dignity . . . and the opportunity to set my pace and win my place according to my own ability.

That's what this war's about.

That's what Victory will be for.

That's what I want when I come home.

Night and day we're driving on to Victory . . . building 2,000 h.p. Pratt & Whitney engines for Navy Vought Corsair fighting planes . . . making intricate Hamilton Standard propellers for United Nations bombers . . . readying production lines to build Sikorsky helicopters for the Army Air Forces . . . producing other important items of ordnance. . .

For we believe there can be no peace without Victory . . . but we believe we can and must win this war soon . . . help bring our sons and brothers back again to their jobs and homes and even better futures than they had before. And, together, turn to peaceful things—to the building of an even finer Kelvinator, an even greater Nash.

The Army-Navy "E" awarded to Nash-Kelvinator Corp., Propeller Division.

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These are Fairchild alumni—fighting men from Norway, Canada, the U.S.A.

Though they come from different parts of the world, these skillful warriors of the United Nations Air Forces have much in common.

Typical of thousands of fliers on every fighting front, each was given an intensive course in a Fairchild Primary Trainer as one important step on the road to winning his wings. Their meeting upon some distant airfield is virtually a reunion of "old grads" of the same Alma Mater.

It is easy to understand why the Air Forces choose Fairchilds for primary training.

There is the element of added safety. For example: quick take-offs and steep climbs can be performed by novices in a Fairchild Trainer without danger of stalling, which caused so many fatalities in the last war. The trainee, behind a 175 or a 200 horsepower Ranger engine, just "pours on the coal" and he's quickly in the air with a lot of runway to spare.

And when it comes to acrobatics, which give a trainee an intimate feel of the controls and teach him instinctive flying, a Fairchild is the answer to an instructor's prayer. No need to crush the student's confidence by telling him not to dive at 200 miles an hour. Just teach him all the tricks in the bag, with the full knowledge that safety has been built into every inch of every Fairchild Trainer.

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Scene in Civil War Days

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Many of our mighty cities of the west and northwest were then mere outposts. And eleven years were to pass before the war between the States began.

The little five-mile railroad of 1850 has grown into an 11,000-mile transcontinental transportation system. Through wars and rumors of wars, depressions and years of development and prosperity, The Milwaukee Road has written its share of American history.

Today all that our free America means is being challenged. And we of The Milwaukee Road, in concert with the rest of the nation, are helping to fling back that challenge.

We are being called on to move more and more freight and passengers every day. We are keeping vital war traffic flowing uninterruptedly over our long supply line from the east and middle west to Washington and Oregon ports—and through the Omaha and Kansas City gateways to California and Texas ports.

Our friends and patrons—both passengers and shippers—are cooperating to the limit. They, as well as we, know the urgency of the situation and the importance of the job we all have to do.

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11,000-MILE SUPPLY LINE FOR WAR AND HOME FRONTS

A FLAME-GRAIN
Kaywoodie $10.00
Dublin Shape [actual size]

"I smoke a Kaywoodie"

Wherever you go, you hear them saying "I smoke a Kaywoodie." *All over the world.* This international opinion is not accidental. Here are the reasons for it: There is a difference in the way a Kaywoodie Pipe smokes. And in the way it tastes. This is because of the briar-wood of which it is made, and the way in which this briar-wood is prepared. It comes from the Mediterranean, and there aren't many pipes made of it any more. It smokes well. With freedom from trouble and perfect satisfaction. It is seasoned and cured with tempering agents that permeate the wood. There's nothing like a Kaywoodie . . . it is always mild, good-tempered and always yields the same delicious Kaywoodie Flavor.

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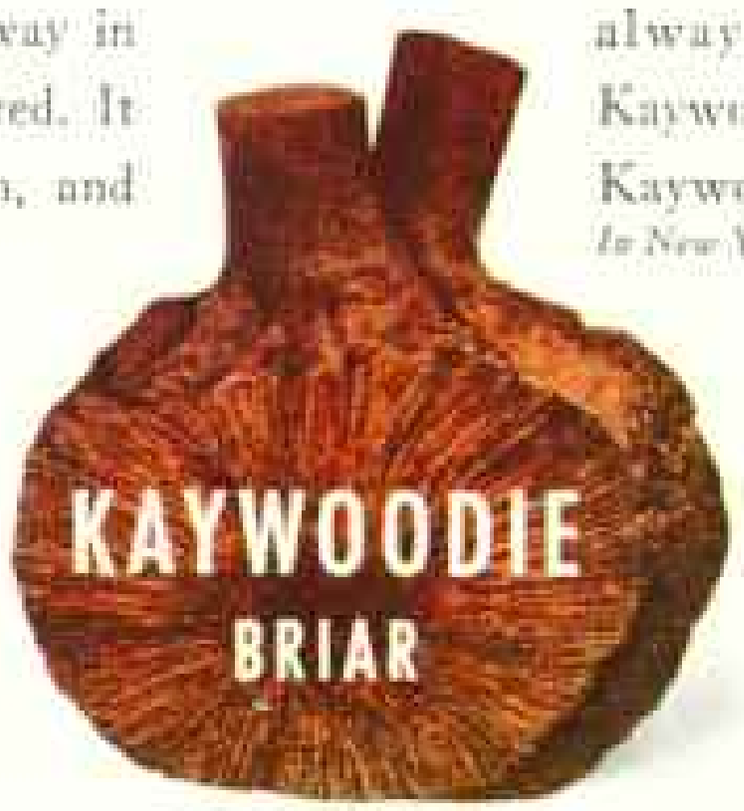

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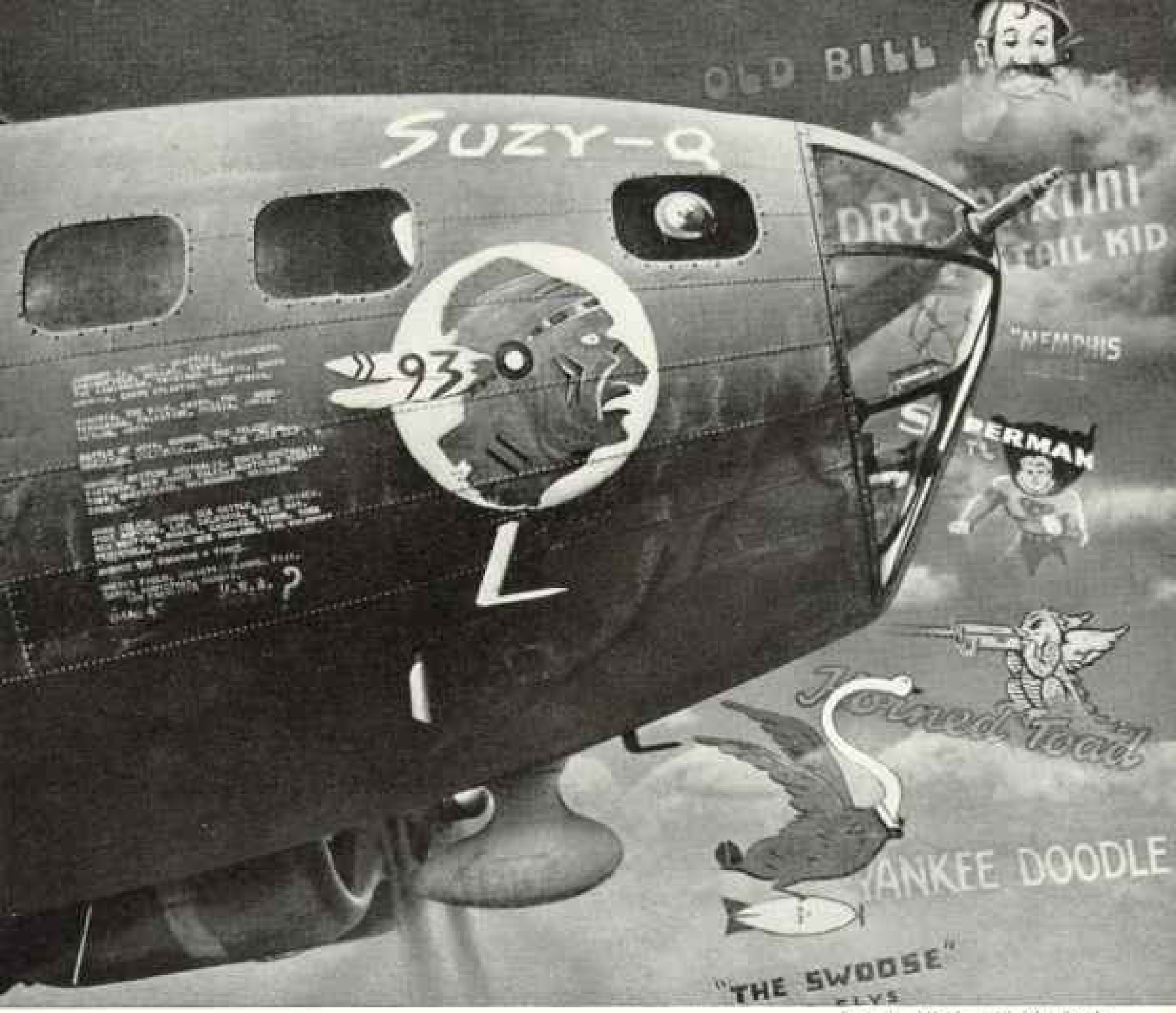


