VOLUME LXXXII NUMBER FIVE

THE NATIONAL GEOGRAPHIC MAGAZINE

NOVEMBER, 1942

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

$4.00 A YEAR 50c THE COPY

VOL. LXXXII, No. 5 WASHINGTON NOVEMBER, 1942

THE NATIONAL GEOGRAPHIC MAGAZINE

QM, the Fighting Storekeeper

By FREDERICK SIMPICH

"QM," the Army calls him. That's short for Quartermaster General. He feeds, clothes, hauls, and comforts the whole Army, shooting with one hand and working with the other.

In all the long, exciting annals of our Army, from Valley Forge to Bataan, no force has played a more important role than the Quartermaster Corps. Like the work of Army doctors, however, its great and gallant deeds are often unsung.

Only now details from Bataan trickle out. With what grim genius those fighting quartermasters scoured that impoverished peninsula for food!

As famine spread, they threshed rice from peasant fields and made salt from sea water. They killed first their carabaos, or work buffaloes, then they slaughtered their own horses and mules that hungry soldiers might fight on (page 563).

Many, sticking grimly to their posts, died when bombs fell on their makeshift jungle shops. The whole Nation is justly proud of that heroic defense. It will live in Army history, along with memories of the Alamo and of Custer's Last Stand.

An epic tale, truly, is this stirring story of the Army quartermasters—a story as epic and glamorous as any tale of high adventure in submarines or of fighting through roaring, smoke-filled skies.

The grim, significant thought is, we would lose this war, instantly, but for the QM. Without his vast ambidextrous corps of worker-fighter men not a wheel could turn. From lack of gas, which the QM handles, not a tank could run or a plane fly. But for the QM's care and skill in planning the movement of supplies, whole army divisions might starve, freeze, or die of thirst.

Not even an army band could play to cheer up the boys, without the QM's help; no mule's tail could be shaved, no soldier could buy an all-day sucker, or find paper, pen, and a place to sit down and write a letter home.

World's Biggest Merchandise Mart

Nobody on earth, in truth, has so many different jobs as the QM.

He's the world's biggest purchasing agent, exporter, and delivery boy. His colossal depot warehouses make the big mail-order houses look like crossroads country stores. He's the world's biggest coat-and-suit man, chain-store operator, tobacco salesman, truck and transfer man; biggest tailor, tentmaker, laundryman, musician, radio- and shoe-repair man; biggest cook and baker—he can turn out 3,000,000 loaves of bread a *day*!

How can you bake bread in fox holes, under fire on the battlefield? That's just one QM riddle out of thousands. That's what Maj. Gen. Edmund B. Gregory, Quartermaster General of the Army, was quickly deciding when I saw him last (pages 562 and 575).

When he isn't popping up unannounced in some training camp to see how QM work is going, or walking unexpectedly into a giant factory that has a contract to make him 10,000,000 shirts, he's busy in a seething new Army building down on Buzzard Point, Washington, D. C.

Husky, hardworking "Pope" Gregory is called the world's biggest, busiest business man. But because he is a good executive, who knows how to share work and authority with subordinates, he doesn't *act* busy when you call upon him.

But don't let that smiling, leisurely manner fool you. Under it lie the alertness of an Indian scout, the latent muscular power of

U. S. Army Signal Corps

Proof of the Pudding Is That the Quartermaster General Himself Eats It

There's an old saying that a restaurant keeper seldom eats his own food. Well, here's Maj. Gen. Edmund B. Gregory, who feeds and supplies the whole Army, lunching at his desk on the same field ration he serves to the soldiers.

a calm, stalking boxer waiting the right split second to soak his opponent in the giblets!

QM's Hardest Job

"Among all your jobs," I asked, "which is the hardest?"

"Finding the right man for the right place," he said. "Look how the Army is growing—from 250,000 to four or five millions, and you'll see what I mean."

"What odd jobs have you, unsuspected by the public?"

"Well, I'm the world's leading dog trainer. We use more and more dogs, for many purposes. Also, I test piccolos and trombones, and my QM tailors design uniforms and even panties for this new women's army."

I said, "Peculiar problems must come up, too. I hear cranks write you, saying you should train prairie dogs to dig post holes, or import pack llamas from Peru—or even organize a camel corps."

"All the advice we get isn't bad," answered the General. "We *are* using some camels now, in a certain part of the world, for the first time since Jefferson Davis was Secretary of War and brought camels from the Near East for use in Arizona and New Mexico. Our biggest headache, of course, is pondering the shape of things to come—how to get food, clothes, and supplies to all the new fronts that are opening all over the world."

Besides all his hard and more spectacular jobs, the QM is also guide, counselor, friend, and indulgent father to uncounted thousands of young soldiers. They depend on him for every comfort, from peanuts and sporting goods to four-octave chapel organs, hymnbooks, and crucifixes.

Versatility, in fact, is a good quartermaster's middle name. One hard-bitten veteran I knew on the Mexican border could recite the Book of Common Prayer as solemnly as any rector. In an emergency, with no chaplain about, he could say the whole burial service—without a book. But for balky mules, or a truck stalled in the mud by green drivers, he also had an appropriate vocabulary!

Logistics—War's Most Meaningful Word

"But it's food, fuel, and clothing—and keeping them moving—that challenge us to our supreme effort," adds General Gregory.

"Logistics," says Webster, "is that branch of the military art which embraces the details of transport, quartering, and supply of troops."

U. S. Army Signal Corps

Bataan Bakers Worked While Guns Boomed and Bombs Burst

Time and again on Corregidor and in Luzon jungles, Quartermaster shops were blown to bits. Then brave QM men quietly buried their dead, carried their wounded to shelter, and went on gathering rice for bread, making salt from sea water, and killing and cooking their own horses and mules to feed the heroes.

Transport comes first in the dictionary, and in fact. Today it is machine power that wins.

"It is useless to procure large numbers of men," says General Sir Walter King Venning, until recently Quartermaster General of the British Army, in the Quartermaster Review, "if they cannot be fed, clothed, and housed.

"All history bears witness to this. Hannibal after Cannae was not able to destroy the Romans, since his supplies were inadequate; Marlborough, in order to win at Blenheim, had to make long-term contracts for bread and bread wagons and to install quantities of boots at depots on the way; Wellington, before he could reduce Seringapatam, had to breed the bullocks required for his transport."

Rommel got into Egypt only because his supply and repair crews raced ahead, along with his fighters.

Counting all men and women in factories making goods for the Quartermaster, it is fair to say more people work for him than for any other one boss. Within the Army itself, it is the same. The big Army today has more truck drivers than it had soldiers when Hitler took the warpath.

But no man can drive a QM truck today, or even be an Army cook, who isn't already a trained fighting soldier. Even the radio men and shoe-repair crews are armed. Everybody in the supply train is armed.

It's just as it was in pioneer western days, when prairie-schooner emigrants had to jump off their wagons, guns in hand, to take cover prone behind dead horses or convenient rocks and trees to fight off the circling, war-whooping redskins.

"Each battle in this global war," says Col. George A. Horkan of the Quartermaster School at Camp Lee, Virginia, "proves that the speed of moving troops is geared to the speed and efficiency of supply trains. The quartermaster, then, becomes the key man in the solution of today's strategic problems.

"Basic principles of war have not changed much since Genghis Khan. He was the father of *blitz*. Surprise attack, lightning thrust, the wedge-shaped formation used by Von Brauchitsch to bring Poland to its knees, were all used by the Khan 800 years ago—and later successfully employed by his followers *right there in the same Poland!* Only difference was that the Germans used tanks and armored cars; the Khan used tireless ponies and deadly arrows.

"Today's higher speed in moving troops

U. S. Army Signal Corps

Smiling, Hungry Soldiers Curl Their Lips over Savory Roast Turkey

This Army Thanksgiving dinner was served in Iceland. Look at all that dressing flavored with sage, and at those big brown mince pies, and the fat mugs of coffee! There are grins on the pleased faces of the English lads who share this feast with their Yankee comrades in arms.

simply means we have to deliver food and other supplies that much faster. Now it isn't enough to keep up with *marching* armies; QM has to keep up with troops hurtling forward at the rate of 100 to 200 miles a day.

"That's why, today, QM troops must be armed to fight, because so often they find themselves right in the thick of battle, as on Bataan. That's why, here at the QM school, cadets go in for chemical warfare, work on pistol and rifle ranges, learn use of tommy guns, map reading, jungle and desert warfare, infantry maneuvers, as well as strictly QM problems. We make 'em soldiers first, then quartermasters."

Transport Keystone of Modern War

Few civilians realize that almost one soldier in every three drives a truck, or works as an automotive mechanic or fuel man. This Army life line of motor transport all centers at QM's Holabird Motor Base, Baltimore, Maryland. This motor camp, with all its stockrooms, schools for mechanics, repairing facilities, and general offices, resembles the "shops" of a great railway system.

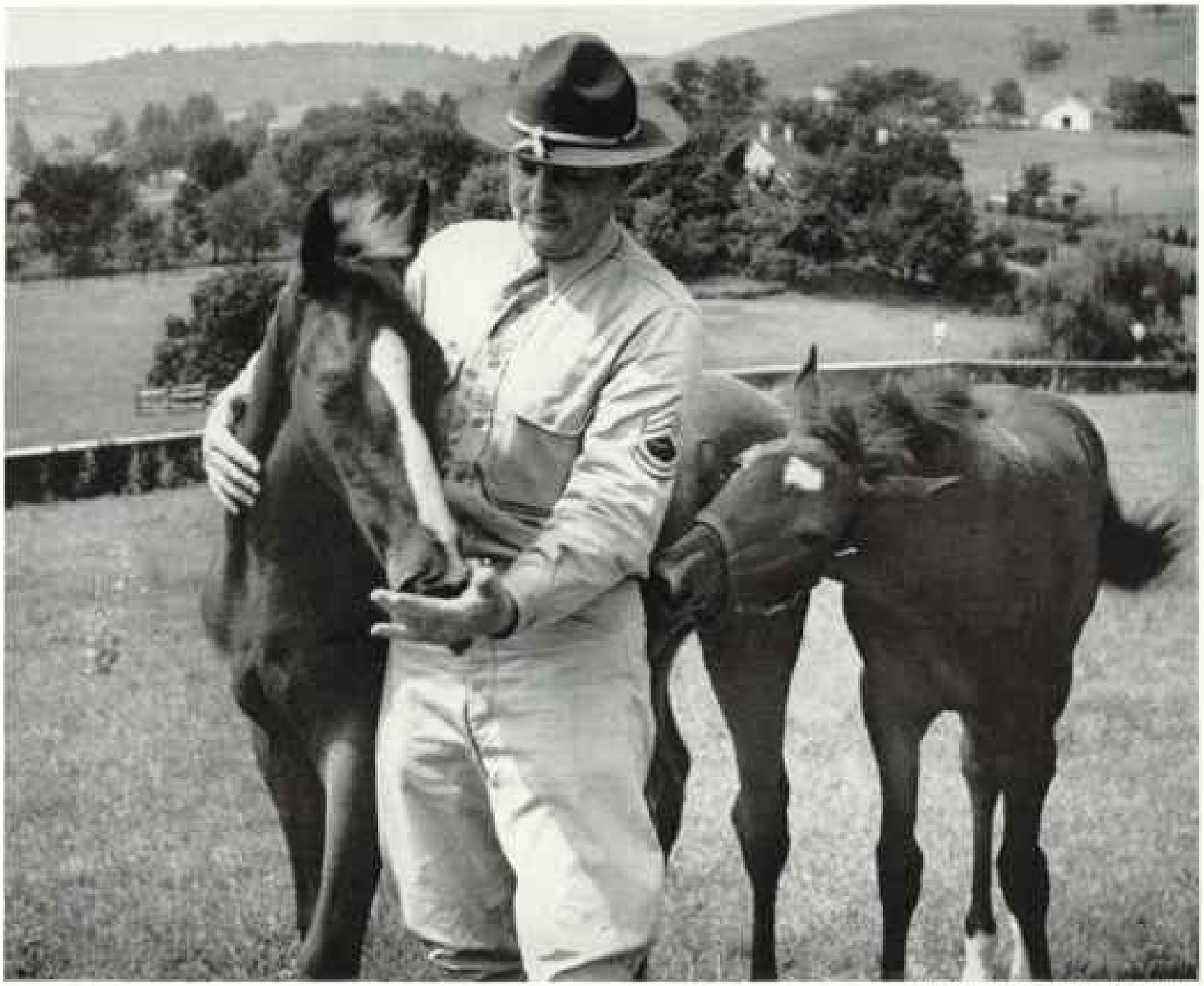
Here they test new vehicles. Hanging on for dear life, I rode the back-breaking test course with a "death driver" who put his weapon-carrying truck over a washboard road of concrete slabs, over railway ties, through ditches and mudholes, up steep hills and down.

"Are you trying to bust her up?" I yelled as we bounced high in the air.

"No! Just seeing if she can take it!"

All about us roared other tactical vehicles, including flocks of motorcycles raising thick clouds of dust, and little peeps and jeeps that wallowed through imitation bomb craters bigger than themselves. There were strange-looking vehicles, too, whose very existence is a military secret.

Based on trials and experience here, QM is standardizing the Army's whole transport serv-



Staff Photographer J. Baylor Roberts

Colts Beg for Sugar at the QM Station, Front Royal, Virginia

Thousands of horses and mules purchased by the QM are received here each year. After physical checkups and inoculations, they are clipped and branded with a serial number, then shipped out to the armed forces. Here, too, the Army keeps stallions and brood mares and raises a few colts (page 590). Recently this Remount Station has received canine recruits for the Army's new corps of war dogs (text below).

ice. In World War I we used 216 different makes of cars and trucks. Now, to have spare parts more interchangeable, we use only 16 types.

Army Trains Dogs To Be "WAGS"

Away over in one corner of the camp, as we went by, caged watchdogs barked and growled. They were there for grim nocturnal guard work.

If you ever worked in a dog and pony show, you may get a job now with the QM, training dogs for war work. And that young Airedale, why don't you give it to Uncle Sam? Or that Boxer, Doberman, Schnauzer, Dalmatian, Collie, or Shepherd? If your dog is one to four years old, the Army would like him, to train as a watchdog or for other man-saving work. If they take your dog, they tattoo an identification mark on his left ear.

With the approval of the American Kennel Club, an organization of dog fanciers, Dogs for Defense, Inc., aids the Army in acquiring and training these useful animals. (Its address is 22 E. 60th St., New York City.)

Hitler's army was reputed to have 150,000 dogs in use when war broke with England. Previously, Germany had shipped 25,000 dogs out to Japan, and it is known the Russians are using fully 50,000 dogs to carry supplies and aid the wounded.

Our QM asks now for a force of dogs to pull sleds, to help human sentries guard supplies, piers, munitions, etc. From the Commander of the Hawaiian forces comes a request for "the best dog trainer available" to help build up the island dog corps.

Big dogs, such as Newfoundlands and Great Danes, are trained as water and supply carriers, and also to lay telephone lines by carrying on their backs a drum from which wire is unrolled. Likewise, big dogs are trained to

U. S. Army Signal Corps

QM Trains, Trucks, or Planes Accompany Marching Infantry to Bring Food, Clothing, and Other Supplies

Each soldier carries a rifle, ammunition, helmet, and pack, weighing in all about 80 pounds. Here goes a headquarters detachment on maneuvers in Virginia.

Staff Photographer J. Baylor Roberts

Temperamental as a Prima Donna, the Rollicking, Frolicking Army Mule Earns His Hay over Rough Mountain Country

Mule skinners may call him "hardtail," "barnyard canary," or "jughead," but since Abraham's time he has been man's faithful beast of burden. Today Army agents scour the American countryside for still more mules. Here at Fort Bliss, Texas, a mule pack train follows its bell mare on a trip over the mesas above El Paso.

U. S. Army Signal Corps

Rolling Laundries Do Soldiers' Wash as the Army Moves Forward

To keep well a soldier must keep clean. So these QM laundries-on-wheels follow the marching troops, who are too busy with war problems to stop and wash their socks or hang a shirt on a hickory limb.

locate wounded men. Army also trains dogs for the Navy and the Coast Guard.

Sentry dogs, through their superior sense of smell, can detect the approach of intruders long before the soldier on guard may even suspect their presence. Dogs can smell a man 200 yards or more away, if the wind is right.

Trained to growl, bark, or even seize a prowler by the arm, watchdogs are invaluable to the Army. Already, dogs trained both by private dog teachers and by the Army itself have been drafted for duty. The number in use is a military secret.

Front Royal, Virginia, a Quartermaster Remount Station, is the main reception center for dog recruits. Each dog is "documented"; he has his "papers," like a soldier.

Dogs Learn to Work in Snowdrifts

Training a dog takes six weeks or more and costs about $70. Professional dog trainers are hired to train soldiers to train dogs. Out in the snowy Colorado mountains one crew teaches dogs to work in the deep snowdrifts.

QMs are among the first troops to go abroad. England, Ireland, Australia, all know this. Certain overseas ports have been crowded for months with quartermaster crews, busy helping to found new bases and expedite the landing and distribution of Lend-Lease goods for China, Russia, and elsewhere.

In advance of large bodies of American expeditionary troops QM people were already on the ground; working with the Engineers—as they work with all other branches of the service—they help build stores, repair shops, warehouses, mess halls, barracks, and roads.

Water is vital. Fighting men drink up to three quarts a day. The QM can't just strike a rock, as Moses did for the Israelites, and bring forth cool, fresh streams. But, working with the Engineers, QM can bring in the cement, iron pipe, pumps, tanks, etc., that make up a water system.

Skilled men, also, the QM must take along. In faraway ports, such as Basra or Massaua,

World's Biggest Coat-and-Suit Merchant Is the Quartermaster General

He must provide uniforms for millions of men. Fifty-five million sheep live in the United States. Even they cannot provide enough wool to clothe our vast Army; so, much wool must be imported.

U. S. Army Signal Corps

Newly Drafted Soldiers Grin as They Trudge Off to Don Their Uniforms

In the duffel bags they carry uniforms, overcoats, shirts, shoes, etc. They're "in the Army now." Each man's bag carries a tag with an identifying number.

U. S. Army Signal Corps

Lice, Bedbugs, Fleas, and Disease Germs All Die in This Steaming Sterilizer

Uniforms, underwear, socks, handkerchiefs, overcoats, blankets, pillows, and even mattresses all pass through this dry-steam cleansing machine. Some sterilizers are stationary, as at big camps; others are on wheels and keep up with the troops (pages 368 and 591).

good native mechanics are scarce as Fijis in Siberia. Broken-down tanks, trucks, and planes are useless; so repair gangs are among the first to arrive.

I know, from having visited most of them, what tremendous tasks the QM faces at such hot, isolated, and often fever-stricken spots as Eritrea, Iraq, Iran, and New Caledonia. Contrast these with cold, bleak Greenland, Iceland, and the Aleutians, and you see what riddles the QM must also solve in sending just the right food and clothes to care for men living in such extremes of climate.

QM is one arm of the great over-all Service of Supply. While QM no longer runs troop trains or navigates the ocean-going Army transports, it supplies much of their cargo, trains officers in the art of loading them safely and economically, and quartermasters are always aboard trains and ships to see that all goes smoothly.

In today's blitz, troops move so fast that they often get far ahead of main supply lines. Defending troops may also become isolated, so that only air-borne food can reach them. Parachute troops' needs present the supply problem in acute form. All these situations make more work for the QM—who feeds the Army.

Signal Corps—Eye of the Army

With every arm of the service, in fact, QM officers are always working, and things supplied by the QM are used throughout all air and ground forces.

Consider, for example, the Signal Corps. Deaf, dumb, and blind the whole Army would be without it. Helpless, too, the Signal Corps

would be without the Quartermaster.

Signal Corps must not only be fed, dressed, and hauled; it must be supplied with infinite materials and tools.

To run its communications system, this corps must use its own flags, signal lights, telephone, teletype, telegraph, radio—even homing pigeons. "Get the Message Through" is the motto.

Indian scouts have even been used by Signal Corps, because enemies could not understand the Indian's talk even if they caught him.

In today's high-speed fighting, says the corps, there's not time to hang lanterns in a belfry or make midnight Paul Revere rides from town to town. Messages now must have "the speed of light, almost of thought."

Under fire, high-pressure communication experts must lay telephone lines, set up radio stations, despatch walkie-talkies, handle codes, locate enemy message centers, intercept their despatches, and keep all Army radio and wire traffic free from tangles. All that time they want food, clean clothes, trucks to ride in, and a lot of tools and raw materials that QM brings them, though the technical equipment peculiar to the Signal Corps is supplied by that corps itself.

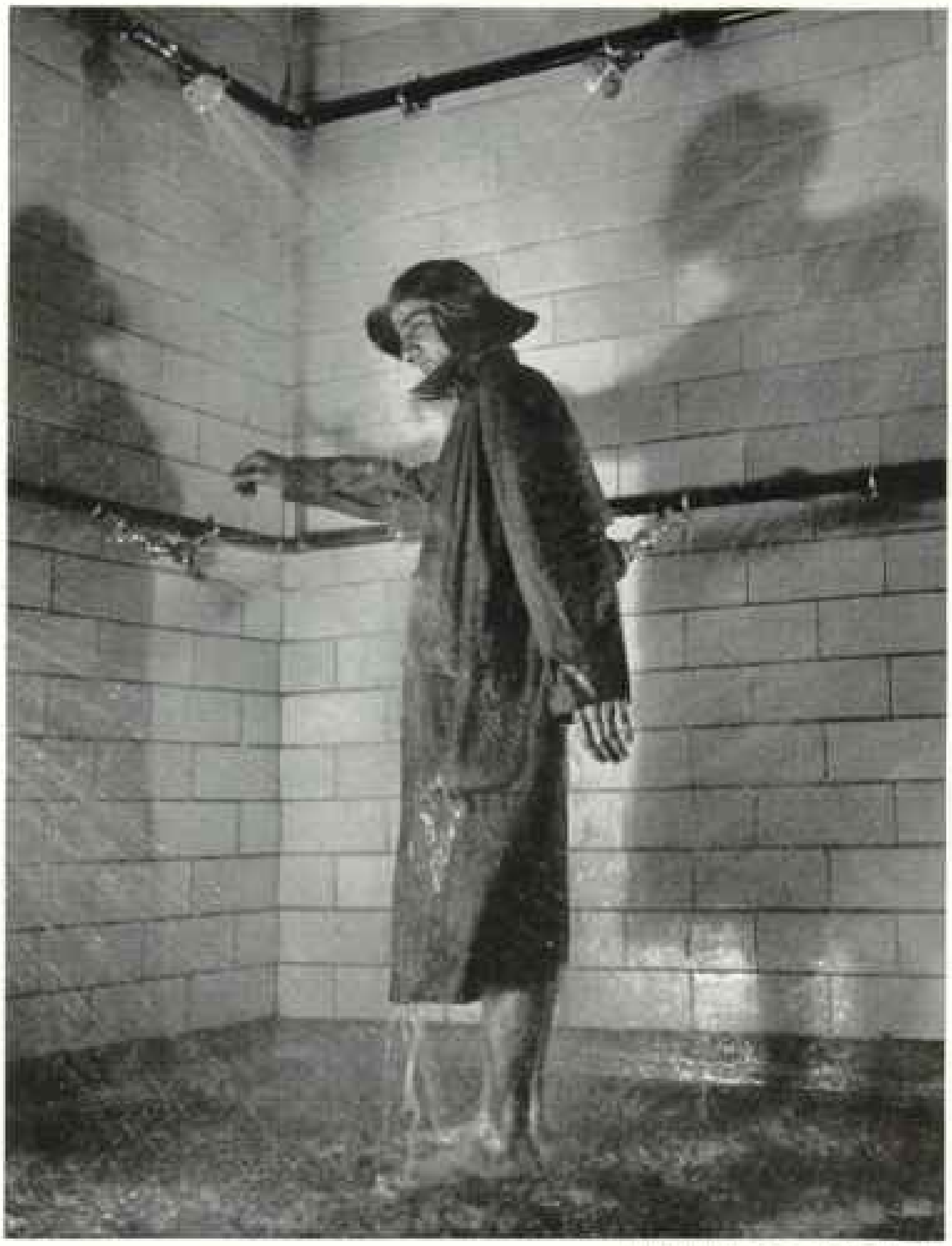
QM Tailors Solve Sartorial Riddles

Washington's army at Valley Forge was so ragged that men's frozen feet peeped from their shoes and stained the snow with blood. What sublime courage! Proving that neither do clothes make a soldier.