Back the Attack — with War Bonds

Affection

As you read story after story about Boeing Flying Fortresses,* one thing is apt to impress you above all else . . . *and that is the deep-rooted affection which Fortress crews have for the sturdy ships which bring them back to their bases, time and again, from fierce battles with the enemy forces.*

Consider the case of the Fortress which fought off half a hundred Nazis for twenty minutes and then limped home with her left wing severely damaged, her inboard engine dead, and more than 2000 bullet holes in her tough hide. At the height of the action the skipper told his crew they could jump. "Sorry, sir," they called back over the interphone, "we're too busy shooting down Focke-Wulfs."

Or this, by another pilot: "We were traveling between 400 and 450 miles an hour. According to the slide rules, there was no chance of our pulling out of the dive. But we were goners if we didn't try. There were tearing noises; the bombs were crashing through the bottom. Then the Fortress came up level, and the wings were still with us! She's a great ship, and you know what I mean when I say GREAT!"

Back of stories like these, and the plane that inspires them, there *must* be designing and engineering and manufacturing skills of high degree. The Boeing engineering staff numbers over 3000 and includes men with experience in more than 25 distinct fields . . . structural, electrical, hydraulic, acoustical, metallurgical and many others.

Boeing products have consistently met or exceeded all claims made for them. True today, it will likewise be true tomorrow . . . if it's "Built by Boeing" it's bound to be good.

DESIGNERS OF THE FLYING FORTRESS • THE STRATOLINER • PAN AMERICAN CLIPPERS **BOEING**

*THE TERMS "FLYING FORTRESS" AND "STRATOLINER" ARE REGISTERED BOEING TRADE MARKS

PREWAR PRICES HERE

WE Americans are paying more today for most things we buy.

But there is one outstanding exception — railroad freight rates. They are the same or lower than they were before the war.

In fact, taken all together, freight is being moved at an average charge of less than a cent for moving a ton one mile. This is less than the railroads have received at any other time during the last quarter of a century.

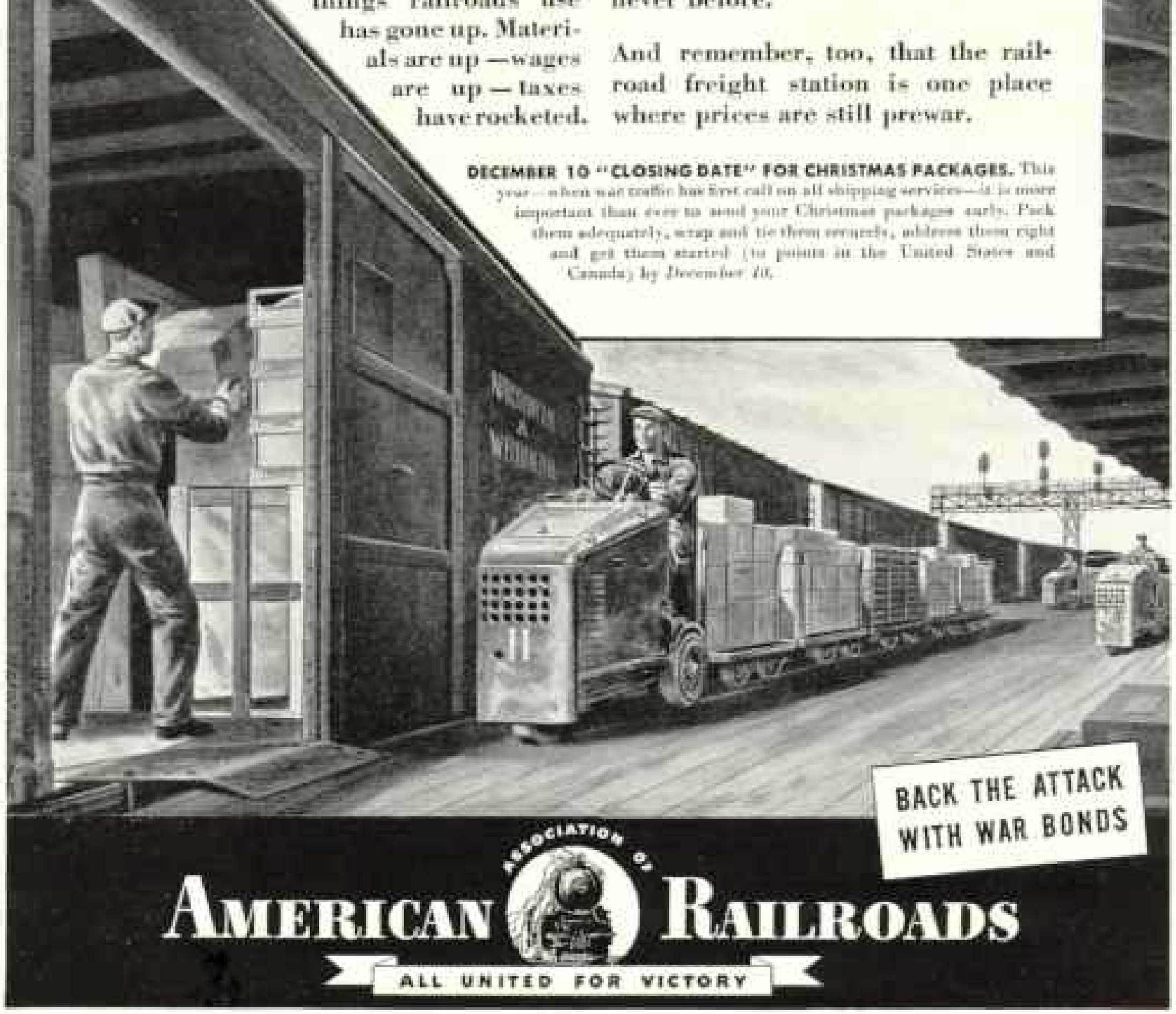
Meanwhile, the cost of things railroads use has gone up. Materials are up — wages are up — taxes have rocketed.

Because railroads are carrying the heaviest load ever shouldered by any transportation system, they are taking in more revenue than ever before.

But if you hear it said that railroads are piling up a lot of money, just bear in mind that railroad expenses and taxes, together, are running at record level, and that after it is all over there will be a tremendous need for rebuilding and restoring the service life now being "run out" of railroad plant and equipment as never before.

And remember, too, that the railroad freight station is one place where prices are still prewar.

DECEMBER 10 "CLOSING DATE" FOR CHRISTMAS PACKAGES. This year — when war traffic has first call on all shipping services — it is more important than ever to send your Christmas packages early. Pack them adequately, wrap and tie them securely, address them right and get them started (to points in the United States and Canada) by *December 10.*



BACK THE ATTACK WITH WAR BONDS

ASSOCIATION OF AMERICAN RAILROADS

ALL UNITED FOR VICTORY

Fighting craftsmanship by Fisher

The Army-Navy "E" flies above four Fisher plants for excellence in aircraft production and from two others for tank production, while the Navy "E," with four stars, is flown by still another Fisher plant for its naval ordnance work.

THIS new naval dual-purpose 5-incher is bringing added advantages in fire power to our armed forces at sea and on invasion coasts.

Here at Fisher, we take particular pride in it, even though we do not make *all* of it.

For the skills we have developed go into it. All the crafts we have mastered are concentrated on it. It represents the many kinds of Fisher craftsmanship combined in a fighting tool that gives our men the all-important edge.

We believe in armament that holds an actual combat advantage within itself. That's why we throw our reserve of fighting craftsmanship into every tank, bomber or gun we build. And our fighting men tell us that it's an added advantage when the going gets tough.

• • •

Every Sunday Afternoon
GENERAL MOTORS SYMPHONY OF THE AIR
NBC Network

armament BODY BY Fisher

DIVISION OF GENERAL MOTORS

"Mother! Bob's ship's in!"

A thousand miles away, a bronzed young ensign has stepped ashore for the first time in months. And a Navy bride has just received the happiest words in the world.