U. S. Army Signal Corps

In Rocky Country, Soldiers May Wear Out Shoes in Two or Three Weeks

Shoemakers called in the draft are put to work in big camp shops, or in shops on wheels which follow moving troops. Men in camp who send their shoes for repair tag them with their name and get the same ones back, but in the field they must take any pair that fits (pages 570, 585).



Staff Photographer J. Baylor Roberts

If a Raincoat Can Take This, It Can Stand a Tropical Deluge

In the "rain room" at the Philadelphia Quartermaster Depot, technicians duplicate any storm, from icy drizzle to torrid typhoon. Here 16 nozzles are spraying 2,800 gallons of water an hour against the man in the raincoat. If he gets wet, the Quartermaster will not buy such coats.

For the present, however, Uncle Sam's soldiers are the best dressed in all military history.

"UNCLE SAM, DEALER IN READY-MADE SUITS AND GENTS' FURNISHINGS"

This might well be the signboard over the big Philadelphia Quartermaster Depot. It covers nearly 100 acres and stocks about 500,000,000 articles.

It *is* the world's largest clothing store (pages 569, 587, 591).

From the QM, when a man joins the Army, he draws 66 items of clothing, from cotton shorts to steel helmet, which cost Uncle Sam approximately $105.

Finding these 66 items of clothes for every man, as the Army multiplies into more millions, is a tremendous task.

Harder yet for the QM is buying or making all the "trick" suits and special garments the Army needs for men who must fight miles up in the air, in the freezing Arctic, in cold mud and rain, or in the hot, steamy Tropics. Unusual things required include:

Asbestos gloves, for handling hot machine guns.

Lambskin muffs for cold-weather use by motorcyclists.

Cool but waterproof coats for equatorial lands.

"Twin gloves" of wool and leather for Armored Force soldiers who must drive the "hell buggies" in cold countries.

Special horsehide gloves for Commandos who must sneak ashore and cut the enemy's barbed-wire entanglements.

Reversible ski suits, snow-white on one side and green on the other, for fooling the enemy in either snowdrifts or pine forests.

Special hats, goggles, parkas, and sleeping bags.

Electrically heated underwear and flying suits. These items are among the new demands made now on QM tailors. To develop this special underwear a scientist slept out of doors when it was 30 below zero, covered only with a sheet, with electric wires in it for heating.

Capt. Paul Siple, who as a Boy Scout accompanied the Byrd Antarctic Expedition, is now among the scientists called in by the QM to help work on Arctic clothes.

Heavy, cumbersome clothes which had to be worn at high altitudes used to interfere very much with the flyers' work. Now, with electric heat, they find much more freedom of movement in the lighter suits. Ingeniously, they "turn off" automatically, when the wearer gets too hot, just as the thermostat in your own home will turn off your furnace.

These odd garments are among the millions seen at the Philadelphia Depot.

There are no such monumental piles of shoes, coats, socks, gloves, hats, blankets, belts, beds, mosquito nets, and sleeping bags anywhere else on earth.

Belts alone, laid end to end, might stretch for nearly 2,000 miles!

Crusaders first got the idea for the Sam Browne belt. They devised it to carry their mace on one side and a battle-ax on the other.

Centuries later, armies revived it. The one now used is named for General Sam Browne, an English officer who lost an arm fighting in India and rigged up this particular type of belt to carry his equipment, despite his handicap.

Much fancied now by smartly tailored American officers, this snappy harness has everything but a crupper.

In a "House of Magic" at Philadelphia Depot you see chemists, tailors, wool experts, and others testing cloth, dyes, leather, metals, wool, cotton, buttons, chaplains' church organs, etc., to make sure that Uncle Sam gets honest merchandise for his money.

Staff Photographer J. Barlow Roberts

"Now, Does This 'Waterproof' Cloth Really Turn Water?"

Because real rubber is scarce, and heavy and hot for tropical wear, the Army uses many water-repellent fabrics. Testing them is an important QM job in the Philadelphia Depot. This girl is spraying water on a sample stretched over an embroidery hoop. To her left is a chart (not visible in picture) which shows standards required. If no water sticks to the fabric it rates 100.

Blankets that tear in a testing machine before they stand a pull of 52 pounds are thrown out.

Wool is combed into fine fiber and then examined under a microscope.

Khaki, wool, and cotton cloths are all carefully studied for warp, woof, and weight.

"What's in that glass jar?" I asked of a girl in white who was taking fluid from the jar and spraying it on a piece of colored cloth.

"Well, it's really lactic acid, but we nickname it 'canned sweat!' It proves whether dyes are fast. If it makes the colors run, we know the tested cloth would soon stain and fade when worn by perspiring men, because the dyeing is defective. Smell that can. It gives off a whiff like the subway in August!"

Rigid tests are made of every item, from tents to trombones.

They dressed me in an Arctic outfit and put me in a big icebox at the QM Depot in Philadelphia. This was to test a soldier's Arctic suit. When the temperature fell to 30 degrees below zero, I cried "Let me out!"

"This is nothing," said an officer. "We had a soldier in here the other night testing a sleeping bag. We cooled the place off to 70 degrees below, but he took it fine."

Staff Photographer J. Baylor Roberts

There's a Right and Wrong Way to Load Army Stuff on Ships or Trains

Here a veteran shows a QM class at Camp Lee, Virginia, the difference. A car or a boat must be so loaded that goods wanted at a certain destination are easily accessible, yet packed to balance the vehicle, guard against fire, and avoid shifting in rough going. To add realism, wags painted dummy cars of a "C.L.-B.-T." or Camp Lee-Berlin-Tokyo Line.

I noticed, however, a button on the wall, which a "guinea pig" may push and escape if he feels himself freezing.

Canvas the Fighters' Textile

You no longer see many tents around big training camps here in the States. But armies on the move use them by countless thousands. Canvas to make tents now runs not into mere square yards, or even acres, but into square miles. Ask the QM at Jeffersonville, Indiana, who specializes in tentage!

Canvas, in fact, is the fundamental fabric for Army use. It goes into hundreds of items of clothing and equipment besides tents. Every yard of canvas now being made anywhere in the United States is going to the armed forces.

One new type of tent, a portable office for field use, is provided with blackout features. Its windows are made of a material resembling cellophane and may be covered at night, when tent lights are lit, with canvas flaps. Roof ventilators also have "light traps."

Also made of canvas is a self-camouflaging tent.

There is a sleeping bag made of down and sturdy cotton balloon cloth and weighing only 13 pounds. This bag comes in three sections, fastening with zippers or slides. Men put it on as they would a two-piece suit of underwear and lie down to sleep. They call it the "mummy" bag, because, when clothed for the night and covered from head to foot by the bag, the sleeping soldier looks like a mummy.

QM bypasses priorities for nonpriority

Staff Photographer J. Baylor Roberts

Earth Ovens, Like Those of Early Egypt, Are Used by Our Armies in the Field

At the QM School for Bakers and Cooks, Camp Lee, Virginia, men are taught to dig these ovens and make bread under difficult conditions. Some officers and men on duty here come from the big baking concerns. The large loaves which the soldier is taking from the oven have a thick crust which will keep the bread fresh and palatable for long periods. Soldiers eat lots of bread.

items wherever it can. When aluminum got scarce, it went to making mess kits from iron. Cots are made now of wood instead of metal. Plastic-treated cloth or oiled fabrics take the place of rubber raincoats (pages 572, 573).

Today's popular hat is a steel helmet. Unless in actual fighting, the man wears only the lining, which makes a good hat. He puts on the steel helmet part only when the bullets begin to fly.

Band Music Stirs Men to Fight

Sounding trumpets knocked down the walls of Jericho. Jungle drums, cymbals, the old-time army bugle—all have stirred men to battle. Carloads of musical instruments are bought now by the QM to help rouse the martial spirit and entertain the men in camp.

"We're outfitting 200 new bands now," they told me at the Philadelphia Depot. "We may have 600 to 700 bands, each with 28 pieces, the way this man's army is growing."

All about, in one vast warehouse, I saw piles of drums, brass and reed wind instruments, cellos, violins, bass fiddles, music racks, cases of "clarinet oil," and flocks of small organs for church use by chaplains; also tens of thousands of hymnbooks.

Most ornate were the shiny, silver-bright glockenspiels. They are sets of flat metal bars, diatonically tuned, giving a clear, church-bell sound when played with a mallet.

"We don't test the drums, just inspect them," said an officer. "But, at random, we do test every shipment of horns, clarinets, piccolos, flutes, etc." Then he took a new

flute from its case and ran the scale. Standing before a stroboscope, he tested the flute for accuracy. He blew the key of F and watched the F window on the testing machine. If its little wheel turned to the right, the flute was flat; to the left, it would be sharp.

"Since John Philip Sousa's time, Army, Navy, and Marine bands have turned out a lot of good band leaders," the officer said. "Among the many thousands of musicians now in our Army, we'll probably turn up another march king before this war's over."

Myriad Chevrons and Insignia

The legions of Hannibal and Caesar used chevrons to show soldiers' rank. Arms of nobles and knights, embroidered on their coats, started the phrase "coats of arms."

American Army insignia and chevrons developed gradually after the Revolution.

In an American Army of 4,000,000 you might find 900,000 sergeants of all grades and about 800,000 corporals. All these noncoms wear chevrons to show their rank, and those who have done one hitch or more may wear service stripes.

To you a "lozenge" may be only a cough drop. But to a first sergeant it's that important diamond-shaped mark below the three bars or chevrons that meet at an angle on his sleeve.

Metal stars for generals, eagles for colonels, oak leaves and bars for lesser officers' rank, wings for the Air Forces, crossed guns for the Artillery, rifles for the Infantry, tanks for the Armored Force, flags for Signal Corps, the caduceus for the Medical Corps—all these insignia, as well as those made of cloth to denote various forces, are made available by the QM. This alone, for an army growing into millions, is a tremendously painstaking and meticulous task.

Flags in the Philadelphia Story

Then there's the flag. Our starry banner snaps in the wind now over strange, faraway lands that seldom saw it before. To keep pace with Army growth, the QM Philadelphia shop makes flags at furious speed, stamping out 100 white stars at one drop of a die (p. 586).

Men carry the flag, but women make it. Ever since Betsy Ross made "ships' colours," official flagmaking has been women's work.

Big 38-foot garrison flags, regimental flags, flags for the President, the Secretaries of War and Navy, code flags, guidons, pennants, as well as flags for the Cavalry, Artillery, and other branches, are all made here. Along with brass bands, the waving flag always thrills a soldier's heart. He respects it, above all other Army equipment, for it is the symbol of the land he loves and is fighting for.

The Geography of Soldiers' Uniforms

Global war, with American boys on duty from the Arctic down to the Equator, calls for variations of that original fig leaf—for many kinds of suits, underwear, hats, gloves, shoes and snowshoes, as well as mosquito nets and sleeping bags.

Ski troops, parachute battalions, high-altitude flyers, mechanics—even cooks and hospital units—each needs his own particular clothing.

What a job, then, to outfit 4,000,000 to 5,000,000 men!

Consider wool alone. Ever since Elijah's mantle and Joseph's coat of many colors, wool has kept men warm. In each new soldier's outfit are about 200 pounds of wool, or fleeces from 26 sheep! Under combat conditions it takes the wool from 32 sheep to care for one man.

Luckily for the Allies, they control over 90 percent of the world's wool, which comes mostly from the Western Hemisphere, or from Australia and South Africa. Hitler's wool supply, even counting all he's robbed from conquered countries, is known to be so short that if war goes into another winter, his men must suffer frightfully from cold.

Count 50,000,000 sheep jumping a fence. Sleepy now? Well, there are more than that here in the United States, but that's far from enough to clothe our Army.

Also, the clothing a soldier has with him is only part of the story. In the warehouses, ready and waiting, the QM always holds a reserve outfit, and has a third "on order."

Small wonder the Philadelphia Depot is busy night and day. Here is the world's biggest tailor shop. Its cutting tables and sewing machines stretch out for a quarter of a mile. Yet this vast shop can make only five percent of suits and coats for the Army's needs; the rest are made under contract by private manufacturers. Chief purpose of the QM's big Philadelphia shop is to help out in emergencies and to set patterns and standards for quality and price control.

Shoes for Millions of Marching Feet

At 10¢ a shine, a bootblack might make $500,000 a day, were it possible for him to shine every soldier's shoes!

Vets used to say the Army issues only two sizes of shoes, "too big and too little." Not now. Today it issues some 238 sizes and shapes, ranging from 4½ to 16!

No man can march far if his shoes pinch.

Painting by Arthur Beaumont

Supported by Planes and Infantry, Tanks Rumble to the Attack

Painting by Arthur Beaumont

11 At Camouflaged Headquarters, the Air Forces Surface a Temporary Flying Field with Metal Sheets

In Field Dressing Stations, Army Surgeons and Nurses Care for the Wounded

Painting by Arthur Beaumont

Painting by Arthur Beaumont

IV Escorted by Bombers, Infantry in Armored Trucks Drag Antitank Guns through Trackless Terrain

Painting by Arthur Beaumont

v After Marching through Mud, Dust, and Brush, Hungry Troops Line Up for Chow at Field Kitchens

Painting by Arthur Beaumont

Banana Plants and Jungle Give Cover to Doughboys in Action

Painting by Arthur Beaumont

VII

Army Engineers Rush Forward with Portable Assault Boats to Cross a River

Painting by Arthur Beaumont

Paratroops Float down Like Fantastic Men from Mars

So Army measured 50,000 pairs of feet to get average data for fitting.

By the new Brannock fitting machine it can accurately measure both feet at once and insure an easy fit. A special toe-length indicator makes the device practically error-proof.

For each man the QM has to figure on nine pairs of shoes! He gets three pairs when he joins up; four more pairs are held in the depots, one pair is being manufactured, and another is on order.

Under extra hard going a soldier may wear out his shoes in two weeks, though usually they last much longer. Figure, then, the astronomical shoe pile for, say, 5,000,000 soldiers!

At the QM school in Camp Lee, Virginia, they show you a sample rolling shoe-repair shop. These keep up with the marching Army. Here, too, as at some other camps, is a vast stationary shoe shop that can repair 200,000 pairs a year (page 571).

In barracks a man gets back his own shoes, but, moving with a fighting force, he gets back any pair that may fit him. Enough shoemakers are found among the selectees, often Greeks and Italians, to do this work. Soldiers often hide things in their shoes. In many pairs coming to the shop have been found love letters, candy, even coins.

Troops in Arctic service need extra heavy, warm footwear. So do the bomber crews and other flyers, who work and fight miles "upstairs" where air temperature may be 60 or more degrees below zero. For Arctic use, QM hired Eskimo women to make it thousands of pairs of special high boots from seal and reindeer skins.

To keep from hurting their feet when they hit the ground, parachute troops also must wear special shoes with thick rubber heels, higher last, hard toe, extra spring, and extra rubber taps. See, then, how utterly all branches of the service depend on prompt, efficient QM work.

Armies Can't Stop Now to Raise Crops of Grain

Genghis Khan milked his mares to feed hungry troopers; in extremes, we read, he let his men suck their horses' blood. Ancient armies, on long, leisurely invasion marches, used to halt for a few months to raise a crop of grain.

Our big Army now couldn't find much mare's milk, nor has it time to grow its own food. But through 32 market centers, scattered all over America and linked by teletype with its Chicago depot, the QM makes contracts for trainloads of fresh vegetables. Areas equal to whole States are raising grain, meats, tomatoes, and fruits for the Army.

A 1,000-room hotel has a big main dining room, grill, and coffee shop. At most, its guests number 1,500 to 2,000.

Uncle Sam's fighting guests may number 5,000,000. It would take a dining room as big as a fair-sized city to seat them! And think of cooking and dishwashing, to serve 15,000,000 meals daily!

Every fighting day a soldier, if he can get it, wants about six pounds of food, which now costs a little over 50 cents. For an army of 5,000,000, that would mean 30,000,000 pounds of food a day. A big boxcar can carry 80,000 pounds. That would mean about 375 carloads, or six fairly heavy freight trains full of food *every day!*

Well, somewhere, somehow, the QM must find it; and not only find it, but ship a lot of it to points where we are fighting all over the world, and then deliver much of it cooked and served right up on the fighting line.

Special foods are needed, too, for use in the north and in the Tropics: bomber and fighting-plane crews, parachute troops (page 590), and those who ride in the new gliders want lightweight, condensed, small packages of food.

These gliders, incidentally, are in mass production. A boy with whom I went to school, Monroe Taliaferro, is now president of the American Seating Company. It made seats for theaters, schools, and churches. Now his whole plant makes glider parts. Foods that are light, small in bulk, and that will keep, are especially needed for these new flying infantrymen.

Army's food business is centered in Chicago; intense research goes on there with experiments on "guinea pig" diners.

300 Items on Army Menu

Army diet includes over 300 items. Food for one man for one day is called a ration. These include garrison, field, travel, "Alaska," and other types of rations. Emergency rations, designed to serve advanced troops who cannot be reached by field kitchens, are carefully worked out. Different from the old type of "canned willy," these rations are tasty and varied. In fact, one prime requirement is that they be appetizing.

Now a finished beef or pork product is obtained with 30 percent fat, 55 percent protein, and less than 10 percent moisture, high in vitamin B, copper, phosphate, and iron. Add water, and this dehydrated meat "comes to life," good for meat loaf, stews, and soup.

It can even be eaten dry, for it tastes good and is easily chewed.

U. S. Army Signal Corps

Cut in Stacks of a Hundred, Stars Are Sewn on the Blue Field

The Army observes many strict rules in handling the flag. It must be hoisted and lowered only at appointed times and in prescribed manner. It must be flown with the stars uppermost and next to the pole; upside down it becomes a distress signal. To be flown at half-mast, it must first be raised to the top, then lowered to half-mast (page 576).

Men want meat three times a day (page 589); fresh meat they can't always get.

When German pigboats began to sink ships loaded with fresh meat, canned fruits, and vegetables in bulky form, some way had to be found to cut shipping space. Condensed foods that occupied less room were the answer. Russia's demand for lightweight, nourishing foods that could be flown in by plane speeded this work.

"Now," says the QM, "in one ship we can pack dehydrated foods that hold as much nourishment as was carried in a half-dozen similar ships when loaded with fresh fruits, vegetables, and meat.

"The same rule holds true when we land the dried foods overseas and have to find trucks to haul it to the front.

"Now by dehydration we can handle, say, 25 million pounds of dried vegetables whose food value is that of 250 million pounds of fresh stuff. By drying, a ton of carrots is reduced to 250 pounds; cabbage, to 100 pounds. A five-pound can of powdered chicken soup makes 25 gallons of liquid soup."

To save space, lemons are powdered; orange juice, concentrated to one-seventh of its former bulk, becomes a big item in food shipments (page 588).

From the Chicago Subsistence Research Laboratory have come many culinary triumphs. Most valuable, perhaps, is the fortified chocolate bar, so prized by high-altitude flyers. There are also special hams and bacon that will keep anywhere, and butter that may be stored in the Tropics for months without deterioration. Various foods are given extra nourishing strength by the injection of vitamins. Army bread is now thus treated.

At the QM School for Bakers and Cooks at Camp Lee, Army bakers are taught to dig holes in the ground and build earth ovens for use when troops are in the field (page 575). These primitive ovens date back to early Egyptian times.

Soldiers like candy and cigarettes. When no canteens are near from which men may buy, commanders are authorized to issue each soldier one ounce of candy and 20 cigarettes a day, free.

From his sling David let fly a rock and killed Goliath.

Before he could fight again, David had to hunt another stone. With a tommy gun he could have fired around 800 shots a minute, killing not only the giant but also scores of other enemies.

Thus, with powder, man multiplies the power and speed of his weapons. One man with a rifle is the basic unit of all fighting forces. Millions of such men, added together, make up our big Army.

Magnify the rifle, and you get all the most powerful weapons now known to military science, from antiaircraft guns to 16-inch coast defense rifles that shoot 30 to 35 miles.

With one finger a gunner can press gently on a button and let loose shooting power enough to sink a ship miles away.

In 16 dramatic paintings Artist Arthur Beaumont vividly shows in this issue of the NATIONAL GEOGRAPHIC MAGAZINE some aspects of the terrific power and striking force of Uncle Sam's fighting machines (Plates I-XVI).

Staff Photographer J. Baylor Roberts

Tall, Short, Fat, Lean—All Sizes of Uniforms Are Stocked

This nook in the Philadelphia Quartermaster Depot shows only a few of the thousands of patterns from which garments are cut. The Quartermaster is the world's biggest tailor. Uniforms are designed and tested here for many varied climates—for those of Egypt, Panama, the Caribbean area, Australia; and for England, Iceland, Hawaii, New Zealand, and other faraway islands.

How *fast* our new well-fed, well-clothed Army moves! Roaring, fire-belching tanks supplant the old cavalry charge. Big air bombers themselves are really long-range cannon that fly maybe 2,000 miles and then shoot point-blank at their target!

Small quartermaster units are attached to this air force. They operate in combat areas. They work under camouflage, bake bread in fox holes, and get supplies into jungle bases.

No science moves faster than war, even if it is "organized waste." It took 50 oxen hours to drag a muzzle-loading cannon up a hill in the Siege of Constantinople—and then it threw a solid shot only a few hundred yards. Now a bomber can "throw"—*i.e.*, carry—four or five tons of high explosive 1,000 miles in three hours and with them utterly wreck forts, factories, bridges, docks, whole blocks of brick buildings, and sink ships.

Yes, Some Soldiers Still Ride Horses!

Roman war chariots were the tanks of that day. One man drove the team, while his mate shot arrows or threw spears. Both wore armor. Today it's the whole "chariot" tank that's armored. One man still drives, but at 30 or 40 miles an hour, and instead of arrows and spears the tank's gunner fires cannon and sprays of machine-gun bullets.

U. S. Army Signal Corps

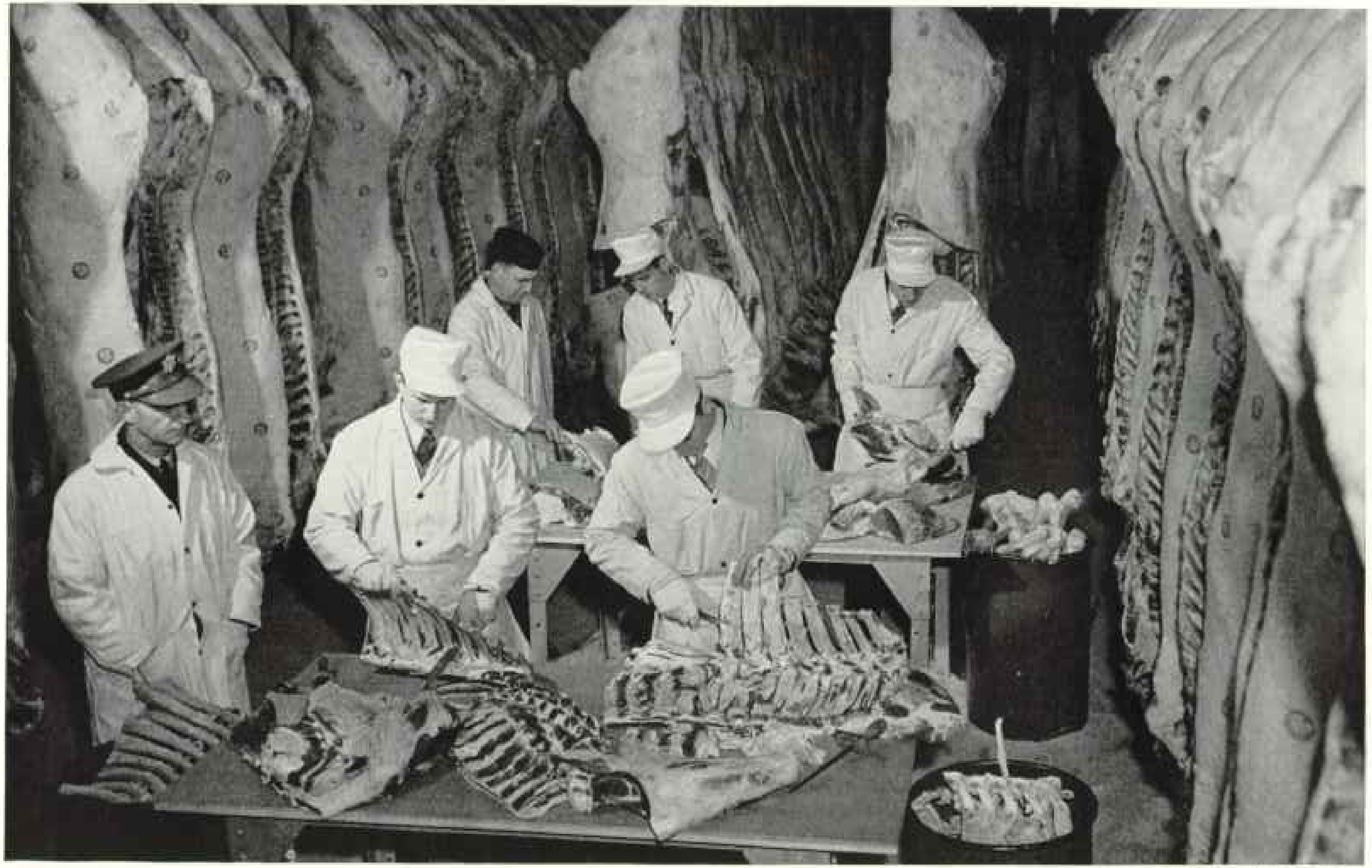
"Take Your Clumsy Breadhooks Away! Let Me Beat It"

"Sure, they're dried eggs. So what? Add water, season right, and stir—and there's your omelet," explains the dietician, lecturing in an Army cooking school. To save shipping and cold-storage space, Army uses more and more dehydrated meat, eggs, fruit, and vegetables (page 586).

Douglas G. White

Concentrated Sweetness from the Orange Groves of California

The California Fruit Growers Exchange developed a method of concentrating orange juice to one-seventh of its natural volume. Now the Army uses the concentrate, and much is sent to Britain to help feed her children. Three boxes of oranges are required to make one U. S. gallon of concentrated juice.



U. S. Army Signal Corps

Meat, Meat, Meat! Since Cave-man Days, Warriors Have Demanded Meat and Plenty of It

Buffalo meat for Indians; the roast beef of old England; mutton in the Arab world; pork in Germany. Packing houses work day and night to supply meat for American fighters. Only rice eaters of the Far East seem able to perform mighty feats of physical endurance without meat. Each day now the American Army eats perhaps five million pounds of meat (page 585).

U. S. Army Signal Corps

A Paratrooper Eats Breakfast While His Tommy Gun Cools Off

On maneuvers this flying soldier samples QM's "K" field ration. Packed in three separate boxes, there's one each for breakfast, dinner, and supper. Total weight, 32.86 ounces; calories, 3,726, with a proper balance of fats, proteins, and carbohydrates (page 585).

Since the tail end of the Boxer War I have followed our Army over much of the world. How we used to love the QM's old "escort wagons." Road or no road, mule skinners could take those stout wagons anywhere.

Uncle Sam Buys and Breeds Horses

Now such mule- or horse-drawn transport is displaced by trucks. Likewise, the dashing, spectacular saber charge is no more. But don't think the horse is gone. Far from it! Cheer up, you old Indian-fighting troopers of yesterday! Saddle leather still squeaks from Fort Bliss to Riley, where rookie cavalrymen now thrill to the tonic smell of horse, corral dust, sweat, and bugle calls.

Today the QM is not only Uncle Sam's biggest horse buyer, but it also buys and distributes stallions free among horse-breeding farms. Thus thousands of foals are being added to the Army's potential herds.

Just how many horses Uncle Sam now owns is, of course, a military secret. But you have only to visit the markets at such centers as Wichita, Kansas, or Camp Robinson, Nebraska, on a sales day, or walk through the QM's vast Remount Station at Front Royal, Virginia, to see that the army horse is far indeed from obsolete (p. 565). Even the mule survives in a few pack trains and mountain batteries!

Used with mechanized forces, or as mounts and pack animals in such country as the rough Big Bend region of Texas, animals are still indispensable. In the United States, as in every other country, there's a lot of terrain too rough for wheels.

Yet speed and striking power almost incredible to old soldiers mark our cavalry of today. Its divisions now include artillery, antitank guns, and even scouting planes. Many "cavalrymen" ride in trucks.

Off they whiz to battle, saddling up and going into action when terrain is reached that is impassable to motor vehicles, or when strategy calls for the use of mounted scouts.

Who has not thrilled to that stirring Field Artillery song, "The Caissons Go Rolling Along!" How graceful are the big galloping grays as they cleverly twist and turn, executing intricate maneuvers on Army Field Day, the high wooden wheels of the lumbering guns emitting that unmistakable "artillery rumble!"

But today, like the Cavalry, most of the

Field Artillery is motorized. We still haul some guns with horses. The Germans, we hear, still use 800,000 horses, three-fourths of their artillery being horse-drawn.

Moving a Division Is Like Uprooting a City

How fast, and with what pains and careful plans, the QM must work when a division moves into battle!

Line, or combat troops, plus such special service troops as reconnaissance, engineers, signal corps, quartermaster, and medical men make up an armored division. Every man is a specialist.

"When a division moves," Maj. Gen. Lloyd R. Fredendall told me, "it's like picking up and moving a city of 15,000 people with every shop and industry in that town." The division uses 2,000 motor-driven vehicles; to move these and its other equipment, about 80 heavy freight trains would be needed!

Consider all that rides on wheels, besides tanks and cannon: one big QM radio truck, with a public-address system; rolling QM kitchens that cook meat and potatoes and make coffee at 40 miles an hour; bath, shoe-repair, and sterilization trucks; motorcycles that mount machine guns; ambulances; cigarette and candy stores on wheels; armored cars and trucks that haul antitank guns and artillery; trucks that haul long cables—cables that run out from drums and stretch far up into the air, to anchor observation blimps. (Go up in a captive blimp and watch them fire a big rifle, and you see the projectile knock up dust 10 miles away!)

Trucks for the quartermasters, too, and ordnance trucks that haul ammunition. Fast-firing weapons burn up tons of ammunition. One machine gunner, should he hold his finger steadily on his trigger, could shoot 500 cartridges a minute—faster than anybody might rush fresh loads to him.

Engineers, too, use fleets of trucks. They even have some that purify water, compress air, bore giant holes in the earth, and others that are complete movable electric-light plants. Besides all their pontoons and other trestle-making material, they carry one complete knock-down bridge that will span a river 350 feet wide!

Staff Photographer J. Baylor Roberts

What the Well-dressed WAACS Are Wearing

Expert designers of women's wear have planned their uniforms and accessories for efficient smartness. Here Miss Maxine Spengler examines the khaki dress uniform as modeled by an employee at the Philadelphia QM Depot.

1942 Division Smaller, but Speedier and More Powerful

To form an infantry division, we use 700 officers and some 15,000 men. That's only about half the size of a division in World

War I, but its firing power and speed are infinitely greater.

Burning 115,000 gallons of QM gasoline, a division can move 150 miles a day; on fine roads, in an emergency, it might move 300 miles. In actual combat, it might advance 15 to 25 miles a day, as against two or three miles made by divisions on foot. *Speed!*

Hauling fuel, or flying it, to advancing armies is one of QM's important jobs. Experiments are now being made to move gasoline by pipeline just as the British in World War I moved water north from Egypt during the advance on Gaza and Jerusalem.

Engineers, again, must both build and destroy. At Fort Belvoir, in Virginia, I watched them at practice, in both construction and demolition. Every man, as in the QM Corps, is armed and trained to fight, since often they must build or wreck under fire, defending themselves the while.

Besides building roads, bridges, and forts for our own use, engineers may have to demolish those of the enemy. With pontoons they can throw a bridge across a river in a jiffy; sometimes they stretch an aerial cableway and haul heavy tanks, trucks, and cannon across a stream on this overhead runway. They build tank traps to halt the enemy, and lay mines to blow up his roads and forts. Think of all the tools and supplies the QM must help find and move for such tremendous tasks!

Special units are now being trained on the southwest deserts, experimenting with hot-weather clothes, tents, canvas water bottles, uniforms, water and gas containers, and special tropical rations.

Planes Talk to Tanks, and Vice Versa

During fights, Army Air Forces planes are attached to Armored Divisions. Scouting for 100 to 200 miles around, they radio back news of enemy artillery positions, troop movements, location of forts, bridges, railways, etc. Also, the division commander uses them to help knock out enemy planes and enemy artillery, and to bomb bridges, ammunition trains, etc.

Once fighting starts, nothing must halt the Armored Division's terrific speed. That is the secret of its power. Now, too, as General Gregory says, QM faces its supreme test. Ammunition, food, oil, gasoline—all must be moved ahead just as fast as the division advances. Sometimes QM must move supplies in haste by air transport.

Planes, parachute troops, and Commandos are part of today's fast-moving fighting forces. QM is responsible for everything they wear—even the special knives paratroopers carry to cut their shrouds if they get tangled up in landing.

Jumping from planes over enemy lines, paratroops rush to blow up bridges, forts, and ammunition dumps, to set fire to gas and oil supplies, or make surprise attacks on the foe's rear. On these attacks they need special QM equipment.

Burnt Cork for Commandos' War Paint

Commandos, landing from small boats at night, undertake similar tasks on enemy shores. QM furnishes even the burnt cork that blacks their faces. We are training picked troops now for this work, for the surprise capture of sentries and outposts, even for kidnaping the enemy's commanding officers.

Speed! In 1848 it took Gen. Stephen Kearny's army long weeks to march from Santa Fe out to California. Now an Armored Division could do that over the week end!

Power! Roll all our new guns into one big one, load it with all the powder flowing now from all our new mills, use the Empire State Building for a projectile, and you might blow that skyscraper clear across the Atlantic Ocean! Whatever this total power, it's imponderable. There's never been anything in human history like it, nor has any government ever faced so colossal a task as the coordination, command, feeding, and clothing of this complex war machine which now encircles the whole earth.

Going into battle, this force must eat, drink, don its fighting clothes—and *ride*. At the crucial moment, then, it all depends on the Quartermaster Corps. In the slang of its own song:

> We're the gang that keeps things moving,
> At the front and post to post.
> When a soldier has tough going,
> We're the guys he needs the most.

Painting by Arthur Beaumont

Snow-field Training Toughens Ski Troops for Mountain Work

Painting by Arthur Beaumont

Propellers Raise Clouds of Desert Dust as Big Bombers Load and Take Off to Lay Victory Eggs

Painting by Arthur Roscoe

XI A Motorized Field Artillery Crew, Working as One Man, Snaps Shells into a Powerful "155"

Painting by Arthur Beaumont

XII Listening Devices and Spearing Searchlights Aid Antiaircraft Gunners to Blast High Targets

Painting by Arthur Beaumont

XIII Fast-working Army Engineers Lay down a Pontoon Bridge for Guns, Troops, Trucks, and Tanks

Painting by Arthur Beaumont

XIV Although Most Cavalry Is Now Mechanized, Army Also Finds Use for Mounted Regiments

Painting by Arthur Beaumont

XV Regiment after Regiment Daily Boards Transports Moving in Ever-growing Convoys Across the Seas

Painting by Arthur Beaumont

Wires, Radio, Light, Flags, and Birds Keep Field Forces in Touch

Painting the Army on Maneuvers

By Arthur Beaumont

IT TOOK fast footwork and frantic speed with the pencil to picture certain glimpses of our ever-growing Army as it raced about on field maneuvers.

For thousands of miles, from South Carolina swamps to arid wastes of the Southwest, I followed roaring tanks, trucks, guns, and mechanized cavalry as they whizzed and splashed through mud and rain, through howling storms and over blistering desert sands.

By day and night, week after week, I lived with and sketched our tough, sunburnt boys as they sniped from ambush, donned gas masks and dived into choking smoke clouds, drove ponderous tanks headlong over crashing trees, charged, gun in hand, into thorny thickets, or loaded their big bombers and roared away on practice demolition raids.

What a back-breaking ordeal—drawing pictures on the dead run! How different from the popular thought of the artist as a quiet, leisurely man, gently painting at his easel in a cool, north-lighted studio, pausing betimes to smoke and chat with idle visitors!

On a "Wilderness Trail"

How little I dreamed what a Wilderness Trail lay ahead, when the National Geographic Magazine assigned me to "Follow the Army on maneuvers and make a series of paintings showing our soldier boys at work."

Risks of snake bite, sunstroke, broken bones, and man-eating insects were yet to come.

On one blistering desert maneuver area it got so hot I had to wrap rags around the steering wheel of my old car before I could touch it. So frightfully hot, another day, that paint dried on my brush before I could complete a stroke!

But back to pictures. My first hurdle, of course, was to get official permission to go with the troops and make sketches of operations wherein many methods and machine parts are still closely guarded military secrets.

However, the request of the National Geographic Society was magic. Once my credentials were signed, I was free to join the Army, sketchbook and all. Thanks to friendly help and guidance of Army officers and men, I painted camp and combat scenes all over America without landing in the guardhouse!

Once I reached certain staff headquarters in a South Carolina town.

Here was a whole flock of top-rank foreign military attachés from the Washington embassies of nations friendly to us. In their glittering uniforms of gray, sky blue, and olive green, with here and there a dash of red, they afforded striking models which I was keen to paint.

But just then, with guns all about, planes overhead, and Signal Corps men stringing mysterious wires through the brush, I faced plenty of "action pictures."

To identify me I, too, was made an "official observer" and given the green brassard of a neutral. They gave me a staff car, too, with a chauffeur, and a well-marked map of the whole battle area. But my map covered so much territory that, to find the particular men and equipment I wanted to paint, I had to ask for an officer to guide me.

"Those planes circling up there," the colonel said, "mean that something's going to bust any minute."

I was sketching a little antitank gun as he talked, when utterly without warning a vast, elephant-like herd of blazing tanks came crashing out of the woods. My timid model, the tiny antitank weapon, discreetly left for parts unknown!

Feverishly I started sketching the big tanks themselves. Camouflaged with green branches and leaves, they floundered forward at speed unbelievable for things looking so clumsy. Knocking down small trees like weeds before a sickle, they raced into open country and fanned out onto the battlefield. So engrossed was I in my work that only a quick jump saved me from being crushed under the whirling treads of one onrushing monster. To such a cruel juggernaut, one mere painter meant only another ant (Plate I).

On the iron heels of the tanks came waves of infantry, riding in their half-track armored cars. Behind this car the doughboys often tow a small "37," used at short range against tanks. It bounces along on two trim, rubber-tired wheels, its saucy snout maybe wrapped in a sack to keep out dust. It shoots a cartridge about the size of a corncob. Men love to practice with this deadly little plaything of a gun (Plate IV).

All about me, as I stood behind a big tree to avoid being run over, there surged a veritable cavalcade of war. Jeeps, peeps, guns; scout cars, command cars filled with "brass hats" and carrying flags; buglers, doughboys, walkie-talkie radio men; horses, mules, men with pigeons in baskets; rolling kitchens, ambulances, army doctors, messengers on motorcycles, wearing devilish dustproof masks; and finally artillerymen camouflaging a big "155" so cleverly I could hardly

see its outlines enough to paint it (Plate XI).

In this simulated war Reds fought the Blues. Back home, when people read about sham battles, some think it's only like boys "playing soldier."

Here in these maneuvers one powerful force represented the enemy, invading us. The other was our defenders, grimly battling to save our homes, farms, factories, bridges, and big cities from bombs, from the fire and sword of invaders.

It was all on such a vast, heroic scale that I could only glimpse a part of it, as when at a circus you can really watch only one ring at a time. For days it went on. I moved here and there, dodging and sketching by turn.

Even though you know they're shooting only "blanks," you get an uneasy feeling in the tummy when you see a skirmish line trot suddenly from a near-by thicket, aim straight at you, and begin shooting. You hope devoutly that nobody has been careless and mixed *live* ammunition with the blanks!

No time now to build fine, smooth concrete runways for planes used by moving armies. Instead, they use portable airfields, called "Marston strips" (Plate II).

Flexible, interlocking steel strips, perforated for lightness, are laid on the ground. If terrain is brushy, big tractors quickly drag it off; if it's sandy but uneven, bulldozers and scrapers soon level it. In 24 hours or less, a 3,000-foot runway can be laid.

Headquarters Digs In

To give Operation Headquarters a safe, secret place to work, I saw engineers quickly dig a long tunnel deep into a hillside. Only the wires that ran toward it hinted at Headquarters' whereabouts.

Modern war uses literally miles of wire. You see it unwound from reels on trucks, laid on the ground, strung on trees, stretching in every direction.

Right in the midst of one "battle," I saw paratroops suddenly come raining from the sky. Red, blue, yellow, and white chutes floated silently down. What a strange sight! Men rode in the white chutes (Plate VIII).

Colored chutes carried rifles, machine guns, and other equipment, an identifying color for each item. Immediately on landing each paratrooper dashed for a colored chute, grabbed a tool or weapon, and went into action.

What delicate, complex, superhuman devices war uses—range finders, searchlights, sound detectors, and locators. Along with them you see trained gun crews working with speed and accuracy, aiming and firing our fast, hard-hitting antiaircraft weapons designed to knock our enemies from the skies (Plate XII).

In this war nobody's job is more ticklish than the Army engineer's. He builds bridges and lays mines under fire, or sneaks up, gun in one hand and dynamite in the other, to blow up the enemy's bridge; or maybe he tunnels under a fort and fires a charge that demolishes it. I painted one picture showing engineers hurriedly laying a bridge and using light pontoons of aluminum (Plate XIII).

"These Things I Saw"

All these things I saw—and more, too, that I dare not paint or talk about—in my many weeks with our maneuvering armies.

Think of me, reader, when you glance at Plate X. Painting that B17 was a nightmare. Even to find it, at bombing practice, was like chasing the *Flying Dutchman*.

I'll skip the dreary details of how I was detoured from camp to camp, because the whole thing is so secret that even many officers don't know where the bombers are working! Anyway, when finally I found their roosting place, not a B17 was there. They were all up in the air. They stay up there, day and night, landing only for fuel, repairs, or to change crews.

What an inferno, too, that western desert camp is! The sand actually burnt my feet, and my palette was so hot I could hardly touch it. To keep my drinking water from near boiling, I buried the canteen, but even the earth was hot.

Whenever a plane took off, propeller wash sent billowing clouds of hot sand into everybody's eyes, nose, and mouth. I still find sand in my hair, after six weeks.

In the shade of the Joshua trees, where shade is thin, the thermometer stood at 126° Fahrenheit. Once a trick of desert light flashed us a startling mirage, a cool-looking lake. Across it a passenger train was running!

When a rattler slid into camp, I, being an old cowhand, showed the city soldiers how to de-fang it, using a rag tied to the end of a stick.

At these bomber bases men live primitively. Even the colonel has only one extra shirt. Soldiers get a gallon of water a day, to drink and to wash in. This is the final polishing-off place for bombardiers. When they wave goodbye to this hellhole they fly straight away to fight.

Nobody here is allowed to keep a car. When I finally finished my picture and drove west for the coast, I hauled out three sun-scorched, well-sanded soldiers. Before me, now, was a Hollywood commission to paint scenes for a new movie, "Wake Island," being made by Paramount Studios. But no assignment can ever beat those turbulent, wonderful weeks with the Reds and the Blues.

Japan Faces Russia in Manchuria

By Willard Price

With Illustrations from Photographs by the Author

JAPAN and Russia have been at war since 1931. It is an undeclared war. But it is not merely a war of words.

There have been more than 2,000 armed clashes between Japan and the Soviet during that period. Some of them have been small affairs; others have involved large forces. In one, 100,000 troops were engaged. In another, scores of bombers and tanks took part. In a single battle, 18,000 Japanese were killed and wounded (page 631).

The world heard little about these troubles. They were hushed up—because neither Japan nor the Soviet was ready for total war. They occurred in remote Manchuria (Manchukuo), well off the beat of American correspondents.

But Manchuria is destined to become well known. Large-scale conflict between Japan and the Soviet is almost inevitable.

Russia, with her Vladivostok dagger poised less than three flying hours from Tokyo, is an immediate menace to Japan's safety. With the Soviet close behind her, Japan is as uneasy as a criminal in the electric chair. Not until this danger is removed can she breathe easily and utilize the booty she has gained in the South Pacific.

American bombers may soon be flying to Japan from the underground hangars of Vladivostok and American troops may be battling Japanese along the far-flung border of Manchuria.

Manchuria is important because it is the Japanese hand on the throat of Vladivostok. A glance at the map (page 607) shows that Manchuria crowds up behind Vladivostok and could strangle it by cutting the Trans-Siberian Railway.

Then Vladivostok would be cut off from European Russia and fall into Japanese hands. Probably all the Far Eastern part of Siberia would go with it.

Japan's Toughest Fighters Await Soviet Attack

The great Kwantung Army of Japan is now massed in Manchuria, itching for action. In all of Japan's recent operations these men have stood idle.

The battles in the South Pacific, when they were not purely naval or aerial, have required few ground forces. Fresh troops have been sent to China, but they came from Japan, not from Manchuria.

Japan has taken care not to deplete or disturb her toughest fighting force, reserved for the specific job of whipping the Soviet.

The Kwantung Army is not merely one of the armies of Japan. It is *the* army. It has the best men and the best mechanized equipment.

More than that, it is a political as well as a military force. It not only governs Manchuria. It is the most powerful factor in the Tokyo government itself.

The Premier, General Hideki Tojo, is a Kwantung Army man. He is surrounded by Kwantung Army chiefs. These are the men who dictate Japanese policy. The people are powerless, the Diet is a farce, the Cabinet is completely controlled by the militarists. The Emperor is the Army's rubber stamp.

It was the Kwantung Army that launched Japan on the bloody path to Far Eastern domination or disaster.

Manchuria "Always a Powder Keg"

In 1931 the then "younger officers" who now rule Japan began the attack upon Manchuria without the knowledge or consent of the Japanese Government. They wrested Manchuria from China, and asked the world to recognize it under the name of "Manchukuo."

The Army men then proceeded to develop war industries in the seized territory preparatory to the next step, the expulsion of the Soviet from Asia.

Why has that step been so long delayed?

Because the cocky young officers discovered in border clashes that the Soviet was disconcertingly strong.

The Kwantung Army began to see sense in the Navy's contention that the best procedure was, first, to conquer helpless southern Asia; second, wait for Hitler's aid against Russia; and then, strengthened by the limitless oil and mineral resources of the Indies, strike at Russia.

But the time of waiting may now be nearly over. The "southward advance" is history, the metals and chemicals of the Indies and Malaya are pouring into Japan's factories and pouring out in planes, tanks, and munitions. There is an abundance of oil for a long war.

"This country has always been a powder keg," an old ex-bandit told me in Mukden.

A Student Repair Crew Tears Down and Reassembles a Locomotive at Dairen

The South Manchuria Railway makes and repairs its rolling stock at these shops. Its Railway Training Institute graduates shop workers into service in three years. Here engineers learn what to do when bandits ambush a train. Conductors and telegraphers must know four languages (page 619).

He professed to have been educated at an American university—not in banditry, but in law. Returning to Manchuria, he had practiced law for some years. He turned to banditry because it was more lucrative.

He became such a menace that the Government sought to divert his powers into better channels by offering him a job as district governor.

He accepted. But he was finding life pretty dull now (page 606).

Battleground Before Christian Era

"Savage tribes warred over this area long before the Christian Era began," said my scholar-bandit.

"In 907 A. D. and afterwards the Khitans conquered Manchuria and set up a dynasty in North China, only to be overturned in 1115 by other Manchurian warriors, the Jurchin, who established a 'Golden dynasty' in China. They were driven out in the thirteenth century by still another northerner, Genghis Khan.

"China learned to look north for trouble. In 1616 Nurhachu steeped Manchuria in blood, gained control of it, and immediately began to think of the throne of China (page 620). In 1644 his young grandson was seated on the Chinese throne, and that was the beginning of the Manchu dynasty.

"Meanwhile, the Russian Bear was creeping across Siberia. In 1639 he reached the Pacific, to find it frozen. In search of a warm port, he began encroaching upon Manchuria.

"But Japan didn't enjoy having the sharp-clawed Bear so near her doorstep; she, too, had her eye on Manchuria. So there followed three wars, 1894, 1904-5, and 1931, all of them for the same purpose—to get Manchuria.

"Well, now she's got it. Or has she? My own notion is that Manchuria is still a football and must expect plenty of kicks from the three big players in this part of the world—Japan, China, and Russia."

From W. T. Turner

A Russian Aura Surrounds the Station at Jap-ruled Harbin

"Great Manchukuo," boasts the large sign just above the clock, overshadowing the Russian letters for "Harbin." The two signs tell the story of the Chinese Eastern Railway—built by Russia, sold to Japan in 1935, turned over to the puppet State, and renamed "North Manchuria Railway." Russian harness is conspicuous in the street. Russian poster (left) advertises "grand movie concert," "revue and ballet," and (below) the play "He Was Convicted" (pages 612, 623, 626, 627).

I asked the ex-bandit governor what effect all this turmoil had had upon Manchuria.