Tonight, she'll be speeding to him—for a brief, belated honeymoon before he puts to sea again.

She is one more reason trains are crowded now and Pullman travel is the heaviest in history. There'd be no problem handling such a load if the whole Pullman fleet were in regular passenger service. But it isn't. Many cars are assigned to special troop trains, moving an average of almost 30,000 men a night.

So *fewer* cars must serve *more* people. And there are bound to be some inconveniences, at times. Occasional disappointments, too. But more wartime travelers cheerfully accept whatever accommodations are available.

That's partly because they feel, as Pullman does, that boys in uniform come first. And partly because they look on Pullman travel now not simply as an overnight adventure in a sumptuous way of life but as an overnight *vacation* that refreshes weary minds and tired bodies.

It relaxes taut, strained wartime nerves. Gives passengers a precious opportunity to do nothing for a change and thus, as like as not, starts those little grey cells to working on thoughts there hadn't been time to think. Then, when bedtime comes, Pullman privacy and comfort *invite* sleep so compellingly that the cares of a war-torn world dissolve in pleasant dreams.

So, if yours is a *necessary* trip—one on which you must get there feeling fit to do the *total* job that *total* war requires—go *Pullman*, by all means.

You'll have a place to sit and a place to sleep that are *all yours* straight through to your destination. And you'll be leaving coach space for *necessary travelers* who can't afford the privacy and comfort you'll enjoy.

★ **BUY MORE WAR BONDS NOW!** ★

PULLMAN

FOR EIGHTY YEARS

THE GREATEST NAME IN PASSENGER TRANSPORTATION

FOR COMFORT AND SAFETY AS YOU GO AND CERTAINTY THAT YOU WILL GET THERE

Women at Work

for

a Railroad at War

Santa Fe

Another chapter in the story "Working for Victory on the Santa Fe"

America needs millions of women to take over war jobs . . . to stay with those jobs . . . to help speed the day when our fighting men will return victorious!

Santa Fe women are answering this call all along the line.

Right now thousands of Santa Fe women are doing war-vital work to "keep 'em rolling." Many of them are pitching into "unglamorous" jobs . . . greasing engines, operating turntables, wielding a shovel, cleaning roller bearings, working in blacksmith and sheet metal shops. They take pride in their work, too!

Many of them have husbands, sweethearts, brothers or sons in the armed forces. Many came to work to replace a relative who had been called into service. Others took jobs because they knew womanpower must step in when manpower goes to war.

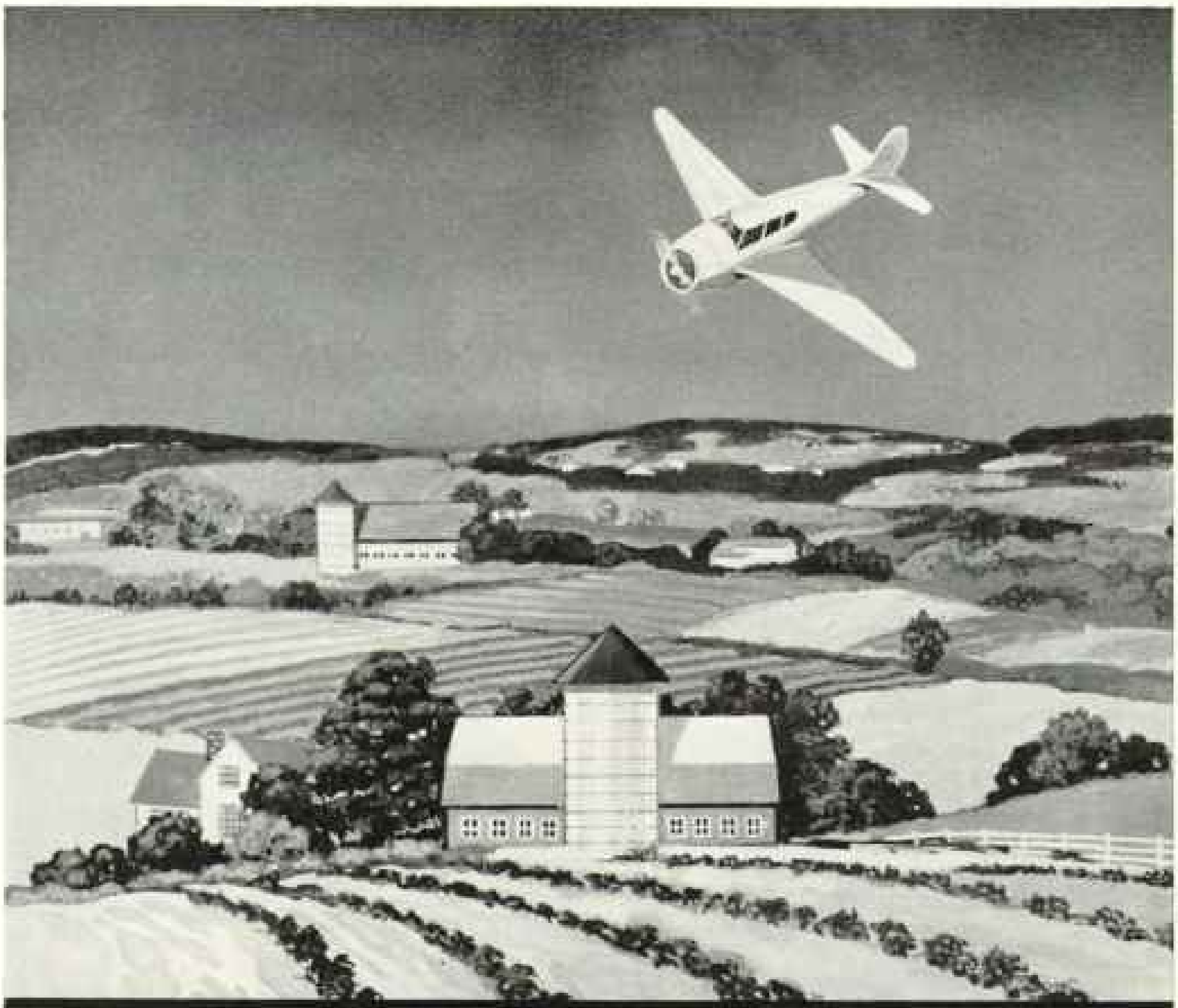
☆ We of the Santa Fe salute these women who know that what they are doing is vital to Victory!

"Back the Attack with War Bonds"

SANTA FE SYSTEM LINES

Serving the Southwest and California

ONE OF AMERICA'S RAILROADS — ALL UNITED FOR VICTORY



HOME

Straight as an Arrow...

With the unconditional surrender of our enemies,—which must be won by our blood, sweat and toil—, will come peace and the post-war period of reconstruction and development.

Aviation, now the No. 1 industry of America, will continue to lead the way. From the centers of our great cities to the vast expanses of our rural sections, Airplanes will play a leading part in our lives. Distances between home and place of business will be of much less importance, as the speed and efficiency of Aircraft will make commuting practical and economical. You can go home straight as an arrow, from wherever you are.

Advanced engineering and foresight will continue Jacobs leadership in the production of dependable and economical Aircraft Engines—*practical engines* for the private owner, the business concern and the "feeder" Airline.

JACOBS AIRCRAFT *Engines*

POTTSTOWN · PENNSYLVANIA U·S·A·

"No scraps for me, any more!"

"It's funny. Used to be lots of stuff left on the plates for me. But no more. D'ya suppose they're giving *my* scraps to some other dog?"

• • •

No, Mike. You're still the family's favorite pup. The reason you don't get juicy left-overs now is because there just aren't any!

Food's gone to war like everything else these days. Folks eat more as they work harder. Soldiers eat a *lot* more. Friends in other countries need our help.

That's why plates go back to the kitchen *clean*. That's why there are no extras for you —*or* your folks. You'll all get *enough* to eat, but there won't be any to *waste*.

We know something about food, here at National Dairy. We've been working with Nature's most complete food—milk—for years and years. We've made many nourishing food products from it.

Right now, our laboratories are busy with new developments—new products for wartime use—new ideas for after the war—when butter, cheese, ice cream and other things are plentiful again.

Meantime, Mike, stay right on the job protecting your family—and we'll do the same!

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

BORING THROUGH ragged gray clouds a hundred miles from New York, the giant Boeing Stratoliner calls LaGuardia Field on the interphone, giving position . . . speed . . . altitude, receiving in turn information on weather ahead and complete landing instructions. Back and forth fly questions and answers . . . and every syllable is electrically recorded!