Banditry "the Only Sound Profession"

"It has made men like me," he smiled. "Restless fellows, who know that nothing is safe, that it does no good to be sober and industrious. You can't win. The only sound profession is banditry."

A pert little Japanese official who had sat in on the interview laughed and said to me: "The governor is just joking."

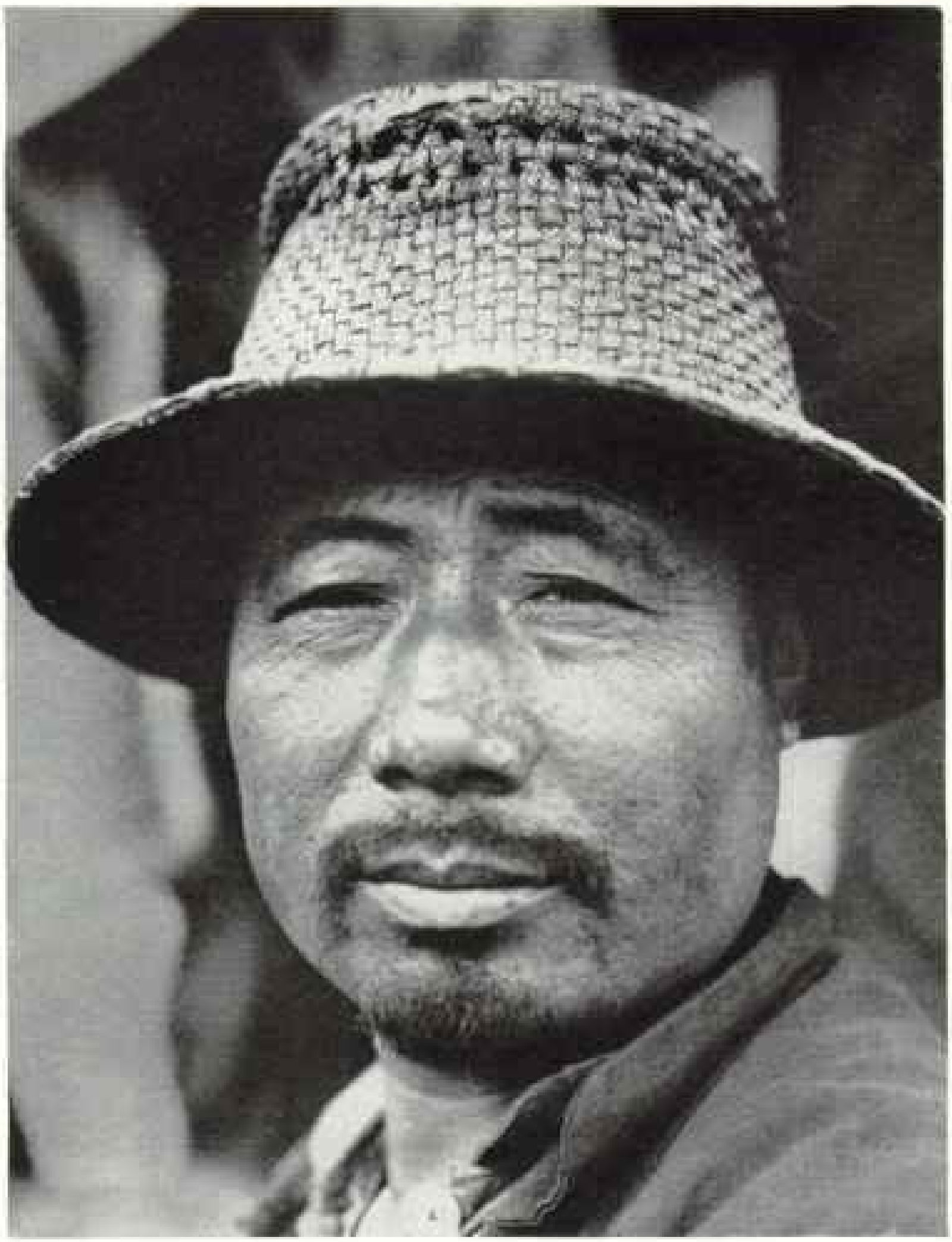
I am not sure that he was joking. No other region in the world is so bandit-ridden as Manchuria. The Japanese have been trying to put down the Legion of Discontent, but when a Japanese "punitive expedition" starts out in one direction banditry springs up in another. As the old proverb has it, you can't keep boiling water down by putting on the lid.

The fire under the Manchurian pot is uncertainty. The Manchurian farmer has always been sure of one thing—that he could be sure of nothing. When his crops were ready to harvest, the waves of war would probably break over his village and when they passed he would be either dead or destitute.

What wonder that he was inclined to take the law into his own hands? Instead of spending patient months plowing, sowing, and cultivating, only to lose in the end, he joined a gang, held up a wealthy citizen, and was richer after one foray than after a year of farming.

Clever, intelligent men became the leaders of these gangs. Often a group would number as many as 3,000 men.

The bandits are called *hung hu-tzu* (Red Beards), perhaps because some of the early marauders were red-bearded Cossacks from



A Governor's Advice: Crime Pays in Manchuria

Turmoil in Manchuria, he proclaims, "has made men like me. Restless fellows, who know that nothing is safe, that it does no good to be sober and industrious. The only sound profession is banditry." Such is the philosophy of this former lawyer who became such a redoubtable highwayman that Manchukuo bought him off with a district governorship. Now, pictured at Mukden, he finds life dull (pages 603–4).

Siberia. Another explanation is that bandits, too well known in the countryside, used to wear red beards as masks when they went raiding.

A tremendous commotion, with a resultant increase in banditry, was caused by the mass migration during the nineteen twenties of millions of Chinese into Manchuria. They came from crowded Shantung and Chihli (now Hopeh) to seek a living in the open spaces of the great north.*

But a living could not be had merely for the asking, and many did not find a place for themselves and turned to banditry.

As Japanese control tightened, there was more order, but the people did not like being bossed by Japanese.

And now that Japan has definitely taken control of Manchuria and clamped on the lid, steam spurts furiously from the pot. Banditry has taken on a patriotic color. Bands bear such names as "People's Revolutionary Army," "National Salvation Army," and "Korean National Army."

They have become more similar to the Chinese guerrillas. They are fighting for freedom.

That doesn't mean that they have turned angelic. They are tough customers as always, and do not hesitate to descend upon a village of their Chinese brothers if they need food or ammunition.

Kaoliang for Food and Guerrilla Shelter

The lone wanderer on a Manchurian road takes his life in his hands.

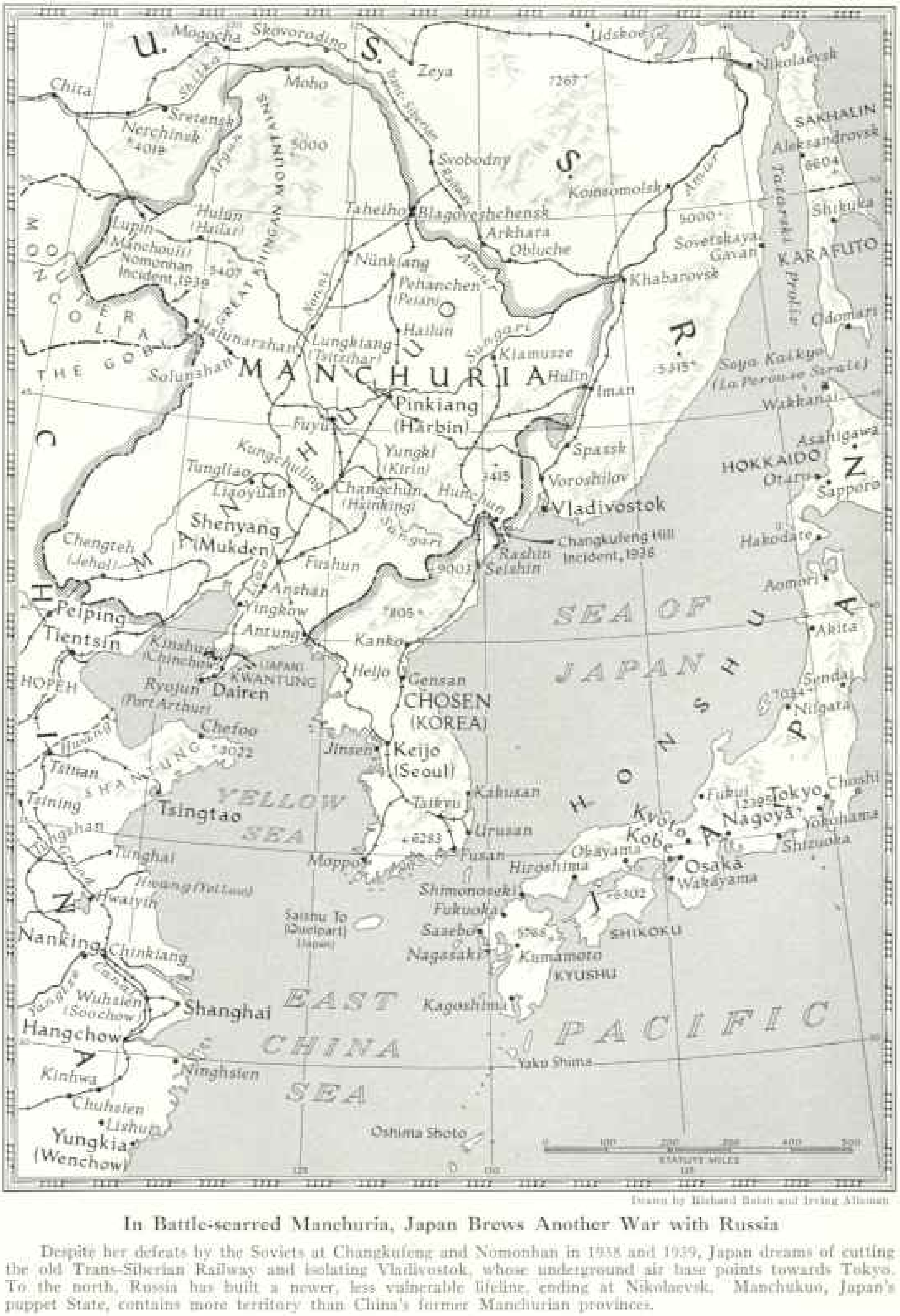
His road is likely to be bordered by fields of *kaoliang*. He sees not a soul, yet there may be a score of men watching him.

The kaoliang is a sorghum that stands 10 or 12 feet high. It is planted in straight rows and spreads at the top to conceal perfectly the alleys between the rows through which a whole army could march unobserved even by planes.

Banditry and kaoliang always reach their greatest height in the same month, June.

From this perfect concealment, a few men

* See, in the National Geographic Magazine, "Manchuria, Promised Land of Asia," by Frederick Simpich, October, 1929; "Byroads and Backwoods of Manchuria," by Owen Lattimore, January, 1932; and "Here in Manchuria," by Lilian Grosvenor Coville, February, 1933.



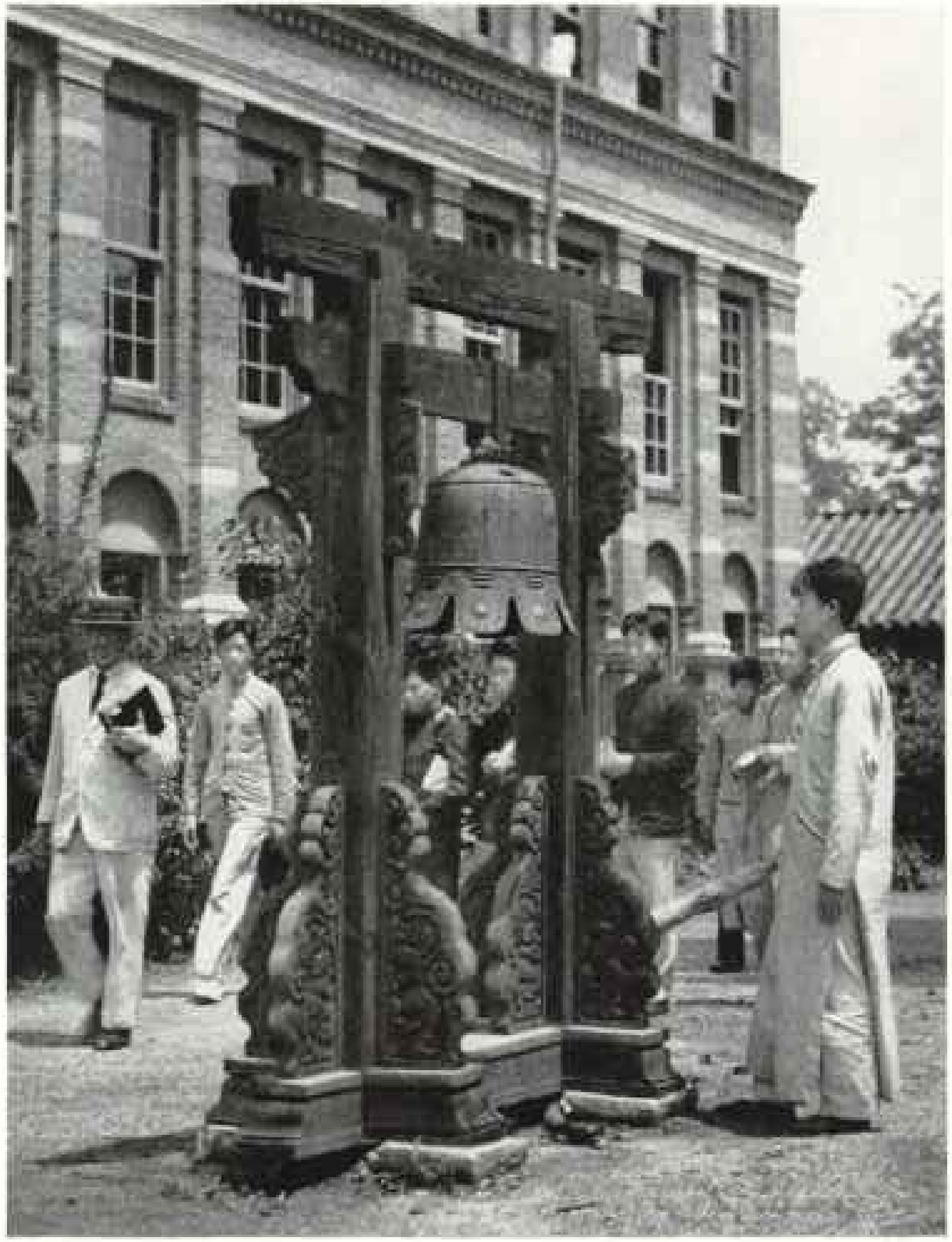
Drawn by Richard Bolsh and Irving Alleman

In Battle-scarred Manchuria, Japan Brews Another War with Russia

Despite her defeats by the Soviets at Changkufeng and Nomonhan in 1938 and 1939, Japan dreams of cutting the old Trans-Siberian Railway and isolating Vladivostok, whose underground air base points towards Tokyo. To the north, Russia has built a newer, less vulnerable lifeline, ending at Nikolaevsk. Manchukuo, Japan's puppet State, contains more territory than China's former Manchurian provinces.

This Japanese Train, Armored and Camouflaged, Fights Bandits—Tomorrow It May Shoot the Russian Bear in the Back

"Does a railway through this waste (north of Harbin) pay for itself?" asks the author. "Not at all. It is here for just one purpose—war with Russia. On sidings we see armored railway cars mounted with searchlights and gun towers, and camouflaged with a mottle of blue, yellow, gray, brown, and green" (page 625).



This Old Temple Bell Started a College Strike

When it was installed on the Manchuria Christian College campus at Mukden, Chinese pupils complained it did not fit the modern spirit of the school. Finally they became reconciled to it as a work of art, and it rang for classes. When war broke out, Japanese interned Scottish and Irish missionary teachers.

From W. T. Turner

Between Dairen and Harbin Rolls an American-type Club Car

These passengers on the Asia Express are occidentals and Japanese. The diner's waitresses are White Russian girls (page 619). Japan's South Manchuria Railway bought its original rails and rolling stock from the United States. This and other cars made at Dairen are imitations of American Pullmans.

Manchurian Soybean Cakes for Fertilizer Give Japan's Weary Soil a Transfusion

The cartwheels stacked on Dairen's docks are the compressed residue of the refining process. Soybean oil feeds Nippon's people and war machine and makes her blockade-proof (page 616). It goes into explosives, lubricating oil, and plastics; into soup, salads, and vitamins. In 1940 Japs made the soybean industry a State monopoly.

Natural from Black Star

"Explosion" Is the Coming Attraction, Proclaims the Japanese Poster above the Entrance to Hsinking's Morning Sun Movie House

The double bill advertised by twin posters costs 5 to 10 cents. The motion-picture industry is a State monopoly. Studios at Hsinking, capital of Manchukuo, make both Chinese- and Japanese-speaking films. No American picture has been imported since 1937. Showboats carry films into remote river villages (page 623).

Harbin Cathedral Is a Monument to the Vanished Glory of the Tsars

The city, a bit of old Russia in the Orient, was built during the railroad boom some 40 years ago. Its 30,000 Russian exiles, largest white population under yellow rule, have not followed Soviet changes (pages 605, 623, 626, 627). From its Orthodox churches the faithful journey each winter to the icy Sungari River for baptism.

step out into the road and politely accost the traveler. They do not rob him; probably he does not have enough on him to make that worth while.

They invite him to tea, and if he is wise in the ways of the Red Beards he knows what that means. It is an evasive oriental way of informing him that he is being kidnaped.

He goes with them through the long aisles to their hide-out, perhaps an abandoned temple.

And, sure enough, there is tea on the fire. Over the teacups, his new acquaintances inquire about his relatives and friends. They are so interested that they even ask for names and addresses and write them down. Then they write letters, demanding a stiff ransom.

If the ransom is not forthcoming, they become less polite. They may disengage their guest of an ear and send this with a peremptory note. The other ear may follow, and then one finger or toe every day until the ransom is paid. If it is still not paid, the captive is killed.

I escaped kidnaping by one day.

On the day before I journeyed by cart to Yi Tung Hsien, a small town 30 miles out of Changchun (Hsinking), all travelers were picked off the road by bandits. The day after my trip the same thing happened. But in the charmed interval I got through without trouble. The bandits were busy elsewhere, looting a near-by village.

Upon arrival at Yi Tung Hsien I was told that Manchurian troops had been dispatched to the looted village to deal with the bandits. The Manchurian troops are Chinese. Their loyalty to their Japanese masters is not very intense. They do not like to fight bandits because they have been bandits themselves or may want to be some day.

Eighteen Heads—and a Cup of Tea

During the afternoon the Manchurian troops came back. They brought 18 heads—gruesome and pitiable objects.

I was in the "city hall" talking with the Chinese magistrate (mayor) and his Japanese "policy determiner" when the soldiers entered and laid out the 18 heads on the long table.

I squeamishly removed my teacup from the table.

The magistrate asked, "These are the heads of the *hung hu-tzu*?"

"They are," replied the captain in charge.

The magistrate turned to his official thorn in the flesh, the Japanese policy determiner, who had been sent to the town to reorganize its affairs according to Japanese ideas.

"You see," he said, "our brave men have killed all these and put the rest to flight."

But the Japanese was suspicious.

"Are you sure," he asked the captain, "that these are not the heads of the village men who were killed by the bandits?"

The captain was indignant. "No, no! These *are* the bandits."

"I have been in that village," the Japanese persisted. "I think I recognize some of these faces."

"Your pardon, but you are mistaken."

"How many of your men were killed in the fight?"

The captain squirmed a little. "Well, we were very lucky. No one was killed."

"I don't see that any of you were even wounded. And yet you killed 18 men. That was a great feat."

The captain mumbled assent.

"You had ten rounds of ammunition. How much have you left?"

"None left. It was a very hard fight."

"It must have been. Where are your guns?"

"After we had used up all our ammunition, we had to throw our guns aside and fight with our knives."

"So you still have your knives?"

"It is a great pity, I know, but in our haste we forgot our knives, and they were left behind."

Strange People! They Resist Japanese "Welfare"

The Japanese slowly rose to his feet and his manner became menacing.

"You fought no bandits! Instead, you gave them your arms and ammunition so they could continue to make difficult our administration of *Wangtao*, the Kingly Way, with which we seek to restore peace and happiness in this country. You will go to your barracks. You will await trial by a military court."

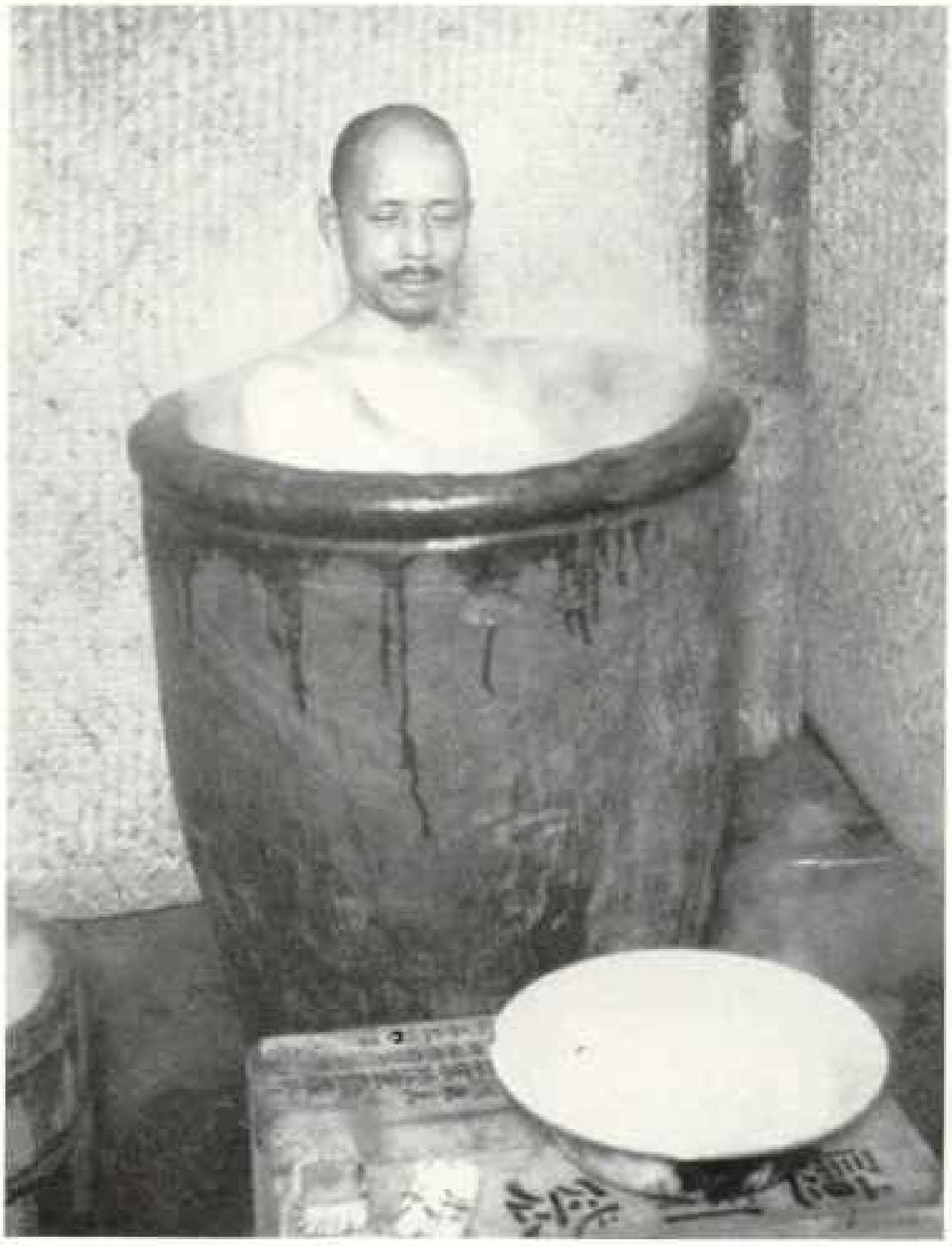
He turned to me as they went out.

"You see our difficulties," he said. "We want nothing but the welfare of these people. But they will not cooperate with us."

I noticed in going about this and other towns that even people who had suffered severely at the hands of bandits would say nothing against them. The "bandits" are the only ones who are fighting the people's fight against the Japanese. They are not gentle. They loot and kill, but they often do so to get food and arms to carry on their war against Japan.

Many people no longer call them bandits. They call them "volunteers."

When Japan attacks Russia, it is to be expected that these tough, cruel bandit-guerrillas will multiply and become an insurgent army.