The recording may be filed and played back any time. Should the flight ever figure in the investigation of an accident or some irregularity in the observance of flying regulations, a running account of all instructions and acknowledgments is available.

Batteries of Dictaphone Electric Recorders are now in operation at airway traffic control centers 24 hours a day, helping to do a vital war job well.

STRATOLINER LANDING TWO PLACES AT ONCE

This is only one of the many innovations in the field of electric recording, which has been created in the Dictaphone Research Laboratories at Bridgeport, Conn., by our sound engineers.

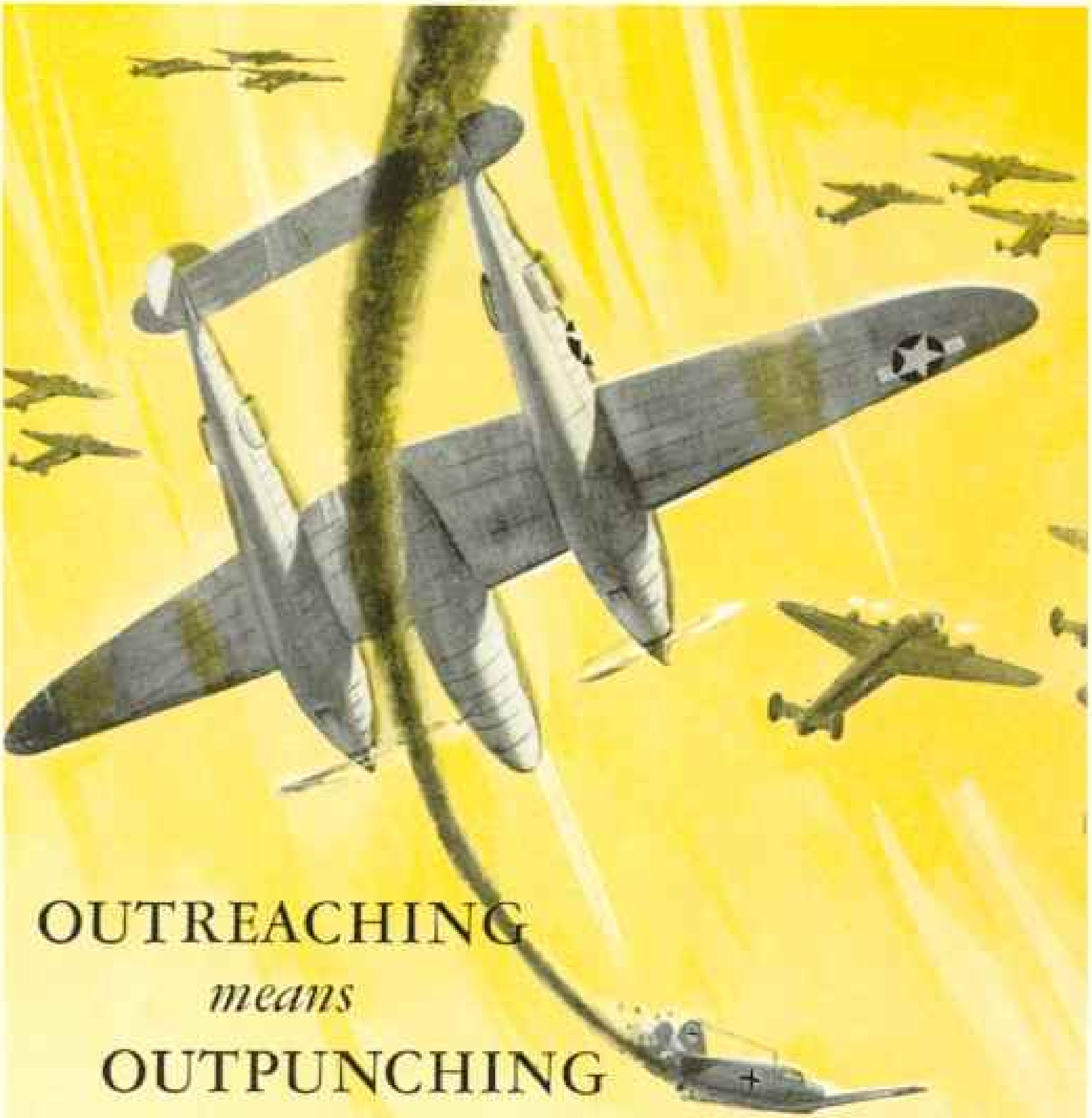
Today, the vast background of skill and knowledge which Dictaphone has acquired during years of effort to make better dictating equipment is available to the armed services and war industries. Wherever the human voice must be recorded and reproduced, there Dictaphone can speed activity.

During the war, the Dictaphone method of dictation serves more effectively than ever, saving precious time and effort for harassed executives. After the war, improvements in electric recording hastened by today's necessity will be giving new satisfaction in Dictaphone-equipped offices.

Dictaphone Corporation, 420 Lexington Ave., New York 17, N. Y.

DICTAPHONE

DICTATING AND RECORDING EQUIPMENT



OUTREACHING *means* OUTPUNCHING

• The longest streak of lightning in the world is flashing through the skies! Super-range Lightning P-38 fighter planes team up with heavy bombers to deal knockout blows at distant targets.

On the production front smoothly-operating teams of Rohr production fighters work 'round the clock to help Lockheed put more and more of these outreaching P-38's on the wing. They use their skills to add new punch behind the challenge of increased production. They work to save the lives which will be spared by quicker victory.

HELPING TO WRITE THE STORY OF TOMORROW

ROHR
AIRCRAFT CORPORATION

CHULA VISTA, CALIFORNIA

Jewels of Today

ARGUS EYES FOR VICTORY

AWARDED TO PLANT 2
OPTICAL DIVISION

PRECISION MILITARY OPTICS
BY

argus

INTERNATIONAL INDUSTRIES, INC.

ANN ARBOR MICHIGAN

FINE AMERICAN
CAMERAS

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PRECISION OPTICAL
INSTRUMENTS

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AVIATION RADIO
EQUIPMENT

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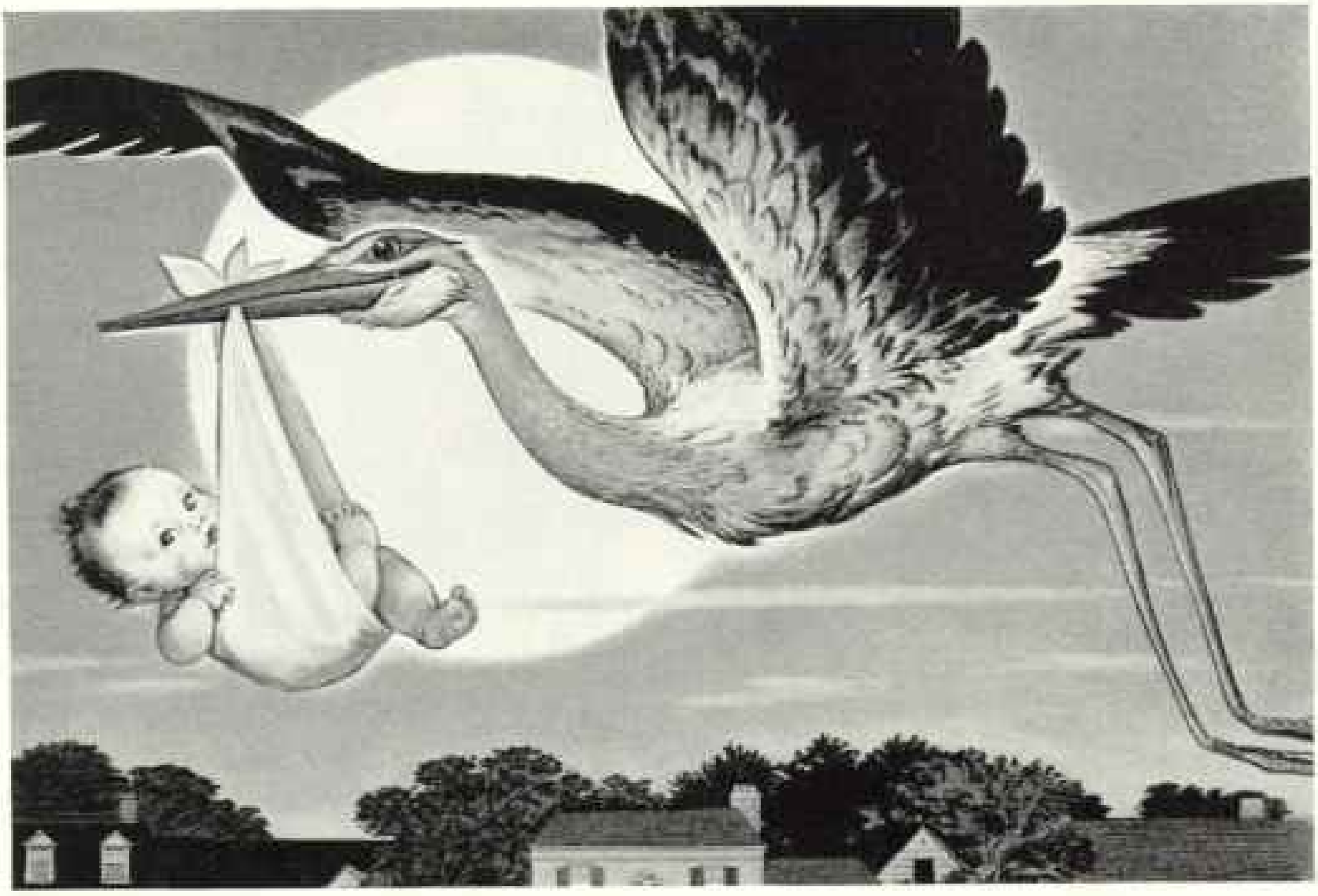
BUY WAR BONDS