A Japanese Army Officer Takes a Steaming Tub Bath

Squatting in an oriental-style tub, he is set for a long soak. The same water, heated by the small stove, may be used by the next comer, for the place is a public bath. The half-cask at left is used for the cleansing sponge bath. The box is a "comfort package" from Japan for the men at the front.

The Japanese say that the people are ungrateful. They do not seem to appreciate the better roads, better railroads, better agricultural and industrial methods developed by the newcomers.

Treasure Chest of Coal and Iron

"That is all splendid," a Chinese farmer told me. "Splendid for Japan. If we raise more, Japan takes it. The new mines? Yes, but what comes out of them all goes to Japan. Everything is for Japan. We become poorer day by day."

He threw up his hands. "There is no help for it."

Japan found a treasure chest in Manchuria. Here was an area of half a million square miles to add to the more than a quarter million of the Japanese Empire.

It was a land of good workers, thanks to the great Chinese immigration. The population of "Manchukuo" was given by the census of October, 1940, as over 42,000,000. All of these were Chinese, with the exception of about four million Koreans, Mongols, Manchus, White Russians, and Japanese.

With millions of highly competent economic slaves to work for them, the Japanese could strut like lords of creation. Upon returning to Japan and seeing Japanese doing menial tasks one said, "I find it very strange. Where I have been, no Japanese would stoop to manual labor."

Manchuria has extensive iron reserves, the largest deposits being at Anshan. The ore is of low quality, but new methods of concentrating it have raised its economic value considerably.

There are also vast bituminous coal deposits. In fact, coal is Manchuria's most important mineral. Though much of it is unsuitable for coking, it is used for steam purposes, gas, and, when liquefied, as fuel. At Fushun is one of the largest open-cut mines in the world.

Coal and iron are sinews of war.

Magnesite, oil shale, limestone, and other products of the mines also feed Japan's industrial and war machine.

As for timber, despite extensive destruction there are yet vast forests where the sound of the ax has not been heard and some where the tiger still roams at will (page 631).

The mountains of the west contain valuable minerals. Down the center of the country sweeps a flat plain, deplorable from a scenic

Black Star

Japs and White Russians Put on Armor for a Rough-and-tumble *Kendo* Match

Attired in masks, breastplates, and gloves, the fencers will belabor each other with two-handed bamboo practice swords. They are students at Hsinking's National University, a Manchukuo creation.

Jap Train Guards Await the "All Aboard!"—Porter 7 Carries His Number on His Back

Officer and privates are going on anti-bandit duty with the Mukden-to-Hailun train. Every field of tall kaoliang is a suspected hiding place of the "Red Beards," or bandits (pages 605-6).

Something Has Tickled the Mongol Funny Bone at the Peers' School in Hailar

These grinning boys, usually poker-faced, are sons of district governors. Like their fathers, who still live in yurts, they will go back to tent houses when they are graduated (page 633). In the group are three recruits not yet in uniform.

standpoint but providing rich virgin soil to the peasant. That is, to the Chinese peasant. It offers its opportunities in vain to the Japanese peasant.

Japan pleaded that she needed space for her crowded farmers. But when she got the space, her farmers refused to take advantage of it.

They would rather be squeezed and pinched on a one-acre farm in lovely Japan than have any number of acres in a flat, dusty no-man's-land where a below-zero winter leaps abruptly without pausing for spring into blazing summer, and then back, with no autumn, into freezing winter; and where their Chinese neighbor raises and sells more because he is content to work harder than the Japanese and to live on less.

For these reasons, Japanese colonization schemes have largely failed. Most of the Japanese residents in Manchuria are there as overlords and exploiters. When they own land, they employ Chinese to work it.

Exploitation by Test Tubes and Microscopes

This exploitation of Manchurian soil for Japanese benefit is scientifically done. It is a matter of test tubes and microscopes.

In the Central Laboratory at Dairen white-uniformed Japanese scientists study vials of soil as if it were gold dust, honor the lowly soybean with endless hours of painstaking experiment, and adapt American apples, pears, and plums to the Manchurian climate.

In one room is a permanent exhibition to show what has been done with the soybean. Of course, this bean is the monarch of Manchuria. It is more valuable than all the mines and forests. It alone is sufficient to guarantee that Japan can never be starved out by blockade. In normal times bean cakes and bean oil have for years furnished more than half of Manchuria's total exports (page 610).

But the scientists have made a good thing better. In the exhibit are twin bottles showing the soybean before and after improvement by the laboratory.

And here is an amazing array of objects to show the many possible uses of the better soybean. This automobile steering wheel was made from beans, these buttons were once beans, this salad oil, this sugar, this great cartwheel of bean cake for fertilizer or cattle food, this bottle of vitamin B, this fountain pen, and a score of other articles—all from soybeans!

Knowing that war would someday cut off Japan's supply of American cotton, the labora-

So Alike, Yet So Different Are These Experimental Houses in Which Nobody Lives

At Dairen the South Manchuria Railway tests houses of tile, wood, brick, and cement, and roofs of thatch, tile, and sheet iron. Instruments in each house record temperature, winds, and moisture to determine the materials best suited to Manchuria's below-zero winters and scorching summers (page 619).

tory has made cotton feel at home in Manchuria. This was no small feat. The world cotton zone is below latitude 37. Yet millions of pounds of cotton are now grown in Manchuria, well north of this zone. The seeds came originally from America.

If Japan holds her cotton plantations in Manchuria, North China, and elsewhere, she may never need another ounce of cotton from America.

Growing Merino Wool on Mongolian Sheep

Japan got her wool mainly from Australia. But there might come a day when she would be cut off from Australia. Therefore she prepared to grow her own wool on the backs of Mongolian sheep.

But there were not enough of these sheep in Manchuria and their wool was not good enough.

The laboratory, together with the great experimental farm at Kungchuling, began to work on the problem.

The French merino sheep was brought in. This sheep had the right wool but couldn't stand the climate. The Mongolian sheep was hard as nails. It had learned how to huddle to keep warm at forty below, present the least broadside to the cutting wind, nuzzle out grass from under a foot of snow. But its wool was straight and thin.

The scientists proceeded to put the merino wool on the Mongolian sheep's back.

In the Manchurian Natural Resources Museum at Dairen three stuffed sheep are mute evidence that it has been done.

The first is a Mongolian sheep, its hair stringy and sparse. The next, a cross of Mongolian and merino, has better wool. The last is a cross between a Mongolian-merino and a merino. The wool is right, while the animal is still structurally Mongolian, a tough, rangy native of the steppes and desert.

A comprehensive breeding program is now on to increase the number of sheep in Manchuria, so that instead of the present two or three million faulty specimens there will be 25 million of the best.

The Chinese farmer or stock raiser would have reason to thank Japan for the better methods that he is forced to put into effect—if he derived any benefit from them. But low fixed prices for his products, and high taxes, transfer the benefit to the Japanese. The standard of living of the governed is declining.

In the cities as well as on the farms there are many evidences of "progress," while the condition of the people becomes worse.

You are immediately impressed as you land at Dairen, port at the southern tip of Manchuria. You walk from ship to shore on a pier much larger, longer, and finer than any of those that fringe Manhattan Island.

You come out into broad streets lined with handsome stone buildings. Everything is new, but built to last. There is nothing extempore. The Japanese believe that they are here to stay (opposite page).

The city fairly boils with activity, and the statistics of imports and exports handled through the port are imposing.

But if you can get behind the scenes, you come upon a somewhat different picture.

In the "City of Bachelors"

In the mean back lots of the glittering city is another one—the City of Bachelors, it is sometimes called. There are 10,000 men here, Chinese immigrants from Shantung, employed by the South Manchuria Railway to work on the piers. It is practically slave labor. They are paid from a tenth to a twentieth of what a Japanese would be paid for similar work.

If they wish to quit and go home, there are good reasons why they cannot. There are no ships going, or no space available. More than likely the men are in debt to the company for food and lodging and may not leave until the debt is paid.

They are lodged in what looks like a prison camp. Dozens of long barracks, exactly alike, are "home."

The men sleep fifty in a bed—or, rather, on it, for there are no covers. The bed is a brick *kang*, a broad brick platform against one wall and extending the full length of the building. Across the aisle is another extending along the opposite wall. A thin straw mat is stretched over each kang and on this the men lie, closely packed.

"You have a recreation hall?" I asked the Japanese superintendent of the colony.

"Ah, yes. Recreation hall. Right this way."

We came to a curious building. It had a door but no windows.

"This is the recreation hall."

I started toward the door.

"So sorry," he said hastily. "We cannot go in. Now I will show you the temple."

He started away.

I pretended not to understand, for he was speaking in Japanese. I said "Thank you," and popped into the door of the forbidden building.

He followed, protesting. But I had already seen. It was an opium den. Men lay in narrow bunks, smoking. An attendant behind a counter was selling the familiar Jap-made packets of opium and heroin to half a dozen workmen.

The superintendent sought to explain.

"In your country you have many strikes, yes? Here we have no strikes. This smoking—it helps to keep the men patient. And we give them no meat. Meat makes labor trouble. It is too strong. If you would not give your American workers meat. . . .

"Now we go to see the temple. It, too, has a very good effect upon the men."

The small Buddhist temple contained a tarnished Buddha whose toe had been almost completely kissed off. There was also a money box.

The Japanese looked about with satisfaction.

"Very good for the men," he said.

"It keeps them patient," I suggested.

He agreed cheerfully. "Yes, yes. Buddhism makes quiet. Christianity no good. It makes every man think he is important. The religion of Mohammed—it is no good. It is a war religion. Buddhism is very good. It makes men look upon every small insect as their brother."

Keeping Labor "Patient"—with Opium, Buddhism, and No Meat

The policy of keeping the men patient with opium, Buddhism, and no meat seems to have succeeded. A more listless lot could hardly be imagined. Their muscles were stout enough for their work, but their spirit seemed dead. Most of those off duty were smoking cigarettes. The smoke betrayed the presence of opium in the tobacco.

I picked up one man's pack and looked at it. It was the familiar "Sunrise" brand, made by Japanese interests and sold at a very low price throughout Japanese Asia.

"More patience," I remarked to the superintendent.

Japan's deliberate campaign to drug the Chinese people into a state of lassitude and nonresistance is too well known to be described in detail here. Everywhere in Manchuria as well as in North, Central, and South China itinerant Japanese "physicians" sell the "medicine" guaranteed to cure stomach-ache, headache, or any other ache of body or mind.

It can be had in many forms. It may be injected, smoked, eaten, or taken in a pinch of snuff. And it is always dirt cheap. The benevolent conquerors see to it that no one, not even the humblest coolie, cannot afford a pack of heroin cigarettes.

The South Manchuria Railway, employer of the ten thousand men of the City of Bachelors, and many thousands elsewhere, is a

From W. T. Turner

Droshky, Rickshа, and Man of Burden Contrast with Dairen's Ultramodern Station

Forty-four years ago Dairen was only a fishing village. Then the Russians built harbor works, fulfilling the Tsar's dream of an ice-free port. After the 1904-5 war, it was ceded to Japan. Nipponese completed it as an occidental-style city, with wide streets radiating from circles like those of Washington, D. C.

model of efficiency. I visited the fine Railway Training Institute where engineers learn what to do when bandits place logs across the track and lie in ambush.

Conductors and telegraphers must be fluent in Japanese, English, Chinese, and Manchurian dialects. In the railway workshop students were taking locomotives apart and putting them together again, and they boasted that a locomotive repair job could be done here in a week that would take two weeks in Japan and six in England (page 604).

In the railroad's Hygienic Institute commendable work is being done to insure the health of Japanese in Manchuria. Scientists analyze Manchurian foods and water, horses confined in spotless stalls furnish serum against scarlet fever, tetanus, and diphtheria, and there is a corral of sheep whose blood is used in the Wassermann test.

Experimental Village—with No People

But perhaps the most curious sight is an uninhabited village. Each house in it is made of a different material. One has walls of cement, one of wood, one of hollow tile, one of red brick, one of Chinese gray brick, and so on. The roofs, too, are different—sheet iron, tile, wooden shingles, thatch, etc. (617).

In each house are instruments that keep a complete record of the effects of the weather, its moisture, wind, heat, and cold. Thus the most suitable building materials for the Manchurian climate are being determined.

So far, the results indicate that the Chinese gray brick house with a sheet-iron roof covered with thatch is the warmest in winter, coolest in summer, and the cheapest.

Ryojun, Kinshu, Mukden—All Aboard!

This railroad carries on so many activities which seem to have little to do with railroading that one is almost surprised to find that it also runs trains.

They are, as might be expected, the best. The coaches and chair cars are American in size and comfort. The diner, where the menu is printed in four languages and you are waited on by smart White Russian girls, is clean and cheap. The observation car has conveniences from radio to library, the roadbed is smooth, and you can rely upon arriving at your destination on the minute (page 609).

The railroad links Manchuria's cities. Let us follow it. Ryojun (Port Arthur), near Dairen, is a health resort—but it was hardly

At Mukden Japanese School Children Visit Tungling, the Tomb of Nurhachu, Founder of the Mighty Manchu Dynasty

The emperor died in 1627 without realizing his dream of conquering China. But in 1644 his victorious successors moved their capital from Mukden to Peking (page 604). Constant recruiting to fill their guard of 100,000 Banner Men almost depopulated Manchuria. In 1911-12, revolution swept the Manchus off the throne of China, and Chinese farmers, reversing the tide of immigration, repeopled Manchuria. Only a handful of Manchus has escaped absorption by the patient Chinese.

Below Old Chinchow's Wide Walls Boys Play Basketball, a Game Taught by American Missionaries

In times of disorder, country people for miles around fled to this sanctuary, just north of Dairen. Occasional ramps lead to the top of the earth-filled walls, 20 feet thick. Chinese boys, while not expert at basketball, play a strenuous game. Missionaries have popularized bicycles, phonographs, clocks, plows, sewing machines, and other American manufactured goods.

Even in Mukden, Chorus-girl Posters and a Band Lure Fans to the Big Top

Within two hours after the last show, tent poles and cloth will be down, leaving a vacant lot. Japanese musicians play on the balcony. Overhead, billboards picture girls, aerialists, freaks, and horses. The vertical banner advertises *sākasu*, a Japanese word which imitates the sound of "circus" (opposite page).

that in 1905 when Japan ousted Russia from this "Gibraltar of the Far East."

Kinshu (Chinchow) is a quaint old town with a wall twenty feet thick, and walls also around the mentality of its conservative people. Here we saw a funeral procession in which a paper cow and paper horse were carried so that the departed would have food and transportation in the world beyond (pages 621, 624).

Mukden—its population is now over a million—is a violent combination of old and new. The part known as "New Town" or "Jap Town" is Tokyo at its most modernistic. But the Imperial Palace of the Manchu emperors, who ruled here before they invaded Peking, and the grand mausoleum of Peiling where one of them is buried, are like roots reaching back through the thin dust of Japanese conquest into a remote and rich past (pages 620, and opposite).

Hsinking (formerly Changchun), the capital of Japan's puppet invention, "Manchukuo," is a miracle.

On my first visit, before the Japanese invasion, it was a flea-bitten village.

On my second, just after the conquest, it was a cloud of dust as the Japanese pulled down rattraps, threw up new buildings, and built avenues. There was no room in the hotels. Visitors had to sleep in cars in the railroad yards.

On my third visit it was a smart modern city with a population well on toward half a million (now it is over this figure) and splendid administration buildings for the Japanese "advisers" to the puppet government (p. 611).

"World's Most Pitiable Ruler"

But the promise of a fine palace for the "Emperor" had never been fulfilled. He was still housed in an abandoned Salt Administration building left over from the old days.

The "Emperor" of Manchukuo is the world's most pitiable ruler. He once sat on the throne of China. When China became a republic, he became just plain Mr. Henry Pu-Yi. When the Japanese took Manchuria they persuaded Pu-Yi with fine promises to come to the new capital as Chief Executive and, later, Emperor.

He went, but he is probably sorry now. He lives in mean surroundings and is the prisoner and baggage of the Japanese Kwantung Army. He may play tennis as much as he pleases, but John Jones of Jonesboro has as much to do as he has with state affairs.

Going farther north, we come to Harbin; its population now exceeds 660,000. And now we begin to think about Russia.

For Harbin teems with White Russian exiles, people of the old Tsarist regime, who do not dare or do not wish to go back to Russia under the Soviet (pp. 605, 612, 626, 627).

Probably you can see the Old Russia better in Harbin than in most cities in Russia, for here the people have been unaffected by Soviet changes. They have scorned to adopt Chinese ways, or Japanese. Harbin has the largest white population under yellow rule. But they are too proud to work for yellow masters.

They live in dismal poverty, beg on the streets, tell the stranger highly colored stories of their supposedly aristocratic past. And, indeed, some of them do belong to once noble families of St. Petersburg and Moscow.

Harbin, the Vestibule to Russia

Harbin is the vestibule to Russia. Japanese troops will make it a rallying point. From here, if you go east you come to Russia; north, you come to Russia; west, you come to Russia.

But distances are great and it is an uncomfortable and sometimes unsafe trip to the border by any one of these three routes.

Curious to see that long, nervous line between Siberia and Manchuria where the greatest conflict in the Asian arena is likely to take place, we first went north.

Our train puffed through a bleak, bare wilderness. Much of the great plain was under water. The July floods were on. They are a regular institution. The mountain snows melt in June, the rivers plow down into the plain and overflow. This is no place for a home, unless it has a keel under it. Even the bandits have little use for this country. Villages are too few, loot too little.

Does a railroad through this waste pay for itself? Not at all. It is there for just one purpose—war with Russia.

Our train is full of troops on their way to the border. The Kwantung Army must be ready at all times; who knows when the moment will come?

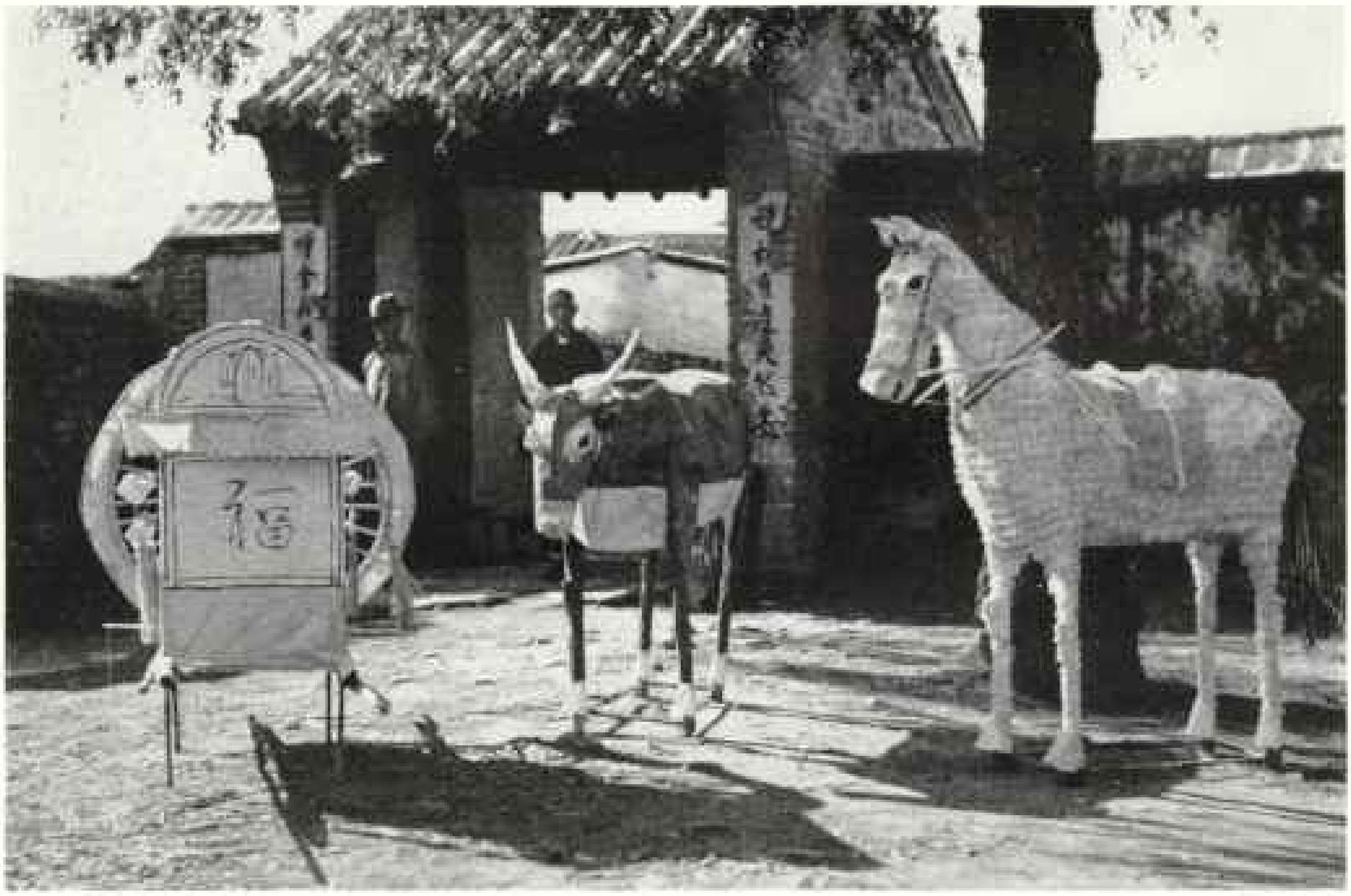
On sidings we see armored railway cars mounted with searchlights and gun towers, and camouflaged with a mottle of blue, yellow, gray, brown, and green (page 608).

There are boxcars of horses, flatcars loaded with tanks, others packed with fieldpieces.

Every station is protected by a double fence of barbed wire and barricades of sandbags, and swarms with armed soldiers.

We rattle over a bridge. At each end of it is a cement fort, and the soldiers on duty salute as the train goes by.

Down the track half a mile ahead of our train runs a gasoline-propelled pilot car, bristling with machine guns. The idea is that



Paper Cow and Paper Horse Await the Funeral Pyre to Deceive the Gods

These substitutes for flesh-and-blood sacrifices represent spirit animals for the deceased in the after world. Even a paper airplane and an automobile were burned at one war lord's funeral. The sign at the left says "Happiness." On the gate at Chinchow are balanced couplets indicating that the picture was taken at the Chinese New Year.

"bandits" or Russian guerrillas may have blown up the track and are in ambush to attack the train. The pilot car should discover any such plot and signal back a warning to our engineer.

Our train guards are all heavily armed. Hitched to the end of the train is a traveling fort, an armored car with many embrasures for machine guns and a round gun turret on top.

Every day there is likely to be an "incident" somewhere along this great border, which stretches for more than 2,000 miles.

It only remains for the chiefs to choose the incident that shall be used as the spark to set off the great conflagration.

The train picks its way gingerly over a section where the rushing flood has undermined the track. (The next day the track was washed out at this point.)

The train stops at Pehanchen (Peian); it will lie there until morning. Night travel is too dangerous. We are told that we can go to a hotel. That sounds all right.

But the hotel is half a mile from the station, and between the two stretches a sea of liquid mud. A motorcar could never get through it.

In high rubber boots provided by the station policeman, we wade. The surface is deceptively smooth. Underneath are all sorts of ruts and lumps to slip and stumble over.

Rain is pouring down. A boy follows with our suitcase on his shoulder, and another boy with our shoes, openings upward, so that they fill with water.

The mud comes only to the knees, but fragments of it spatter us from head to foot. The town, when we reach it, is a board and tin affair reminiscent of American frontier days.

The streets are a trembling brown jelly. Citizens, bare-legged, hoisting their Japanese kimonos or Chinese robes, wade nonchalantly about.

At the center of the town is a large fort to which the people may flee if marauding Russians come. Russian planes sometimes playfully bomb this town. A plane—probably Japanese, but who can be sure?—is above us now.

Drenched, bespattered, Mary looks herself over.

"One comfort," she says, "is that we're well camouflaged."

She regrets arriving at a hotel in such con-

Still Dear to the Chinese Immigrant in Manchuria Is the Firecracker

China's festive fireworks are centuries older than Europe's death-dealing gunpowder. Earliest celebrators called them "exploding bamboo" after the popping sticks which they burned to ward off evil spirits. The Chinese ideograph above the gate locates the scene as Mukden. Fur hats and padded garments reveal the season, winter.

dition. But when we reach the hotel, it appears that there was no cause for worry. It is not the Ritz; it is a sort of barracks of rough boards, and there is about as much mud in the lobby as outside.

The fare is plain, the prices high. This is frontier life. We are lucky that there is a hotel at all.

On the Banks of the Border Amur

In the morning we wade back to the station—it is still raining—and ride on to Taheiho (Heiho) on the bank of the Amur. The great Amur River marks the border. It is a mile wide. Beyond it is Siberia. The rain has stopped. The sun pierces ominous clouds to shine upon the Russian church towers and domes of Blagoveshchensk.

There is no bridge and no ferry. No boatman will take you across. Here are two separate worlds. Russia is content to let it go at that. But Japanese eyes look covetously across the stream.

The present China war really began here. In the summer of 1937 Japan was ready to fight China, but wished to know first whether Russia would come to China's aid. There was a way to find out—twist the Russian Bear's tail and see whether it growled or not.

Japanese gunboats steamed over to yonder two small islands, Bolshoi and Sennufa, near Blagoveshchensk and expelled the Russian troops that guarded them. In the scrap one Soviet gunboat was sunk.

The Bear took it lying down. Japan was left in control of the islands. Japan had learned what she wanted to know: Russia did not wish to fight. A few days later, on July 7, 1937, Japan opened the Chinese war at the Marco Polo Bridge near Peiping.

Now let us return to Harbin and thence go west into another wilderness where Japan had a quite different encounter with the Bear.

We come to one of the most fascinating lands in the world—the Gobi, which stretches across Outer Mongolia and reaches up into Manchuria until the desert is stopped by the Great Khingan Mountains.

Here Manchuria, Russia, and Outer Mongolia meet. Here there has been trouble and will be trouble.

The greatest troublemaker of ancient Asia came from hereabouts. Genghis Khan conquered from the China Sea to the Dnepr

Harbin Builds Dikes Along the Sungari—Ten Years Ago the "River of Heaven" Broke Its Bonds and Left 150,000 Homeless

Cholera followed flood, but Harbin survived and grew, for it is the commercial pivot of north Manchuria. Small boats navigate 700 miles of this river to the Amur. From here, rails stretch west to Moscow, south to Dairen, east to Vladivostok, and north to Taheiho (page 623).

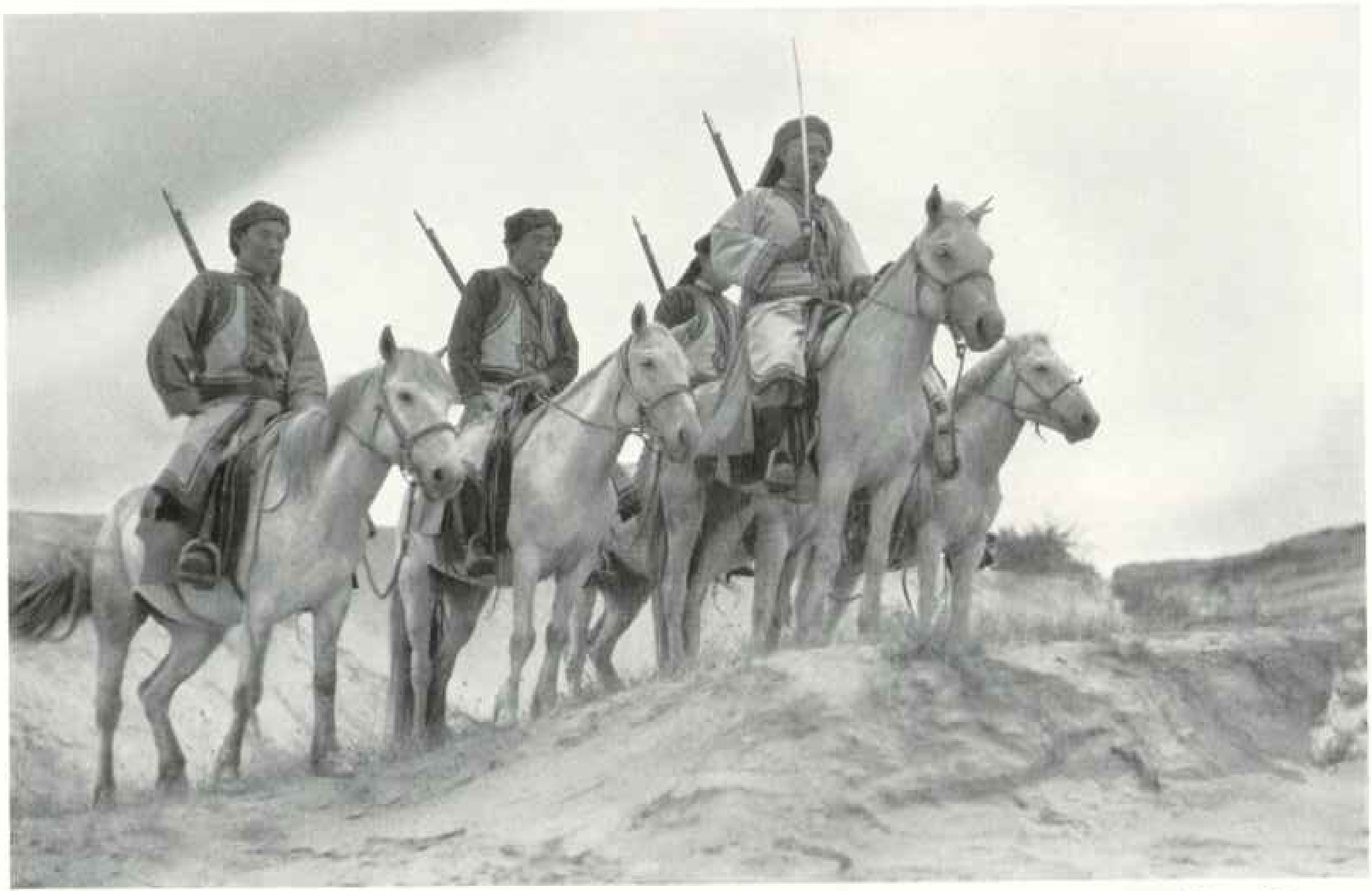
Ice Boats Skim Across Frozen Liao River as Plodding Chinese Drag Half-ton Sledges of Beans

When winter seals the channel for four months, the soybean fleet transfers cargoes to the two-foot ice. The Liao drains Manchuria's richest valley.

From W. T. Turner

Harbin's Sled-taxi Men, Both Russian and Chinese, Pole Passengers Across the Frozen Sungari River

When winter stops ferries, sled men on rear platforms propel the chairs with ice poles.



Mongol Scouts Survey the Desert in Northwest Manchuria—Seven Centuries Ago Their Ancestors Overran Asia and Part of Europe

Many Mongol princes trace descent from Genghis Khan, Asia's mighty conqueror (page 625). The cavalryman and his pony are inseparable companions. Dismounted riders roll like bowlegged American cowboys as they walk.

Mongol Cavalrymen Occupy This Chinese-style Fort beneath the Rising Sun Flag at Hailar

Manchuria's two million Mongols are indifferent subjects of Manchukuo's Japanese-advised Emperor, although some of their horsemen serve his army. They have blood brothers in Outer Mongolia. When war breaks on the border, says the author, the Mongols will make trouble for Japan (page 631).

Directing Goats Is Beneath the Dignity of the Hailar Traffic Cop

On a banner slung across the street, the Chinese and Western Drug Company advertises, "Wholesale and retail, prices low." The door at right offers "Japanese-style haircut." The rider is Mongolian, the policeman Chinese. The goats supply meat, milk, and cheese to the Mongols.

(Dnieper). Though he grew up in a tent and had never seen a city, he went out to conquests that surpassed Napoleon's.

From Kublai Khan to Jimmy Doolittle

His grandson, Kublai Khan, sat on the throne of China and made the only attacks in history upon the homeland of the Japanese until Jimmy Doolittle came along six and a half centuries later.

The Mongols are still warlike, and there are two million of them in this far province of Manchuria. The word Mongol is from *mong*, meaning "brave."

We ride out on Mongol horses into the frontier country. We decide that the Mongols must be brave, and able, too, to make a living in such a land (pages 628-634).

By the Chinese the Gobi is also called *Shamo*, Sand Desert, and *Han-hai*, Dry Sea.* This part of it is not sandy, but it is surely dry.

There is not a tree. The ground supports only a light grass.

Yet on this thin grass are grazing far larger herds and flocks than we have ever seen in the American West or even on the pampas of Argentina.

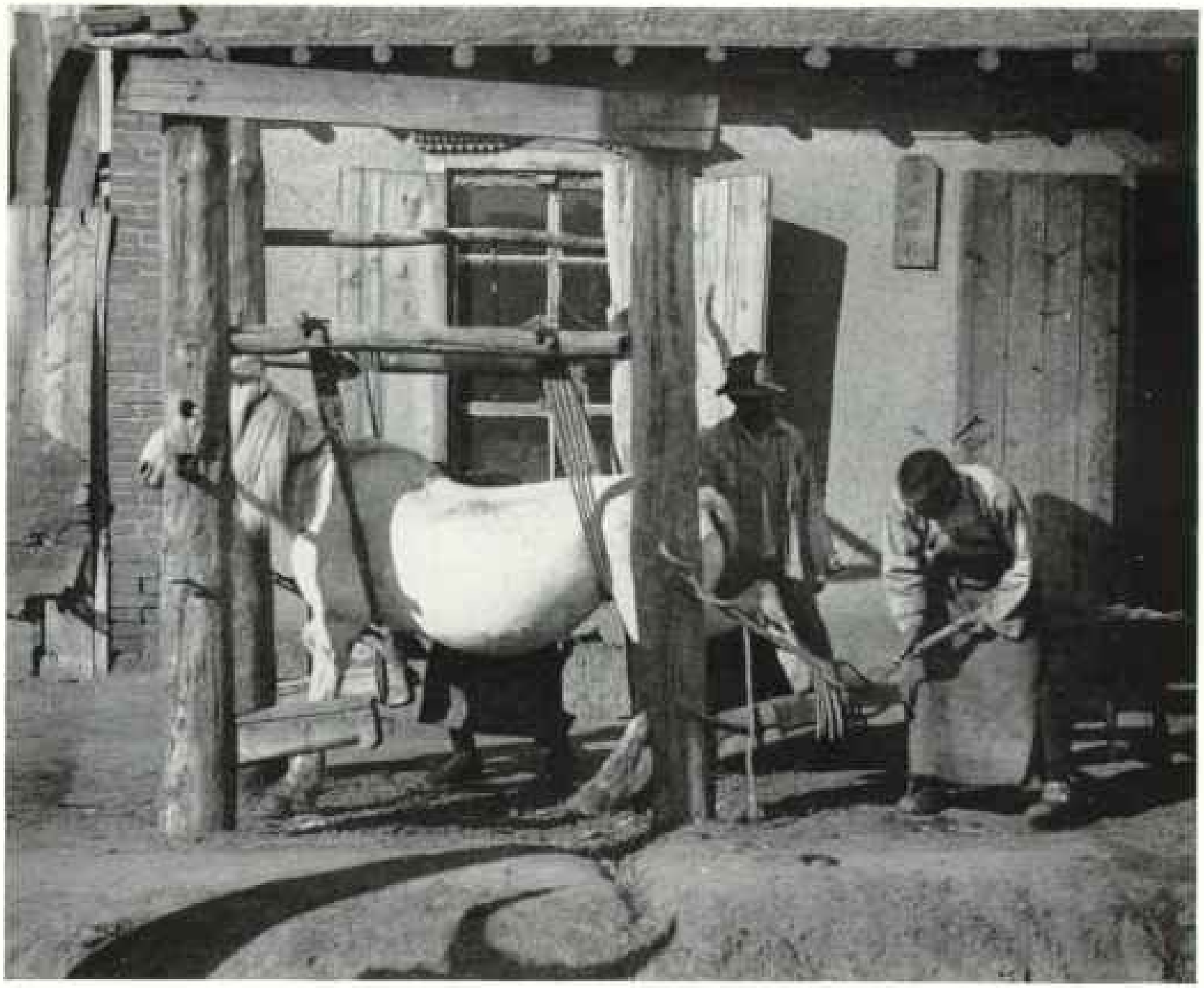
The former home of the dinosaur and baluchitherium and possible birthplace of the human race is still very much alive.†

Yonder is a herd of five thousand horses. Some of them are rough, tough Mongolians, but others are the new cross-breed of Mongolian and Arab, combining the good qualities of both.

There are vast herds of two-humped camels. And around that lake, which looks so refreshing but is heavy with salt, ten thousand sheep graze on the slopes. They are the famous

* See "Desert Road to Turkestan," by Owen Lattimore, National Geographic Magazine, June, 1929.

† See "Explorations in the Gobi Desert," by Roy Chapman Andrews, National Geographic Magazine, June, 1933.



A Mongol Pony Is a Tough Customer—the Wary Smith Must Truss Him in a Sling

Each lashing hoof is bound to a foot-board before the iron is applied. On their native Mongolian steppes, these half-wild ponies are seldom shod. Short and sturdy, they grow shaggy "overcoats" in winter. They scrape away the snow to forage on dead grass. Many are broken, shod, and exported. On such tireless mounts, Mongol archers swept into Europe in the thirteenth century. Lately the Japanese have crossed the Mongol pony with the Arab (opposite page).

Mongolian-merino breed already mentioned (page 617).

Near each herd or flock are the *yurts*, felt tents, of the Mongols in charge of them. The yurts are shaped like the hogans of our Navajos.

I have slept in these yurts on sheepskins beside the fire of *argol*, dried dung, which must be used as fuel since there is no other. I have eaten horse meat and kumiss (fermented mares' milk), and licked my bowl clean in approved Mongol fashion, since water is too precious to be used in washing dishes. And I have come to respect the Mongols for their Spartan lives and constant courage.

The Mongols are not good citizens of Japan's puppet State. They are constantly making guerrilla raids upon the Japanese. When war breaks on the border, they may be expected to make considerable trouble in the rear of the Japanese troops.

A border dispute at Nomonhan in 1939 swiftly grew into a young war. Russian troops and their Mongol sympathizers from both sides of the frontier fought so sturdily that the conflict lasted all summer and it was finally the Japanese who called quits. They had used 500 airplanes and 60,000 troops, of whom 18,000 never returned to Japan.

This humiliating defeat is credited with having made Japan decide to leave Russia alone for the time being and to concentrate first upon acquiring the resources of southern Asia.

Hunting Tigers Near Vladivostok

We now cross this great land from the far west to the far east and find still another Manchuria.

Here, close to Vladivostok, are mountains and great forests where some of the finest tigers

Automobiles Speed at 40 M.P.H. Across the Roadless, Grassy Plains South of Hailar

Inspecting the car is a herdsman who wears the Mongol symbol of manhood, a belt. One of his words for woman is "beltless." The pigtail queue, discarded by Chinese, survives among Mongols.

in the world tempt the visitor to forget international affairs for a time and turn hunter.

With the famous Russian hunter, Yankovsky, I wearily walked for days through mighty forests, watching for yellow and black stripes.

"Are you sure there are any tigers up here?" I asked skeptically. "I always understood tigers belonged in hot countries—Bengal, for instance."

"Bengal!" he snorted. "Their tigers don't compare with ours. The Siberian tiger is larger. His pelt often measures twelve feet. And the fur is much more valuable, because it's softer, thicker, and longer. It has to be to stand this cold climate. I can get $300 for a pelt."

"It's worth it, considering what a job it is to find one," I complained, peering down the endless aisles of great trees.

"But that isn't all. I sell the meat and bones. The Chinese consider them good medicine. Especially the kneecaps!"

"Do you ever sell tigers alive?"

"Oh, yes. To the zoos. If you've ever been at the Keijo Zoo you've seen two of my tigers. I got $1,000 for the two."

"How did you catch them?"

"They were young ones, about six months old. I killed the mother. Then with a forked oak stick I held one tiger's head to the ground while the other men tied its feet together, jammed a stick behind its teeth to prevent it from biting, and put a stick through its legs to carry it by. Same way with the other."

"It sounds very easy," I said. "But here we've been going three days and haven't even come on a track."

"Be patient. Something may happen just when you least expect it."

It did. That night we stayed in a tiny hunting cabin. I came out after dark to get a bucket of water from a near-by spring. As a precaution, I picked up the ax as I went out the door.

By the spring a black shadow was lurking. Thinking it was one of the savage wild dogs that had been annoying us, I swung the ax and the animal dropped without a sound.

"Got a dog," I said as I returned to the cabin. In the morning we found a tiger five feet long from nose to tail-tip, lying dead beside the spring!

Of course he was only a youngster, yet hardly what one would choose to meet on a dark night.

"I think I've had enough tiger hunting," I said.

When Nomad Mongols Settle at Hailar, They Bring Their Tent Houses of the Steppes

Felt covering of the yurt in the foreground, raised slightly to admit the breeze, reveals the lattice framework. The wooden door is a city luxury; a rug door (right) is more common. On the plains the family home is rolled up and taken along when the tribe moves to new pastures. From the Mongol word *orda*, meaning a collection of yurts, hence a tribe, comes the English word *horde*, first applied to Mongol armies.

Just over this border we come to Vladivostok, Russia's finger pointing at Japan. Will Japan bite off the finger, or will the finger teach Japan a much needed lesson?

Vladivostok is a picturesque city on hills overlooking the Golden Horn harbor, dotted with wooded islands.

It is vaguely reminiscent of Naples, but if you should come in winter you would find the harbor frozen over except for passages kept open by icebreakers—this in spite of the fact that the latitude of Vladivostok is about that of the Riviera.

An Underground City Awaits Attack

The town, apart from its hills and harbor, is not beautiful. Its buildings are poor, its cobblestones are rough, and it is difficult to imagine where its 206,000 people live—until you are told that a good number of them are underground!

Vladivostok is more than meets the eye. Behind its low hills covered with buildings are higher hills, rounded and bald, which conceal the real might of Vladivostok.

These hills are hollow. Some of them are underground airplane hangars. This war has taught that an ordinary airfield is peculiarly vulnerable. Many a battle has been won by destroying an airfield, together with all its planes before they could get off the ground.

Put the airfield under a hill, and it is not so easy.

In other hills are subterranean ammunition depots and supply centers. In still others are living quarters for troops.

It seems to be calmly expected that the town itself may be quickly obliterated by enemy attack. But that will not end Vladivostok. The subterranean Vladivostok will carry on.

The city is in a powerful and dangerous position. It is almost completely surrounded by Japanese territory.

Russian and perhaps American bombers would radiate not only to the nerve centers of Manchuria and Chosen (Korea), but also to the great cities of Japan, less than 700 miles away.

On the other hand, Vladivostok might easily be cut off from European Russia and besieged. Alive to this possibility, the Russians have striven to make their far-eastern army entirely self-supporting and self-sufficient.

Reversing the "Evil Eye," a Mongol Babe Gives the Camera a Scornful Look

Grandmother and grandson, nomads of the plateau, have finer clothes which they will wear to the fair at Hailar. The spectacles probably are a cheap Japanese import not well suited to grandma's eyes.

There are two daggers poised to strike at Japan. One is Vladivostok. The other is the daggerlike peninsula of Kamchatka. If Vladivostok falls, Kamchatka will still have to be reckoned with.

Kamchatka Stepping Stone of American Aid to Russia

Kamchatka is a stepping stone for American aid to Russia. It lies near the end of the United States' Aleutian chain. Fully conscious of Kamchatka's importance, the Japanese have occupied the neighboring Aleutian islands—Attu, Agattu, and Kiska.*

That makes our route to the Russian front more difficult but not impossible.

Kamchatka is an armed camp. It needs to be, since it is only twenty miles from Japanese territory—the Kurile Islands.

Japanese fishermen comb the waters off Kamchatka in accordance with a fisheries agreement. There is no agreement to admit Japanese to the towns, but they are there just the same.

They doubtless know the coast and country better than the Russians do, know the military preparations that have been made, and are taking "appropriate measures"—one of them being the capture of American islands.

Although Kamchatka seems remote, it is on America's highroad to Japan. Along this short Great Circle route Charles and Anne Lindbergh flew "north to the Orient." They stopped at Karaginski and Petropavlovsk in Kamchatka. Thence they followed the Kuriles to Japan.

Their successors, in American bombers, may duplicate their course as far as sparsely populated Hokkaido and then either continue to the Japanese main island or turn to the right to Vladivostok and the Manchurian border.

It is important to keep open our road north to the Orient. The Manchurian border may, in a sense, become our second front in this global war.

Japan considers Manchuria the first essential in her ambitious plan to rule the earth. According to the infamous Tanaka Memorial, Japan had first to conquer Manchuria and Mongolia, then China, then the rest of Asia and Europe, and eventually the West.

If Japan loses Manchuria, she loses the foundation stone of her dream world.

If she keeps Manchuria and conquers Russia, our own dream of a free world will be infinitely harder to realize.

* See "The Lonely Aleutians," by Lonnelle Davison, NATIONAL GEOGRAPHIC MAGAZINE, Sept., 1942.

Finding Jewels of Jade in a Mexican Swamp

By Matthew W. and Marion Stirling

With Illustrations by Staff Photographer Richard H. Stewart

IN THE depths of the vast coastal swamps of Tabasco, we sat somewhat dazed in the comparative luxury of a two-room corrugated-iron house. Near by, in an armchair, was Richard H. Stewart, National Geographic Society staff photographer, who shared our magic-carpet experience.

Only twelve hours before, the three of us had eaten breakfast in Mexico City. We still wore our best clothes, in which we had boarded a Pan American plane.

Two years before (1940), we had come to this very swamp, but had spent five days in arduous travel to reach it from our near-by camp in southern Veracruz. On the last lap we had wallowed afoot in the muck. On that National Geographic Society-Smithsonian expedition, we lived here for two weeks in an Indian's uncomfortable thatched hut while we were uncovering an impressive group of ancient stone monuments.

In 1941 the National Geographic Society-Smithsonian Institution Expedition to Southern Mexico had found 782 pieces of jade at Cerro de las Mesas.*

This evening, had we known that within a few days we were to unearth another magnificent collection of pre-Columbian jade objects, we would have been even more amazed.

But sufficient for the day was our wonderment at the swift journey and such pleasant quarters.

The Petróleos Mexicanos, in our absence, had sunk a wildcat well here in the swamp, only a mile from the archeological site of La Venta. A camp had been established and a canal dredged to it from the Tonalá River (map, page 642).

Orizaba Casts Its Veil Aside

So we had boarded a plane in the Mexican capital, flown across Lake Texcoco, and then on to Veracruz over the rugged mountains which separate the central plain from the coastal plateau. We caught a rare glimpse of the snow-clad peak of Orizaba (Citlaltepetl) gleaming in its white mantle and completely free of the clouds which usually cling to it.

Leaving Veracruz, we flew south to Minatitlán. We had hoped to obtain an aerial view of the village of Tres Zapotes, which had been our home for two winters. Unfortunately, the entire area south of Veracruz was wrapped in clouds. Not even the peaks of Tuxtla or San Martín appeared above the white blanket. Only when our plane ducked below the misty screen to land at Minatitlán did we know our whereabouts.

Through the courtesy of the oil company we found another plane awaiting us, so we piled in immediately and flew to Coatzacoalcos (Puerto México). Landing in a little cow pasture behind the sand dunes, we motored to town and met Alfonso M. de Ibarrola, superintendent of the new oil camp at La Venta.

By station wagon and boat we completed our trip to the camp before dark.

Awaiting us were two of our old workmen from La Venta. We dispatched them to report our arrival to Dr. Philip Drucker, who had been sent ahead more than a month before to continue the excavations at the archeological site on this island in the heart of the swamp.

Explorers Acquire a Modern Home

Ibarrola, who had accompanied us, insisted on turning over to us his two-room house, complete with shower, while he moved into the radio house.

Just as we were getting settled, Dr. Drucker hiked over from his camp on the island. We had a reunion, catching up on news from our respective ends of the world.

We were eager to see La Venta again, so early the next morning we set out for Drucker's camp, built in the clearing of Sebastián, native headman of La Venta.

Sebastián's ample wife, with commendable conservatism, refused to recognize recent encroachment of civilization by donning a shirt. She listened with coy pleasure to her vigorous 85-year-old husband while Sebastián told us, "She's not much to look at, but is a fine worker, loyal, and the best wife I ever had."

Drucker had finished his work on the stratigraphic trenches and we looked over the collection of pottery and figurines he had recovered. One interesting specimen was the clay model of a human skull on a platter.

La Venta's huge central mound is 105 feet high. From the summit a view may be had over the coastal swamp as far as the eye can

* See "Great Stone Faces of the Mexican Jungle," National Geographic Magazine, September, 1940, and "Expedition Unearths Buried Masterpieces of Carved Jade," September, 1941, both by Matthew W. Stirling.