When the stork arrives in Wartime

EVERY mother-to-be wants, above everything, a healthy, happy baby. The wisest step she can take is to see the doctor *early*—especially in these days of wartime worries.

Such a visit helps the doctor keep both mother and baby in the best possible health . . . helps them avoid complications while medical and hospital facilities are under great strain.

An early visit also enables the doctor to schedule later visits to conserve his and the mother's time . . . to make hospital or home arrangements including, perhaps, available nursing service.

For expectant mothers who are employed, it is *doubly* advisable to seek the doctor's early advice about the suitability of the work and how long it may continue.

Wartime conditions, including rationing, make the doctor's individual advice especially helpful. Here are some things he usually emphasizes . . .

A nourishing diet. The mother needs the basic foods essential to the health of both herself and her baby. The right diet also helps keep the mother's teeth in sound condition. A visit to the dentist may be advised.

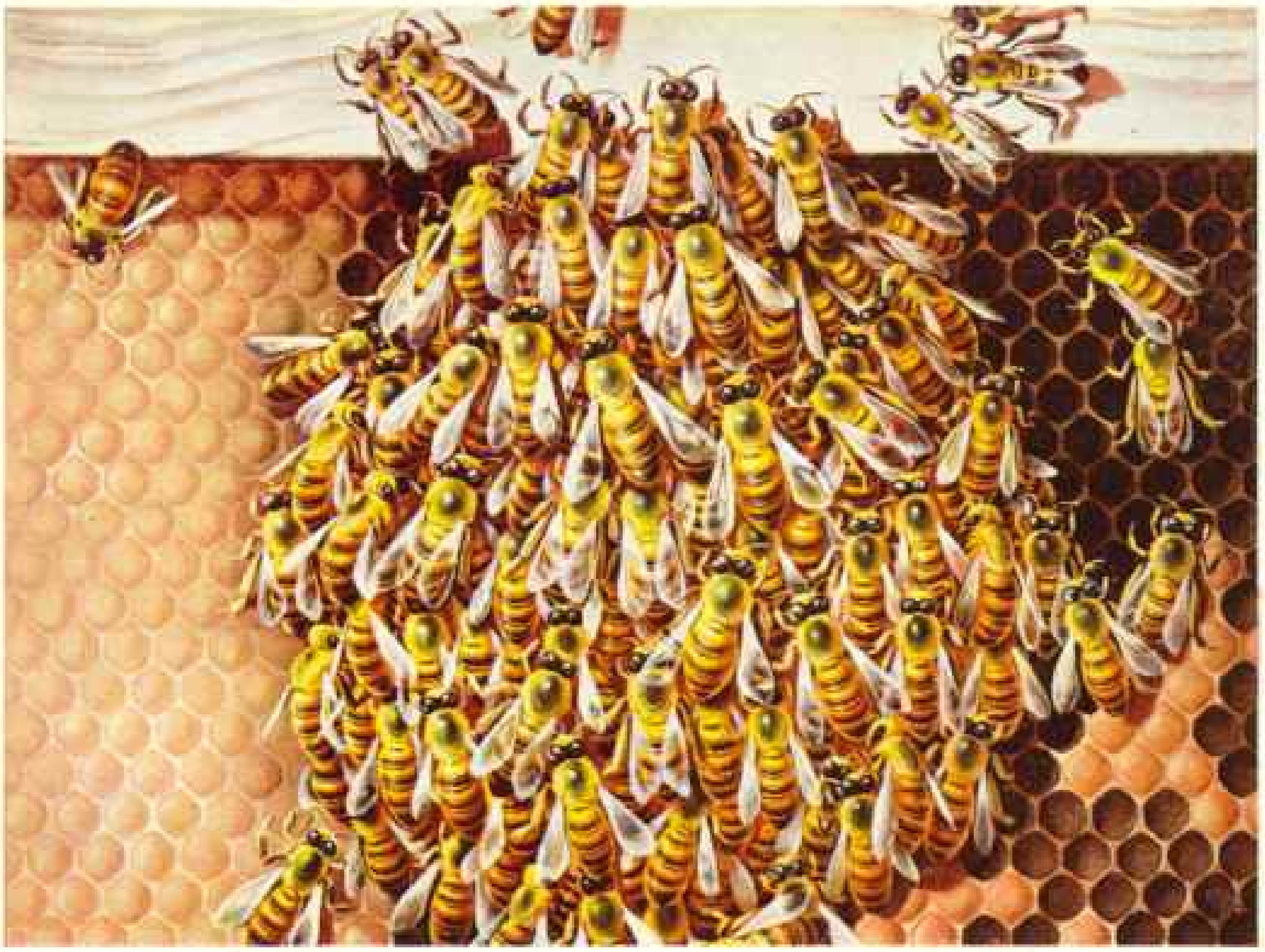
Exercise, sunshine, and fresh air. Proper exercise helps the body's muscles make necessary adjustments. Violent effort—especially reaching—should be avoided.

Sleep and rest. Eight hours each night is the minimum. Daily rest periods and an afternoon nap are beneficial. It is wise to perform as many household tasks as possible while seated—preparing vegetables, for example.

Clothing. In general, clothing should be light in weight, comfortably warm, attractive and, for economy's sake, easy to alter. Shoes of the type most comfortable to you are important.

A booklet of facts—free

Upon request, Metropolitan will mail you a 48-page booklet, 123-N, entitled, "Information for Expectant Mothers."



No coal, no oil, but they keep warm

Although the common honeybee (Apis mellifera) is not physically equipped to withstand cold weather, she is often found in climates where winters are severe.

And, unlike some insects whose life span is no longer than a season, a honeybee may live through the winter and into the following spring.

This is possible only because of the ingenious co-operative system by which she manages to keep warm, even at low temperatures.

The bees ball together in the hive, those in the center generating heat by moving constantly in a sort of dance. At intervals, they change places. Those that have been outside, exposed to the cold, go to the center.

By pooling resources in this way, honeybees are able to protect themselves from serious danger which they could not meet singly.

Of course instinct causes a honeybee to use this effective group protection. She is merely following out the plan which nature has prescribed for her and over which she has no control.

Now if you'll stop to think it over, man, even more than the honeybee, is threatened by dangers which he may find it difficult or impossible to meet alone.

A fire or windstorm may damage his property, an accident cause injury to him or his family. Expenses which follow can be extremely heavy. If he had to meet them alone, it might mean financial ruin.

Nature has prescribed no solution to these problems for man. But man, using his intellect, has arrived at one. He has worked out a means of combining his resources to protect himself from these hazards. He does it through insurance.

With proper insurance protection, you will not need to worry about how you can meet any unusual expenses which may result from an accident.

Are you certain that you have such protection, adequate for all emergencies? Your local Travelers man will be glad to check this for you.

Moral: Insure in The Travelers. All forms of insurance and surety bonds. The Travelers Insurance Company, The Travelers Indemnity Company, The Travelers Fire Insurance Company, Hartford, Connecticut.

Have a "Coke" = Good winds have blown you here

...a way to say "We are friends" to the Chinese

In far-off places, when Coca-Cola is on hand, you find it cementing friendships for our fighting men. China knew Coca-Cola from Tientsin to Shanghai, from Hong Kong to Tsingtao. To Chinese and Yank alike, *Have a "Coke"* are welcome words. They belong with friendliness and freedom. From Atlanta to the Seven Seas, Coca-Cola stands for *the pause that refreshes*—has become a symbol of good will among the friendly-minded.