Basalt Columns, Limestone Flags, and Clay Filling Seal a Crypt for Centuries

Here ancient bones reposed in a shroud of brilliant cinnabar amid masterpieces of the jade carver's art (pages 639-642). Figurines of vivid green and translucent blue jade were turned up. The builders tried to make the tomb burglar-proof by fitting the stones closely together and packing it with clay.

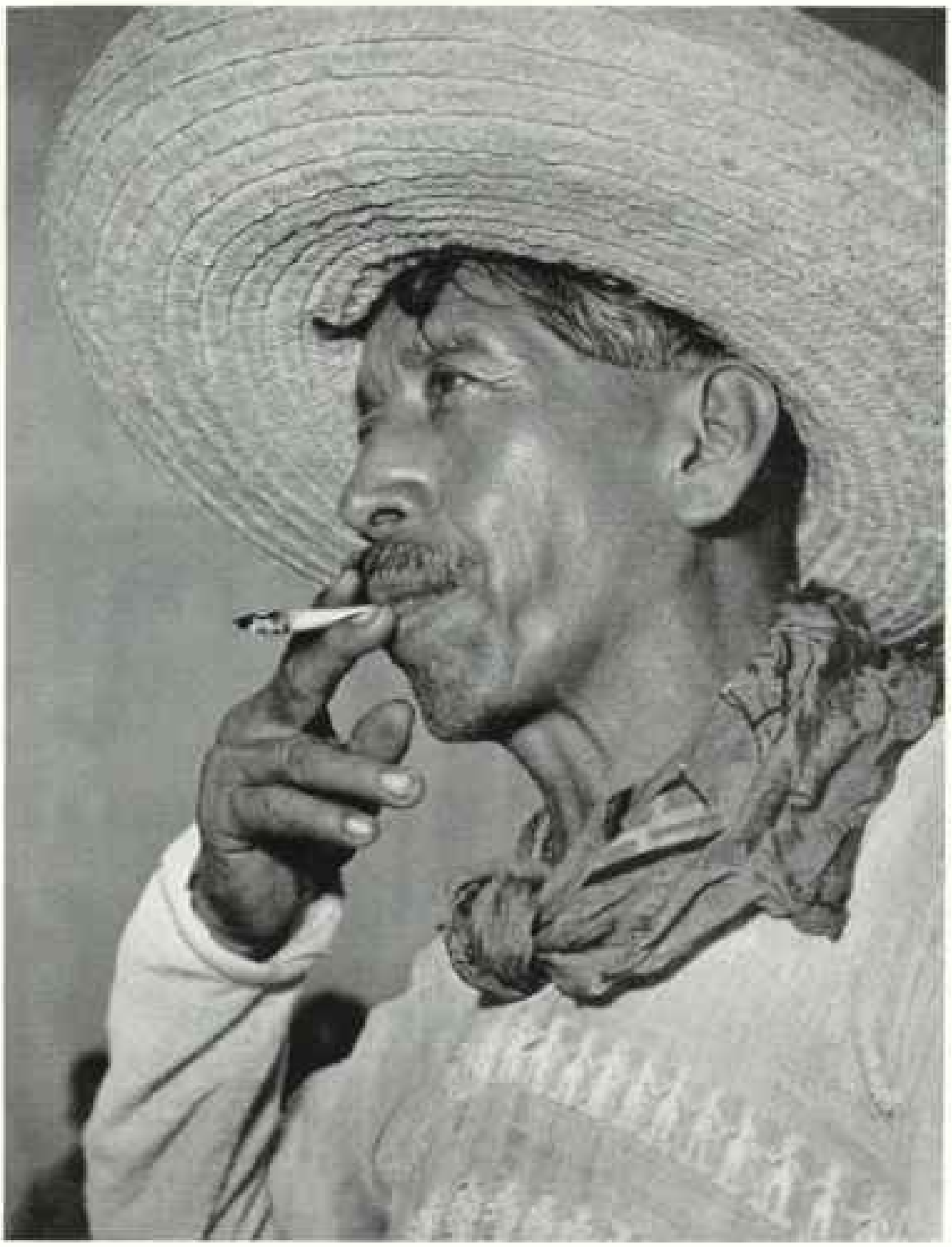
see. On a clear day the ocean is visible in the direction of Tonalá.

North of the mound is a large rectangular enclosure, formed of closely fitted posts of pentagonal basalt, approximately 10 feet high. Wind-blown earth had filled this corral, transforming it into a platform. In the middle was the great 14-foot leaning stela which we had excavated two years ago.

Drucker Moves a Small Forest

Just north of the stone corral is a low mound, its center on a line with the stela and the apex of the big mound. Dr. Drucker had selected the small mound for his first excavation. He had cleared the stone corral of its dense growth of trees. Now we were able to see how impressive it looked.

On the south flank of the mound lay a curious flat slab of hard, fine-grained sandstone about 10 feet long and 3½ feet wide, and not more than 8 inches thick. A shallow depression had been carved in the top surface.



Here Men Sport Fancy Shirts and Bright Scarfs

The mayor of a small village shows what a well-dressed chief of the Zotzils wears. Blouses for men are of cotton, woven with human figures and flower and animal designs. A Zotzil would not feel fully dressed without a scarf knotted around his throat (pages 647, 648).

At first the slab seemed to be a stela which had fallen over, although it lay perfectly flat. Further digging showed that it was meant to be in this position, because it was resting on a massive block (page 640).

About 20 feet to the north a level platform consisting of nine basalt columns, each about a foot in diameter and between 9 and 10 feet long, had been exposed. These were closely fitted and were supported by a series of similar columns, placed vertically.

We were mystified as to what this unique unit might represent.

Was the flat slab an altar, supported on a heavy stone block, or was it a lid covering a hollowed-out stone?

Was the basalt structure merely a massive platform, or was it meant to be a sealed enclosure?

We voiced pessimistic theories and hoped for the best. The possibilities were numerous. It was a rarely exciting archeological prospect. The enormous amount of work which had gone into its construction proved that the aborigines considered it important.

We Uncover a Stone Jaguar

The mound covering the structures, except for its sandy surface, was built mostly of heavy reddish clay. Digging was slow.

As the trench reached the base level, some new features appeared. Not wishing to scar

A "Front Door," Closed for Centuries, Yields to the Tug of Block and Tackle

How the builders of this tomb transported two-ton basalt columns to the site of the grave is an engineering riddle. Volcanic basalt is found in mountains 60 miles away. La Venta people knew nothing of the wheel. Scientists think the blocks may have been floated by raft over a sea and river route.

the sandstone block supporting the slab, we had left an inch or two of clay adhering to the surface.

On cleaning this off, to our surprise we found that the stone block was carved to represent a crouching *tigre*, or jaguar. The north end was the face, in the style employed by early sculptors of southern Mexico—branching eyebrows, long, narrow eyes, flat nose, exaggerated lips, and projecting fangs.

The carved claws clutched the lower front corners. Leaching action of the clay had worn off the detail on the back and most of the sides, except for the ornamental border around the top (page 641).

The roots of big trees growing on the mound had cracked the slab into several pieces, so we easily lifted the chunks of stone. Off came the top and our best hopes were realized!

The "jaguar" was hollow, presenting the appearance of a big stone bathtub, and was filled to the top with red clay coated with a small amount of loose sand. Clearing this out with trowels took most of a day and produced a fine crop of blisters on hands not yet hardened to this type of work. However, we would welcome the opportunity of suffering again under similar circumstances.

Our stone tigre proved to be a sarcophagus. Some personage, doubtless of prominence, had been buried in it with his ornaments, and presumably in full regalia. The head had been placed to the south, facing north. Seepage of water through the cracks in the lid and chemical action of the clay had destroyed the bones.

Still in proper position were two magnificent paper-thin, mottled-green jade circular ear ornaments. To each had been attached, by means of minute drilled holes, the representation of a jaguar claw fashioned from translucent emerald-green jade.

By the right side, at approximately the position of the hip, lay a well-made figurine of pale-green serpentine. This represented a

nude male with slanting eyes, flat nose, and narrow head, so characteristic of the early art of this region.

Beside this lay an implement about 8 inches long of highly polished jade, spatulate at one end and pointed at the other. It was similar to an implement, shown in Mexican and Maya art, which was used for piercing the tongue or ears in the ceremonial letting of blood.

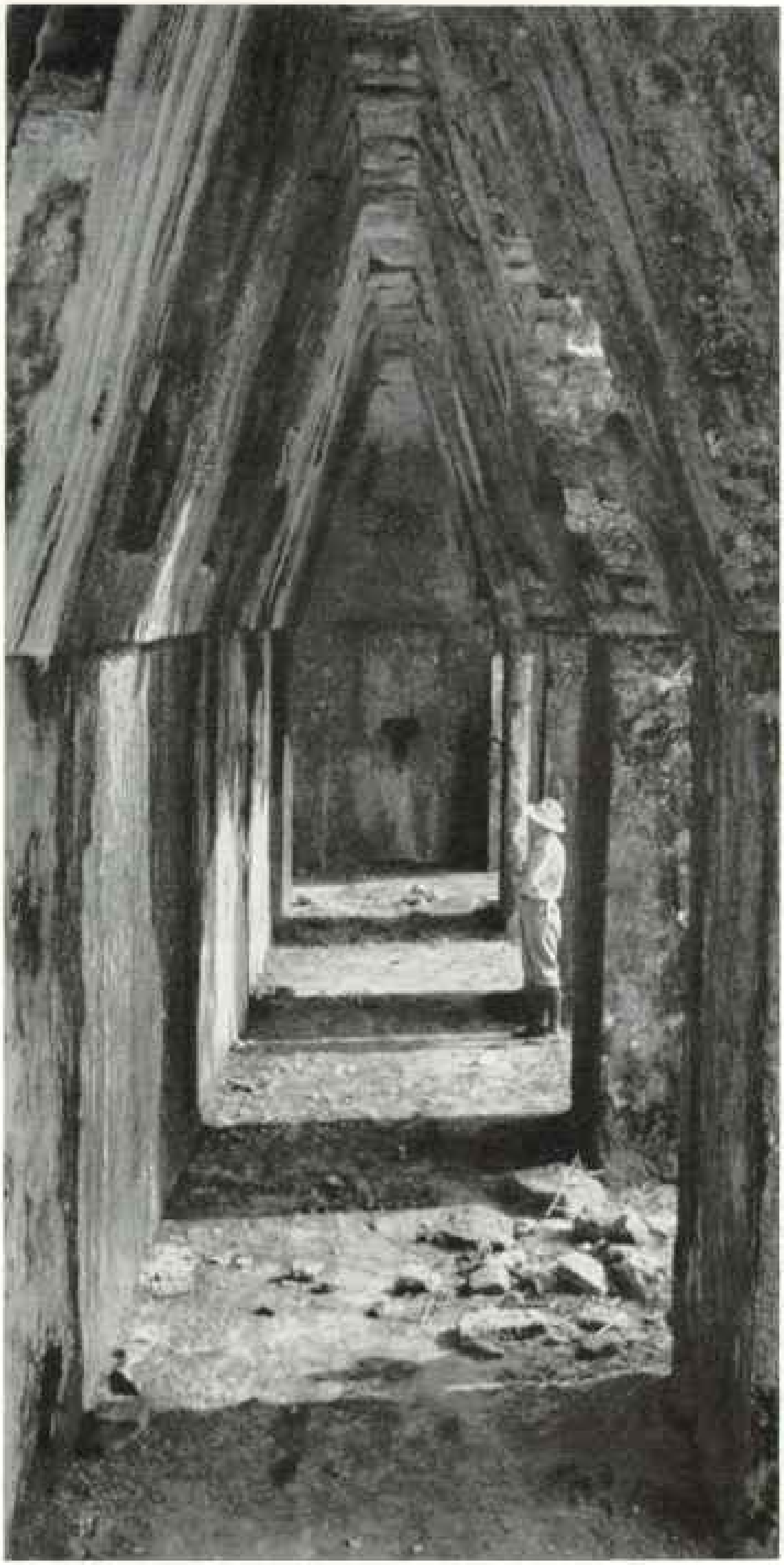
Preoccupied with our exciting discoveries, we forgot our workmen, who had been busy near by. Between the sarcophagus and the basalt structure they had uncovered an irregular platform of 11 basalt columns, laid parallel to the axis of the trench and almost touching the north end of the sarcophagus.

They also had uncovered the basalt structure, revealing a stone roof supported by nine vertical columns on each side and five in the rear. At the front, or north end, a ramp composed of five sloping columns leaned against the first horizontal roof piece (Plate I). Filling the space at the sides of the ramp were additional vertical columns, three on each side, stepped down in proportion to the slope.

Ancient Walls Were Burglar-proof

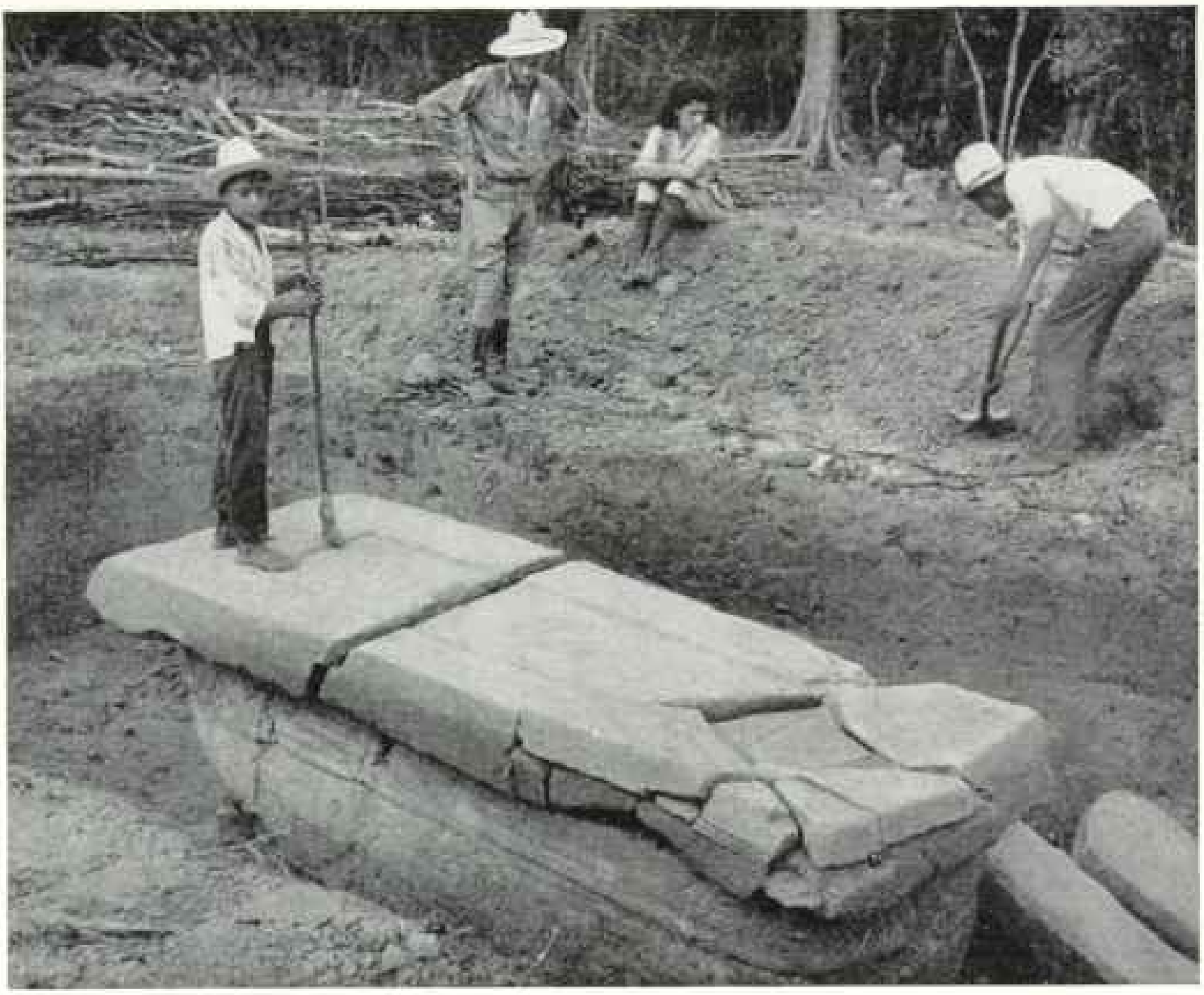
Now that the building was completely uncovered, we faced the problem of getting inside it. The ancient artisans had done their job well. So closely were the stones fitted that a mouse would have found it hard entering. Each column weighed a couple of tons or more.

We brought tackle and rope from the oil camp, set up a heavy tripod of logs, and spent most of the next



Massive Masonry Arches Roof a Maya Corridor

The cloisterlike passageway, opening on a plaza, is part of the ruins of imposing Palenque Palace (Plate II and page 659). At the end of the corridor is a T-shaped niche. Tunnels and underground rooms honeycomb the base of this structure, which stands on a broad basal pyramid overlooking the green jungle (page 657).



Time Spares a Stone Box and Puzzles Posterity as to the Identity of Its Builders

Once credited to Olmecs of the southeastern Mexican Gulf coast, the culture of the stone carvers who made this sarcophagus has now been named "La Venta" because here their workmanship reached its apex. Dr. and Mrs. Philip Drucker look on as the lid, cracked by roots, is about to be lifted from the vault. A preliminary estimate dates this site between A. D. 500 and 800 (page 637).

day removing the columns forming the ramp. Four columns on the roof were broken and had to be taken off before we could excavate.

At last, with the "front door" open and the roof clear, we were ready to investigate the interior. This was not easy, for we found the builders had packed the inside to the roof with clay.

As we dug we saw that the stones, both roof and walls, had been so fitted as to present a smooth and even surface on the interior, leaving the outside rough.

The first day we dug down to the base level, almost to the middle of the floor, without finding anything but a grass-green jade pendant in the form of a jaguar tooth.

The next morning we had scarcely begun work when we encountered a streak of bright-red cinnabar about a foot above the base level and an oval mirror of polished black hematite.

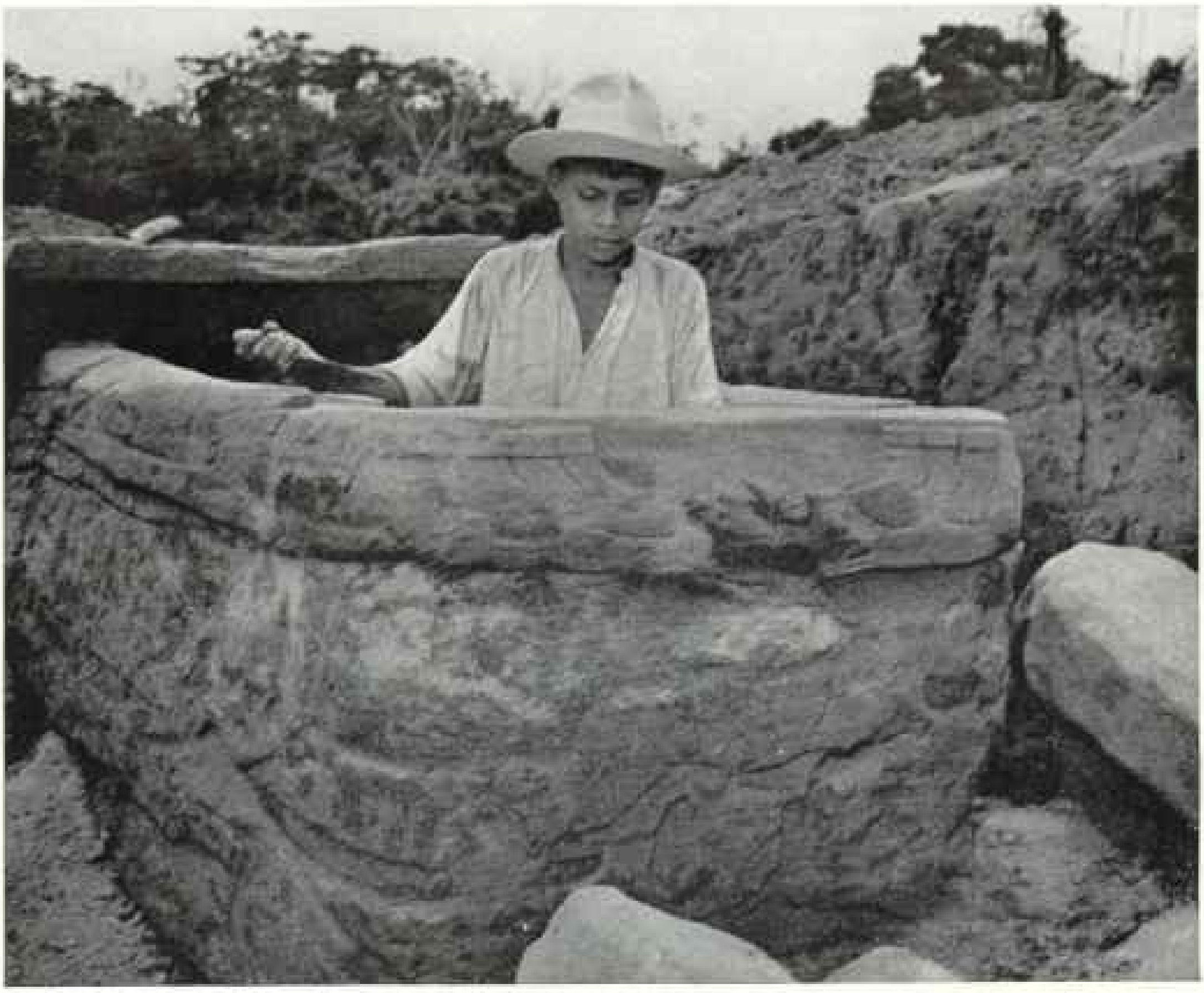
The streak marked the edge of a burial platform about a foot high. This occupied the rear eight feet of the tomb, as the structure now proved to be.

The platform was built of clay and covered with large flat limestone flags, coated with a thin layer of blue clay. On this platform was an irregular six-inch layer of brilliant cinnabar, in which lay mere traces of the bones of apparently three persons placed with heads to the south.

Clamshell Covers a Jade Masterpiece

With one of these were two handsome jade figurines. One was a seated figure, hands resting on knees, made from vivid green jade. It had been broken in several pieces, but was complete and easily mended. With it was a standing male figure of translucent blue jade.

Two feet beyond them we came upon a realistic reproduction of a fresh-water clam-



Jade Burial Ornaments Appear When the Stone "Tigre's" Filling Is Removed

The bathtub-shaped box shows the projecting fangs and branching eyebrows of the jaguar design sarcophagus traditional with La Venta sculptors. Red clay and sand filled the grave to the top. A day's work with trowels revealed two paper-thin earspools, a figurine of serpentine, and a polished implement for ceremonial bloodletting (page 637).

shell of heavy polished jade, about 10 inches long, and perforated for use as a pendant. Inside it was a small oval mirror of brilliant crystalline hematite.

Lying under this "clamshell" was what is possibly the most exquisite example of jade carving known from ancient America—a seated female figure of highly polished dark-colored jade, with a circular mirror of crystalline hematite attached to the chest.

The arms were held across the chest, the right hand above the left. Long hair, neatly dressed, hung down the back. The features were realistic, with the slightly parted lips outlined by a delicate hairline. The face had a relaxed and pleasant expression.

About a foot and a half from this same deposit were a jade frog, a green jade leaf, a jade "flower," and two large rectangular ear ornaments of dark-green jade, each engraved with eagle-head designs.

Around them were a number of long jade beads of especially beautiful material, carved like sections of bamboo.

Near the southwest corner of the platform was an unusual necklace or headdress, apparently rolled into a bundle. This consisted of six sting-ray tails, each about 6 inches long, set with small squares of glittering crystalline hematite. A seventh, evidently the central piece of the necklace, a reproduction of one of these tails, was carved from translucent green jade. Each piece was perforated at the base.

Near by was a handsome, highly polished blue jade awl or perforator, with large bulbous handle, but with the point broken off. Beside it was a small pottery vessel, placed against a burned human skullcap. This vessel was plain, and about the size and shape of an individual Boston bean pot.

In the southeast corner of the platform we

Southern Mexico Reveals a New Store of pre-Columbian Jade

La Venta, where the National Geographic Society-Smithsonian Institution Expedition of 1940 discovered colossal stone heads, this year yielded two strange tombs containing priceless jade art objects. Mr. and Mrs. Matthew W. Stirling, accompanied by the National Geographic Society photographer, Richard H. Stewart, stopped at many sequestered towns to study Indian customs and costumes. It was at Cerro de las Mesas that the National Geographic-Smithsonian Institution expedition of 1941 discovered a storehouse containing 782 pieces of fine jade (page 635).

found another fine standing human figurine of translucent blue jade, with wide mouth depressed at the corners, flat nose, and narrow head. The figure rested on an unusually large shark tooth.