* * *

Our fighting men are delighted to meet up with Coca-Cola many places overseas. Coca-Cola has been a globe-trotter "since way back when". Even with war, Coca-Cola today is being bottled right on the spot in over 35 allied and neutral nations.

"Coke" = Coca-Cola

It's natural for popular names to acquire friendly abbreviations. That's why you hear Coca-Cola called "Coke".

An American Tradition

—HOME MOVIES ON CHRISTMAS NIGHT

THIS is a scene from the reel they made the last time Jim was home on leave. And so it is particularly precious to them this Christmas night, when their thoughts are so much with him . . . when, faithful to a family custom of years' standing, they set up the projector, turn out the lights, and relive the happy yesterdays.

Of course film is scarce, although you may be able to get a roll. But in any event there are the reels of other years, ready and waiting to make this Christmas a memorable one.

Have your Ciné-Kodak dealer check your projector . . .

If you haven't used your projector as often as usual during this busy year, have your Ciné-Kodak dealer clean it, oil it, and check it; then you can be sure it will be running smooth as silk . . . Eastman Kodak Company, Rochester, N. Y.

Life is a movie—**CINÉ-KODAK** *gets it all*

First American vessel to reach China and establish profitable trade in tea, silks and rare spices. One of the trading ships which identifies Old Spice Toiletries for Men.

OLD SPICE . . . a name that men depend upon . . . Shaving Requisites, with the tangy refreshment and fine quality for which Shulton is famous. Distinctively packaged, individually or in sets, from 50¢ to $5.00.

THE RIGHT GIFT FOR ALL. First choice in Christmas Gifts this year is United States War Bonds and Stamps. Buy them today for the Peace tomorrow for the Prosperity of the future.

*Trade Mark Reg. U.S. Pat. Off.
Shulton, Inc. • Rockefeller Center • 630 Fifth Ave., New York 20, N.Y.

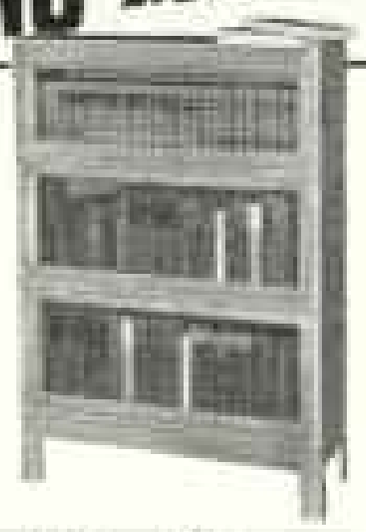
Set your course due southwest for the sunniest point on the compass—for Phoenix, of course, in the friendly, fascinating Valley of the Sun. Even if wartime tasks and travel have tied you down for the duration, this delightful *Certified-Climate** is well worth waiting for! Meanwhile, you can at least begin dreaming of your Valley of the Sun sojourn—and buying more Bonds to hasten the day of your liberation.

* ..."Certified" when the Valley of the Sun was chosen by the U. S. Army as one of America's foremost aviation training centers because of its unexcelled climate and weather conditions.

For free, profusely illustrated booklet and cartograph map, write Valley of the Sun Club, 431 Chamber of Commerce Bldg., Phoenix.

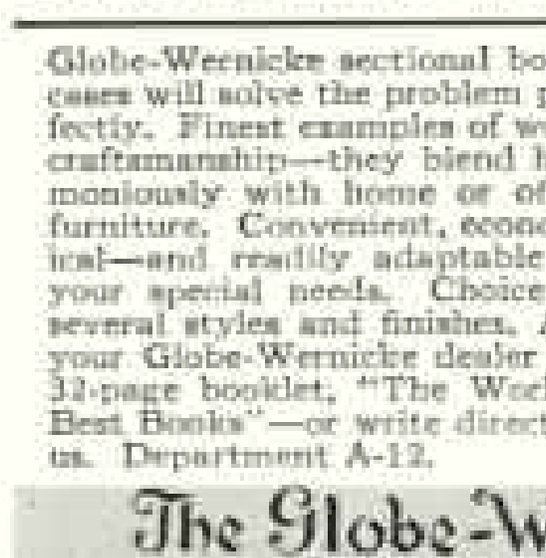
Phoenix Arizona
In the Valley of the Sun

"GROWING PAINS" IN YOUR LIBRARY?



Globe-Wernicke sectional bookcases will solve the problem perfectly. Finest examples of wood craftsmanship—they blend harmoniously with home or office furniture. Convenient, economical—and readily adaptable to your special needs. Choice of several styles and finishes. Ask your Globe-Wernicke dealer for 32-page booklet, "The World's Best Books"—or write direct to us. Department A-12.

The Globe-Wernicke Co.
CINCINNATI, OHIO

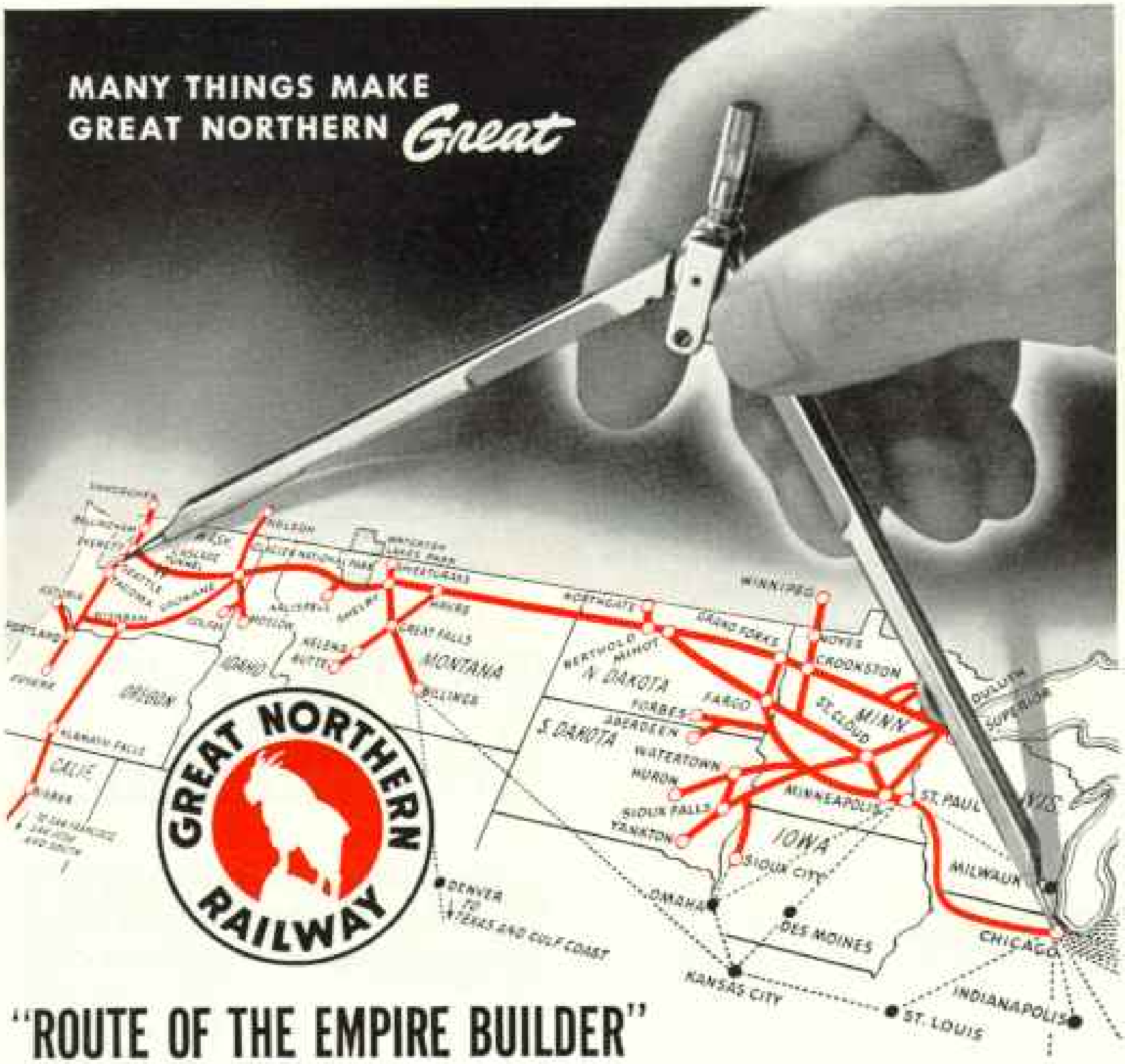


Superbly Made
COLOR SLIDES
ON MORE THAN 15,000 SUBJECTS

Choose 2" x 2" color slides from the S.V.E. Library. ART, NATIONAL PARKS, SCIENCES, etc. 50¢ per slide. Sets of 5 slides with 5 S.V.E. (Glass) Slide Binders (at no extra cost) $2.50 per set. Society for Visual Education, Inc., Dept. 12-G, 100 E. Ohio St., Chicago (11), Ill.

Write for **FREE** Circular!

THE SVE LIBRARY OF KODACHROMES



"ROUTE OF THE EMPIRE BUILDER" MEANS "DEPENDABILITY" TO SHIPPERS AND PASSENGERS

Great Northern Operating "Know How" is Big Factor in Maintaining Victory Pace

Dependable transportation by rail never has been so important as now, when armament, iron ore and steel, explosives, lumber, plywood, copper, aluminum, magnesium, and an impressive list of foodstuffs are moving from and to Great Northern territory.

Equally important is Great Northern's movement of men and supplies bound for all the theaters of World War II.

This year Great Northern will handle the greatest traffic load in its history with fewer locomotives and cars than during World War I. Its superbly-engineered route between the Great Lakes and the Pacific makes this possible.

Great Northern's short, strategic line crosses the Rocky Mountains in Montana through Marias Pass, lowest in any northern state, and the Cascades in Washington through 8-mile Cascade Tunnel, longest in the Western Hemisphere.

These advantages assure greater comfort for passengers and dependability of freight schedules.

Here's a mammoth G. N. locomotive roaring down the Victory trail with a trainload of war supplies. Regular passenger and freight trains, in addition to special military trains, are handled by different motive power, each designed for a specific job — diesel, electric, coal-burning and oil-burning steam locomotives.

GREAT NORTHERN RAILWAY

BETWEEN GREAT LAKES AND PACIFIC

The Movado Calendar Watch—a limited supply is available in sizes suitable for men and women.

MOVADO

WINNERS OF 18S OBSERVATORY AWARDS
SOLD AND SERVICED BY LEADING JEWELERS ALL OVER THE WORLD

See SAN DIEGO FIRST

When Peace comes, travel-hungry America will find new delight in postwar SAN DIEGO; an old friend in new clothes, with the accent on a fuller life commensurate with a far greater place in the activities of West Coast development.

Buy War Bonds Now . . . plan SAN DIEGO as your first objective when war ends. ¶ Write for "San Diego Facts". Address: San Diego-California Club, Room B-57, 499 W. Broadway, San Diego 1, California.

SAN·DIEGO
SOUTHERN CALIFORNIA

LENOX CHINA

Oak Leaf Pattern.

In your plans for the future, include a service in Lenox China. Start your service now with the "Mr. and Mrs. Plan." The finest materials and skilled craftsmanship make Lenox China a wise and economical investment in design, beauty, quality and durability.

• • BUY WAR BONDS FIRST • •

Send ten cents for "Fine China." Learn the difference between fine china and earthenware and what that difference means to you in the selection of your service.

LENOX INCORPORATED, Trenton, N. J.

ELECTRONIC HEARING AID
brings back a world of sound

Send name for new hearing experience.
Maico Co., Inc., Dept. 60-A, Minneapolis 8, Minnesota

SHEPARD Home LIFT

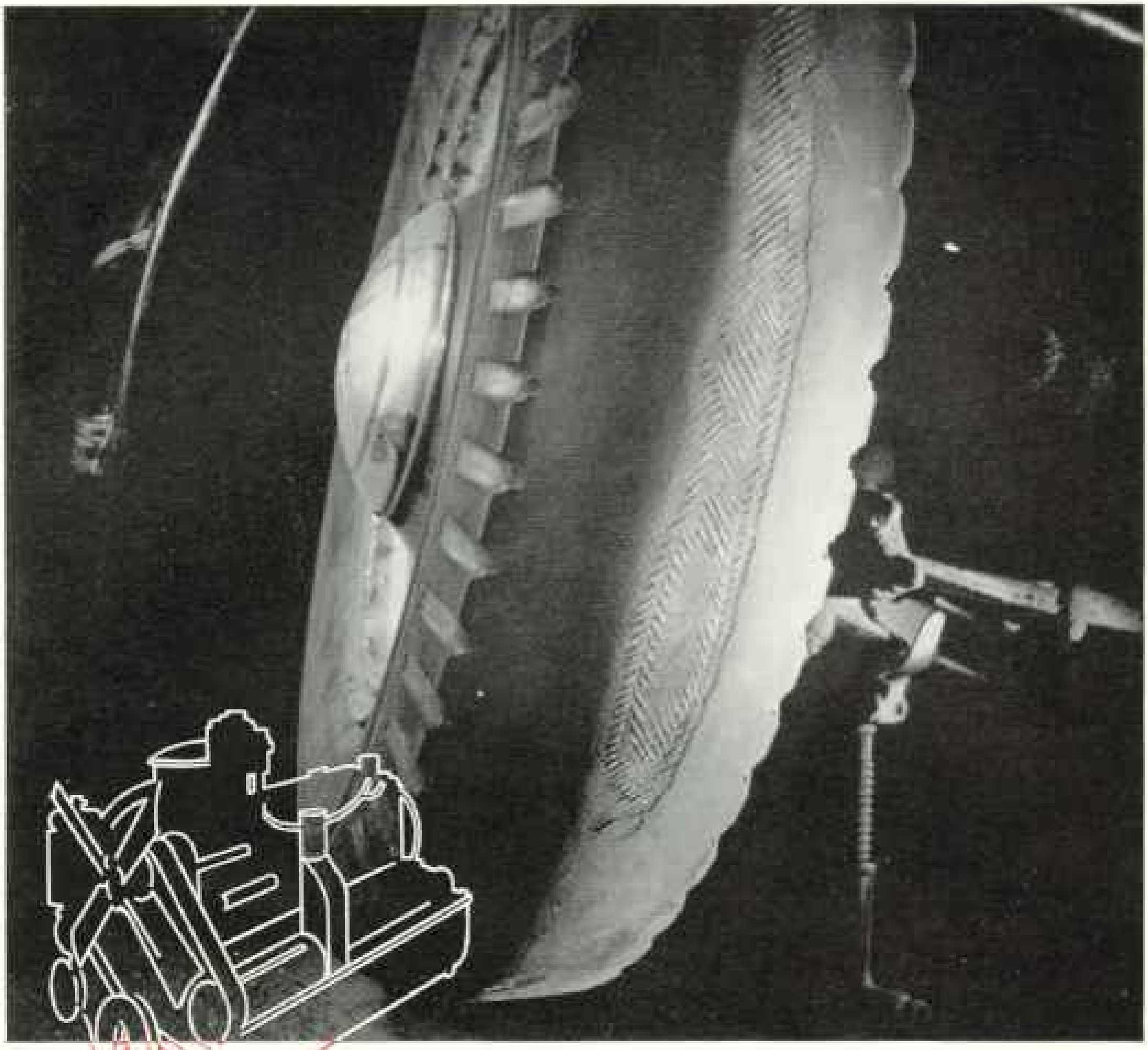
THE AUTOMATIC ELECTRIC RESIDENCE ELEVATOR

Operates from Light Circuit

Safe—dependable. Moderate price—inexpensive to operate. Easily installed in new or old homes.

Not available now because of war work, but send for descriptive literature. Keep this desirable home convenience in mind.

THE SHEPARD ELEVATOR CO.
Builders of Finest Office and Hotel Elevators
2432 COLERAIN AVENUE CINCINNATI, OHIO
Representatives in Principal Cities



You Can't "Re-cap" a Worn Motor!

It's easy to see what friction does to your tires—but what about your motor? Friction is hard at work every second the motor runs. It not only wears out hard-to-replace metal parts, but motor friction wastes gasoline, too! That's why you should start using Macmillan RING-FREE Motor Oil at once. RING-FREE measurably reduces friction! In scores of road tests with various makes of owner driven cars, the average gasoline saving was 1.3 miles per gallon after crankcases had been drained and refilled with Macmillan RING-FREE Motor Oil. There's real, *measured* proof of friction reduction! Start using RING-FREE—keep on using RING-FREE to *save gasoline* and to lengthen motor life.

Removes Carbon *while you drive!*

If your valves, pistons and rings are suffering from carbon accumulations, try RING-FREE. You'll get a cleaner, more thoroughly lubricated, better running motor. By continued use of RING-FREE you fight carbon all the time — cut repair bills, save gasoline.

MACMILLAN PETROLEUM CORP.

50 W. 50th, New York • 624 S. Michigan Ave., Chicago • 530 W. 6th, Los Angeles

BUY RING-FREE WHERE YOU SEE THIS SIGN

*DUES: Annual membership in United States, $3.50; Canada, $4.50; 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 6, D. C.:

I nominate _____

Occupation _____
(This information is important for the records)

Address _____

_____ *for membership in The Society.*

_____

_____
Name and Address of Nominating Member

12-43

She Still Has "The Voice With A Smile"

War traffic keeps her busier than ever but she manages to keep calm and pleasant.

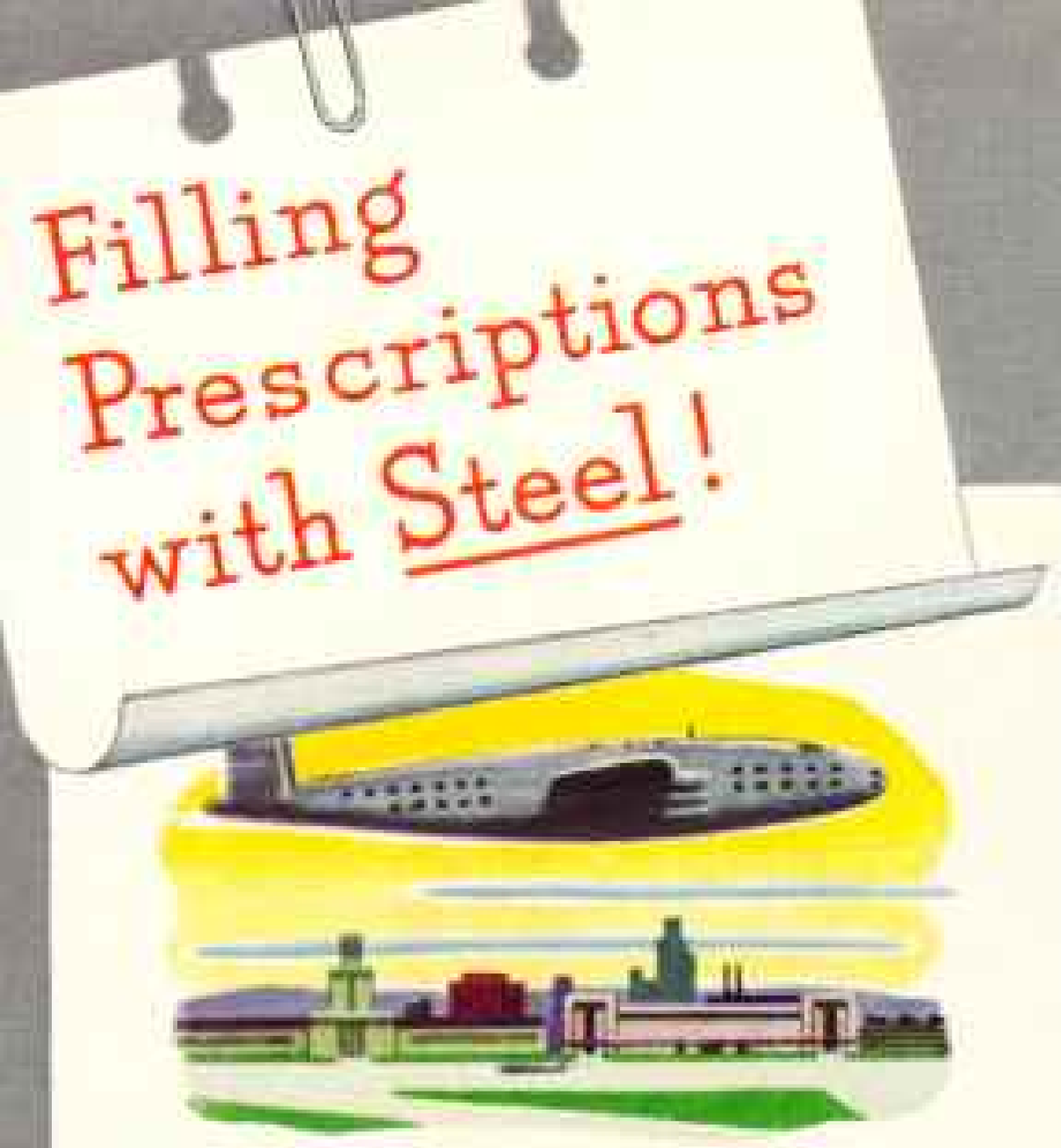
She still has "The Voice With A Smile" even when the lights are thick on the Long Distance switchboard and the circuits are crowded. Even when she has to ask you to—

"Please limit your call to 5 minutes. Others are waiting."

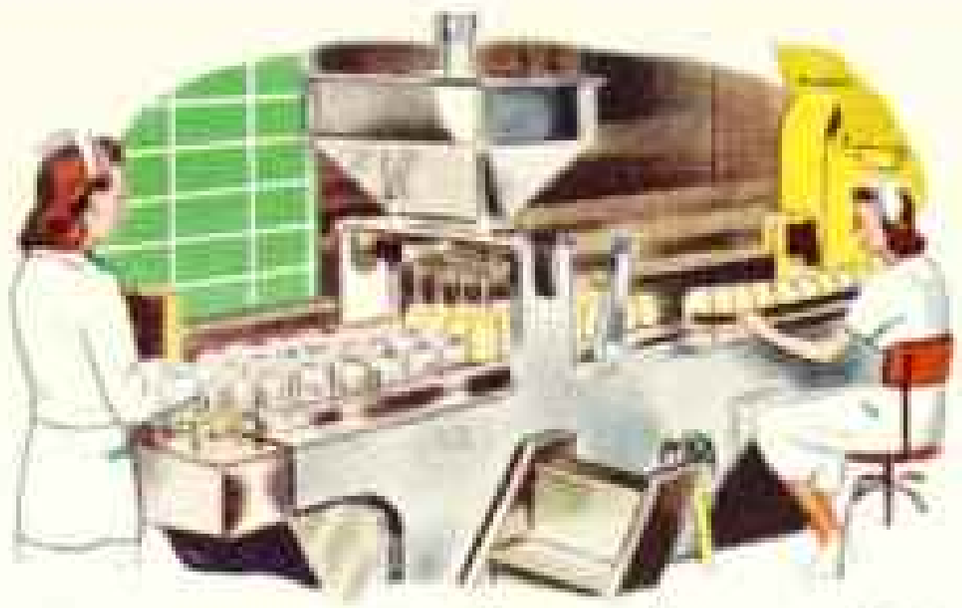
That's to help everybody get better service and you couldn't ask for a better reason than that.

BELL TELEPHONE SYSTEM

Filling Prescriptions with Steel!



1. BETTER STEELS! This country needs aircraft that fly high and far . . . and hit hard. It needs ships in great numbers. It needs tanks that can take it when the going gets tough. It needs equipment to outperform any on earth. All these things require many special steels. Such steels with needed properties are created through the use of *alloys*. Basic peacetime research by ELECTRO METALLURGICAL COMPANY, a Unit of UCC, has developed many important steels and the alloys to make them, such as chromium, silicon, manganese, vanadium, tungsten, calcium, and columbium . . . all vital today.



2. STAINLESS STEELS! The development of steels of high chromium content gave designers and engineers a whole family of new materials with which to work. Such steels resist rust and corrosion, and are easily kept clean. They are essential in the food industry. Possessing great strength in addition to their corrosion resistance, they save weight in trains and planes. They have brought improvements in the oil, chemical, textile, and other fields . . . with resultant savings to you. Low-carbon ferrochromium, an Electromet development, is essential in the large-scale production of stainless steels.

3. NEW NATIONAL RESOURCES! Tungsten and vanadium are essential to steelmakers. Long before war clouds loomed, many felt that more of this country's domestic sources of these metals should be developed. Engineering research by UNITED STATES VANADIUM CORPORATION, another UCC Unit, found efficient ways of refining low-grade ores. This enabled U. S. VANADIUM to revitalize old mines with new mills and methods, and make America less dependent on foreign sources for her increased needs of tungsten and vanadium.

4. BUILDING TOWARDS THE FUTURE! Alloy steels offer still greater promise for the future. Bridges and other structures will be made still lighter, stronger, and longer-lasting by wider use of some of these steels with which engineers are already experienced. Trains, trucks, and aircraft will be made lighter, stronger, faster, and safer. Better cars and tractors, homes and home equipment will be made through their use.

Units of UCC do not make steel. They do make ferro-alloys used to purify and give special properties to steel. They also make non-ferrous alloys which, because of their exceptional resistance to wear, heat, and corrosion, are used as cutting tools, hard-facing welding rods and for other purposes. UCC research and developments mean ever-new and improved alloys for industry . . . and ever-better products for you.

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