Scattered about were a number of beads, all of extra fine quality jade, and near the southeast corner of the tomb we found some of the milk teeth of a child.

Beside the engraved ear ornaments was a pair of clay ear spools, painted a pale blue as if in imitation of jade, and with them two pieces of green polished jade, carved in the shape of a pair of human hands. Two oval-shaped pieces of polished obsidian and two similar pairs of green jade were probably eyes set in carved wooden masks or figures. The wood had disappeared.

Throughout the layer were copious unrestorable traces of organic material. The red cinnabar lay in a fashion which gave the impression that it had been inside of wrapped bundles. Probably the bodies had been thus wrapped before interment.

Magnificent as was the material recovered, we would have been willing to trade it, as

An Infant's Dress Makes a Stylish Bonnet—Result of a Centuries-old Mistake

Tradition tells how a Spanish galleon was wrecked off southern Mexico and tiny garments floated ashore. The Indians, not dreaming such fineries could be intended for babies, decided they must be head coverings. The style persists to this day around Tuxtla Gutiérrez (page 645).

Drucker said, "unsight, unseen" for the things that had crumbled away.

Completely cleared, the tomb presented a neat interior appearance and renewed our admiration for the skill of the ancient stone fitters.

Ordinarily, our workday was from 6 until 1 P. M., avoiding the extreme heat of the afternoon. On this day we did not dare abandon our unfinished task, for on the morrow Mrs. Stirling, Stewart, and I were to leave on a scheduled flight to Tuxtla Gutiérrez, in the highlands of Chiapas. We completed the job just at dusk, worn out but well pleased with our results.

With reluctance we left Drucker, after the most interesting period of digging in our Mexican archeological experience. Before leaving, we started a test trench near the sarcophagus, to locate the edge of the mound covering both sarcophagus and tomb.

Soon after our departure, Drucker encountered on the bottom of this pit a cache of 37 polished jade axes, several with engraved decorations.

The Legend of Montezuma

According to La Venta legend, Montezuma is buried on the island and comes out on certain moonlight nights to dance with his

A Bronze Tongue Is Silent in the Peace of a Cow Pasture

Relic of an old church in the village of Palenque, this bell, dated 1573, serves as a tethering post for cattle. Near Palenque are the ruins of the Maya city now called by the name of the village. Behind the bell and José Martinez, caretaker of the ruins, rise walls for a modern stone building.

court in the plaza. We wrote to Dr. Drucker, when he left for the field, to be sure and have Montezuma's tomb ready for excavation when we arrived.

As we left La Venta he said, "I don't know whose tomb it is, but it's the best I could do on short notice."

Subsequent excavations indicate that the great stone enclosure is unusually complex and interesting. Two rectangular abutments near each corner on the south side proved to be stone-enclosed platforms made of solid adobe bricks. Apparently the big rectangle, 184 feet by 142 feet, contains a number of such structures. To clear it would be an extremely interesting project.

On this Mexican itinerary other fields beckoned, so we retraced our way to Minatitlán and there boarded a plane which carried us high above the dark-green carpet of the Tabasco jungle on an uneventful trip to Villa Hermosa.

Here we met "Peck" Woodside, an enterprising American who owns and operates the Compañia del Sur, an airline which has revolutionized travel in southern Mexico. Before he came with his planes, travel in this area was tedious at best and sometimes almost impossible. Now, in from half an hour to two hours, one can travel to almost anywhere in southern Mexico. The excellent pilots fly virtually "by the seat of the pants" and land on tiny fields carved from the jungle.

We clambered into a compact six-seater and headed southward. Soon we saw our first mountains, cloaked here and there by clinging patches of cloud. A few minutes later our plane began to lose altitude as the pilot cut the gas. He was about to make his first scheduled stop, at the village of Teapa in southern Tabasco, near the Chiapas border.

Chasing Cows from the Airport

Looking for the field, we saw a narrow strip of greenish yellow leading from the brink of a high bluff which formed one edge of a small ridgelike plateau. Just as we thought we were about to land, the pilot suddenly turned on his motor full power and, sweeping over the little clearing in a modified dive, zoomed up again; then, circling, he once more aimed at the field and repeated the maneuver.

Mystified, we looked below and saw the purpose of these antics. A small herd of

cattle had been grazing in the clearing and scattered for the sidelines when the plane, for the second time, roared down at them. On the third attempt, having gained undisputed possession, our pilot delicately shaved the edge of the bluff with his wheels and rolled to a gentle stop.

Taking off after a brief pause, we soon encountered higher land. We circled several times to gain sufficient altitude to cross the ranges ahead, for the principal one was over 9,000 feet high.

As we neared Tuxtla, we flew alongside the vast gorge of the Grijalva River, an awe-inspiring and impressive sight. Over these precipices 2,000 brave Chiapanecos hurled themselves to death in 1527, rather than be captured by the Spaniards, who were defeating them on the field of battle.

Soon we reached Tuxtla Gutiérrez, capital of Chiapas, built in a wide, level valley and flanked by mountains on both sides. We had come to this town of 20,000 people to attend an archeological conference, but incidentally had arrived in time to witness an impressive Labor Day parade of the citizenry.

A Triple-scarfed Beauty Rests between Dances

This Zoque country girl in festival costume danced at the Governor's feast at Tuxtla Gutiérrez (Plates VI and VIII). She carries one silk scarf in her left hand, wears another in her hair, and drapes the horseshoe-decorated third over one shoulder. Her *charro* hat is made of felt.

Most striking division was made up of the market women, wearing their Zoque Indian costumes—white cotton blouse, with dark-blue cotton skirt wrapped around the waist, and either dark-blue shawl or white *huipil de tapar* for head covering. The latter was most curious, being cut exactly like a miniature dress, with neck opening and sleeves.

The story goes that several Spanish galleons were wrecked on the Pacific coast and trunks of clothes which floated ashore were found by the Indians. Among the clothes were many tiny garments. Since the Indians could not imagine such frilly daintiness and loveliness was to be worn by a child, the only use they could contrive for them was to wear them on their heads. They have followed this style in headdress ever since (page 643).

Jocotes Have a Plum-grape Flavor

Wandering through the town market, we saw *jocotes* for the first time. Small, red, and much like a crab apple in appearance, this fruit grows on low trees.

Jocotes have pits similar to a clingstone peach, a tough, bitter skin, and pulp which is a cross between a plum and grape in flavor (Plate VIII).

Both vendors and customers carry their

Older Than the 16th-century Fountain Is This Ceiba Tree at Chiapa de Corza

From the tree's gnarled branches many men have been hanged (opposite page). Seeds of the tropical ceiba, or silk-cotton tree, provide kapok fiber for stuffing life preservers and furniture. The principal world supply was cut off when Java fell. Mexico's ceiba trees, growing wild, offer scant replacement; only a small amount is exported. The United States has a fairly large supply on hand. The Navy has recently tested and approved the common milkweed fluss as a substitute.

wares in colorful painted gourds. Made in near-by Chiapa de Corza, they are a survival of a pre-Columbian art.

The gourds are first rubbed smooth with white sandy soil, then greased with a yellow-orange substance prepared from small insects. Next, they are well impregnated with black, red, dark green, or yellow powder. Black is generally used for the entire gourd, although red linings are common (Plate VII).

The girls who rub in this powder by hand are rather woebegone creatures. They are almost invisible as, black from head to toe, they sit on the floor in a room with only a door to permit the entrance of light. The polishing is done with cotton until the gourds shine as if lacquered.

A day later, after the gourds have dried, they are painted. The girls who perform this delicate operation are proud of their calling. They would not permit their pictures to be taken until they had put on fresh Chiapanecan costumes and combed their hair.

While we were waiting for them to primp up, the owner of the house gave us tiny cordial glasses filled with juice from the fresh

Zotzil Men in Shorts Wear Maya Sandals and Carry Handbags

Figures found on monuments ten centuries old have similar footgear. Stiff leather backs, six inches high, protect the ankles. Short pants have no pockets. These visitors in Ciudad de las Casas carry most everything in net bags—money, packages, lunch. Pink-tasseled neck scarfs cover noses and mouths on dusty roads. Color patterns of serapes vary in Zotzil villages from white with pin stripes to pure black.

gourds. It was dark and syrupy, and Mrs. Stirling remarked to Dick that it tasted like some of our disguised medicines or laxatives. Our host informed us they recommend it for curing colds.

A Fountain and a Ceiba Tree

Conspicuous in the plaza of Chiapa de Corza is the 16th-century brick fountain. People lounge and gossip on the broad steps and in the arched corridors which surround it. The coping around the fountain itself is polished to a marble sheen after being rubbed by hands and arms for four centuries.

Not far away stands a bare, gaunt scarecrow of a ceiba tree, with a few living branches cropping out. It is the town's only living survivor of pre-Cortesian times, and the natives believe it is enchanted.

From its branches many people were hanged in the past (opposite page).

The ceiba was sacred in aboriginal times over a large part of Central America. Father Francisco Núñez de la Vega, Bishop of Chiapas, says that the Indians worshiped the ceiba and under it elected their chiefs and perfumed them with incense. They believed that their lineage came from its roots.

The bell in the church is the largest in Chiapas and is nearly 400 years old. When it was poured, the priests urged everyone to throw into the oven a piece of gold.

We drove on from Chiapa de Corza to Ixtapa, by a gravel road which climbs the mountain in a series of hairpin turns.

At the top stands a curious combination of pines and sugar cane, growing together near large archeological ruins. Close by is an old ceiba with a concrete platform next to it, on which is painted a cactus mural.

Here live the Zotzils (Tzotzils). The men are dressed in short white pants and heavy black woolen shirts, which hang almost to the knees. Around their necks they wear black-and-white-checked handkerchiefs with pink yarn fringe in each corner. Their hats are double-woven, heavy wide-brimmed straws with flat crowns, decorated on the crown and along the edge of the brim with a fine black design (pages 637, 647).

Near-by salt mines supply the country for many miles around. They are free for the working. Brine is dipped out of the wells and evaporated in dugout logs. The salt is white as whipped cream and is carried in sausagelike rolls, 6 inches in diameter and 20 inches long, each weighing about 15 pounds.

The vendor saws off circular sections and then quarters them according to the wants of his customers (page 659).

Dining on Baked Agave Root

From Ixtapa the road becomes very narrow and often merely follows streambeds. About halfway between Tuxtla Gutiérrez and San Cristóbal there is a roadside house where we had a meal of baked agave root.

This root, usually weighing from 30 to 50 pounds, is cooked in a pit in the ground for several hours. The pulp is stringy and flakes off in sections like an artichoke heart. One has to suck as well as chew in order not to lose too much juice. The flavor is that of a juicy sweet potato cooked in molasses.

After a few more hours of driving, we reached San Cristóbal, or Ciudad de las Casas, if you prefer. At an elevation of about 7,000 feet, San Cristóbal is always comfortably cool. Here are grown delicious peaches, figs, cherries, almonds, walnuts, and apricots.

The Dominicans founded a convent here in 1537. Many of the priests were especially sympathetic with the Indians and appreciated their accomplishments.

Francisco Ximénez wrote of an Indian doctor who cured two priests. One had such sore eyes he could not see and the Indian told him that he could cure him within three days. He told him to eat chicken, bacon, fish, and greens and whatever he wanted, except honey and chocolate. Also, he was told to wash his face every day with cool water, especially around his forehead; to pull on his eyelids until one or two tears should fall; and then to put a mild solution into his eyes at night.

The cure took nine days instead of three, but the Indian said this was because the priest had waited too long before beginning his treatment.

Reviving Mexico's Silk Industry

In San Cristóbal we met a man who for years has been interested in reviving the silk industry in Mexico. He has a factory in Jalapa, Veracruz, and his daughter showed us a dress made from the silk.

Raising silkworms was an important industry in early Spanish times. When the Spaniards took over the Philippines the enterprise was abandoned in Mexico.

There still are mulberry trees in Chiapas and the Indians are being encouraged to plant more, with gifts of worms and instructions in caring for them. Our friend was hopeful that silk can be revived here as an industry (Plate VII).

While here we saw Zotzil Indians wearing the type of sandal shown on the ancient Maya monuments. These have a stiff six-inch leather projection, which fits around the heel and protects the ankles (page 647).

By good fortune we happened to visit Chamula on Sunday, May 3, as the village was bidding goodbye to the Old Year and greeting the New.

We climbed a ravine and entered a narrow pass, and there, spread before us, was the perfect example of a pastoral village, as described by so many chroniclers. Sheep were grazing in the meadows, tended by women in clothes made from their wool.

The houses were made of sticks plastered with mud and thatched with grass. Off to one side was the church and its accompanying buildings (Plate IV).

Zotzils from miles around crowded the plaza in front of the church. The women were dressed completely in black wool. Each wore a heavy scarf, lapped and folded, which hung over the forehead like an eyeshade (page 660).

Despite long, heavy woolen shirts, the men appeared much more gay with their short, white cotton pants and Chamula hats. These hats have a small peak rising from the middle of the crown. From this peak a bachelor lets bright-colored ribbons cascade over the edge of his hat.

From the Fastness of a Tabasco Swamp Comes Another Priceless Collection of Jade

This cache of pre-Columbian relics is the second unearthed in two years by Matthew W. Stirling in southern Mexico. In 1941, while leader of a National Geographic Society-Smithsonian Institution archeological expedition, he made his first spectacular find of 782 jade objects.

 Kodachromes by Richard H. Stewart

Within the Sarcophagus, Shaped Like a Stone Bathtub, Lay Many of the Relics

They were covered with red clay. Five sloping, two-ton basalt columns close the entrance to this strange tomb.

Kodachrome by Richard H. Stewart

The Spirit of Cimi, the Maya Death God, Broods over the Ruins of the Palace at Palenque

The migrating Maya mysteriously abandoned Palenque to the jaguar and the jungle about a thousand years ago. They built the Palace, abode of rulers and priests, atop a truncated pyramid. The 40-foot tower was an astronomical observatory. The view is from the Temple of Inscriptions.

"It's All Maya to Me"—Mrs. Stirling Scans a Palenque Glyph

The Maya developed an original system of writing. Their numerals and calendar hieroglyphs can be read. Most of the word signs are still undeciphered. Hundreds of native books that might have answered this riddle were destroyed by 16th-century Spanish zealots.

Kodachromes by Richard H. Stewart

Temple of the Cross—Here the Maya Left a "Christian" Tablet

Discovery of a cross in the shrine once led to the erroneous belief that Palenque harbored Christians. Below the roof façade are corbeled arches capped with key slabs. These "false" arches resulted in a mass of masonry leaving little room space.

Shepherdesses in Black Tend Black and White Sheep during a Colorful New Year Festival at Chamula

From the wool these Zotzil women weave the shapeless, heavy garments they wear the year round. Houses near the church are built of vertical poles, mud-daubed, with thatched roofs. The plaza is crowded with Zotzil Indians from miles around.

Reichenbach by Richard H. Stewart

Masterpiece of Maya Masons, the Crumbling Roof Comb Soars above the Temple of the Sun

The fanciful lattice, once ornamented with elaborate stucco carvings, was designed to give an imposing appearance. The roof slope is decorated with gods, men, and serpents. The pillars are an evolution from the corbeled arch. Within the sanctuary is the sun-symbol tablet. On steps are Mr. and Mrs. Stirling.

Kodachrome by Richard H. Stewart

A Congress of Dancers Steals the Spotlight from a Congress of Archeologists at Tuxtla Gutiérrez

Host to the archeologists was Dr. Rafael P. Gamboa (center), Governor of Chiapas, shown in patio of his palace. The dance entertainers wear the Zoque Indian festival costume: ribbons in hair, scarves over blouses, Guatemalan skirts, necklaces, and gold earrings. Zotzil men display straw hats and turbans.

Market Basket or Sunshade—the Painted Gourd

This artist displays a *jícara* at Chiapa de Corzo. Such gourds, on women's heads, bear huge loads; inverted, they are solar helmets.

Kodachromes by Richard H. Stewart

Answer to the Stocking Famine?—Mexican Silkworms

This girl's father, a factory owner, encourages Indians near Ciudad de las Casas to revive the silk industry, which once flourished in Chiapas.

Barefoot Belles, Beware! Your Dance Partners Wear Spurs

"Liveliest we saw in southern Mexico," the authors say of this spur dance at Tuxtla Gutiérrez. In relays, the Zoque girls weave in and out to harp music. The vowels jingle as the men move about.

Lenticulrome by Richard H. Stewart

The *Jocote* Looks Like a Crab Apple and Tastes Like a Plum

The Chiapas fruit in the basket grows on a small tree, and has a pit like the clingstone peach's. The barefoot buyer in the Tuxtla Gutiérrez market has a *jicara* on her head (Plate VII).

We threaded our way through the crowd into the church and saw a group of musicians, in front of the main altar, playing a monotonous tune on harps and guitars.

To the right of the altar six women were seated cross-legged, dressed in the typical black costume but with their hair combed in large rolls around the face. The odor of incense was strong and the women swayed and bobbed their heads as if in trance.

Behind them were six men shaking gourd rattles. We were told that these were the six major-domos of the previous year and their wives. Every now and then someone would place a candle before the seated group.

About noon the cross was carried from the church, followed by the twelve principals and the musicians, certain neighboring town officials; and a procession of interested spectators.

Toasted Flying Ants a Delicacy

From San Cristóbal we drove back to Tuxtla Gutiérrez, where we were the house guests of Dr. and Mrs. Antonio Cachón during the sessions of the archeological congress. Our hosts spoiled us with kindness.

Here we first tasted the delicious and nourishing drink called *tascalate*, of the color and consistency of cream of tomato soup. It is made by grinding very fine a combination of corn, *totopos* (oven-baked tortillas), chocolate, and achoite for color. Sugar and water are added, and the preparation is allowed to stand five or six hours, or overnight if possible.

Another special delicacy is a large flying ant, found only at the beginning of the rainy season in May or June. It is eaten toasted, with salt.

In many parts of Chiapas, rubber trees grow in the dense forests. Raincoats are manufactured from the latex. In some localities plantation rubber has been developed. Dr. Cachón told us he has set out a large number of Brazilian rubber trees on his ranch near Pichucalco.

The Governor of Chiapas, Dr. Rafael P. Gamboa, invited the congress to a *Xoxe* feast, to be held in the patio of the Governor's mansion (Plate VI). An arbor was erected in Zoque style. The side walls were of thatched banana leaves. Hanging from strings in front of the house were bunches of bananas, pineapples, and sweet bread.

The inside was decorated with mahogany leaves and garlands of flowers festooned around the walls and piled in front of the altar. At the far end was set up a cross.

Most entertaining dance, to the liveliest music, was the Zoque spur dance. The men wore white cotton shirts and long pants, over which were short leather trousers.

Bandannas encircled their heads, topped with hats. On their feet were spurs with large rowels (Plate VIII).

The women wore full red skirts of Guatemalan material, gathered to a band around the waist, and embroidered white blouses with very large necks and short puffy sleeves. Wide silk ribbons were braided in their hair and hung down the back. On their heads were enormous, elaborate felt *charro* hats.

By the time the dancing ended the moon was almost full. The marimba, the Mexican xylophone, began playing and the tables for the feast were set up along one side of the patio. Down the center was a zigzag design of pink and white japonica strung on wire. In true pre-Columbian style our host had arranged for the preparation of fancy flat bouquets of flowers, banana leaves, bamboo, and colored paper, working out mosaic designs of birds, butterflies, and pinwheels.

We feasted on large tamales wrapped in banana leaves. The filling consisted of turkey, almonds, raisins, olives, and the proper spices, a combination closely resembling the tamales of California. We drank chocolate mixed with spices and whipped to a froth.

With the appealing call of the flutes and the insistent rhythm of the drums in our ears, and a lingering taste of delicious chocolate in our mouths, we regretfully left the feast and prepared to say goodbye to Tuxtla.

Wonder Ruins of Palenque

We had one more archeological visit scheduled. This was to the famous "Old Empire" Maya city of Palenque, in Chiapas. Every student of the Maya has been intrigued by the account of John Lloyd Stephens, who visited this most picturesque of all Maya sites a little more than a hundred years ago.

The first extensive exploration and description of these ruins was by Captain Antonio del Rio, who was sent out by the Guatemalan Government in 1787 to verify the truth of local reports that the ruins of a great stone city existed near the town of Palenque.

The report of Del Rio, not published until 1822, gave to Europeans their first real inkling of the site.

Work in modern times on a small scale has been done by Frans Blom and Miguel Ángel Fernández, Mexican artist and archeologist. We had the good fortune to meet Don Miguel in Tuxtla Gutiérrez.

He flew with us in our plane from Tuxtla to Villa Hermosa and there, in addition to much useful information, furnished us with

He Carves Mahogany Masks for a Fiesta

Chiapa de Corza villagers wear them at the Feast of San Sebastián. After the wood carver finishes the face, leaving the eyes blank, he paints it a china-doll pink. He calls these masks *Tonalteca*, because they are shaped to resemble people from Tonalá. During the festival off-season, the artist models religious statues.

his camping equipment. He also gave us letters to a family in the village of Palenque with whom we could stay, and to the young caretaker of the ruins, José Martinez.

About four o'clock in the afternoon, Dick Stewart accompanied us in a plane for the village of Palenque, about nine miles from the ruins.

As we flew inland over a vast level sea of jungle, we came in sight of a long mountain range, an outlying finger projecting from the lofty central mountains. From the air we could see the white ruins of the Maya city, standing out with startling clarity against the dark-green forest background. They are situated on a narrow elevated bench or terrace at the mouth of a steep gorge which descends from the mountain and makes them the most picturesquely located of all Maya sites.

Soon we landed at the village airport and unloaded our baggage. The pilot taxied his plane to the far end of the field and took off immediately on his return trip, having arranged to come back for us in a week. We all experienced a remarkably deserted sensation as we found ourselves standing alone, feeling exceedingly small and with the sun beating down with real tropical intensity.

In about half an hour two natives arrived on the run, one with his foot bleeding badly from a cut received on the way. After fixing up a makeshift bandage with a handkerchief, with their help we lugged the baggage up to the village, a hike of three quarters of an hour. The man with the cut foot turned out to be the town's chief official, and he arranged to get us animals in the morning.

The ride to the ruins along the base of the mountain requires two hours over a trail through high jungle. The first half of the way is well cleared but the second half is much overgrown. The Mexican Government has built a house at the site, where qualified visitors can stay.

Maya Builders Had an Eye to Location

The ruins are located on a splendid vantage point, backed by steep mountains. In all directions, as far as the eye can reach, nothing is to be seen but dense jungle. We were awakened every morning by the roaring of howler monkeys on all sides. The camp is

in a pleasant spot by the side of a stream of clear water, which emerges from an ancient subterranean aqueduct. The stream is crossed by a Maya stone bridge, which is still as serviceable as when built more than 1,000 years ago.

Below the bridge is a good swimming hole, a welcome spot after working all day in the hot sun. The ruined buildings themselves are remarkably well preserved, considering their age, and are a tribute to the skill and materials of the ancient architects.

The central feature of the Palenque ruins is the structure known as the Palace, a complex group of buildings joined together around three courts. The broad basal pyramid on which they stand is honeycombed with tunnels and underground rooms. The base of the pyramid, now buried, is covered with a series of large stucco reliefs (Plate II and page 639).

A high square tower probably was an observatory. West of this is a high pyramid without a structure on top. From this pyramid a fine view can be had of the entire site. South of this, on a high, elongated pyramid, is the Temple of Inscriptions, so called from a long series of fine hieroglyphic carvings which it contains. Just to the west is another smaller structure.

Southeast from the Temple of Inscriptions is another plaza surrounded by four pyramids. Three of these are surmounted by temples containing some of the finest stone carvings in the Maya area.

The Temple of the Sun (Plate V) is a well-preserved and restored building on a low pyramid on the west side of the plaza. It contains an entry room and in the back a shrine with the famous carved tablet of the sun.

The Temple of the Cross (Plate III) is on the high pyramid on the north side. The carvings on the back of the shrine in this building were removed long ago, and after a short sojourn in the United States are now one of the featured exhibits in the National Museum of Mexico. The two tablets flanking the central carving are now set in the walls of the church at Palenque.

On the east side of the plaza is the pyramid and Temple of the Foliated Cross, so called from the central feature of the carved tablet in its shrine.

This Salt Merchant Saws His Wares into Disks

From a long white cylinder the Zotzil salesman cuts as much salt as the customer wants. On the ground is his saw. He carried the blocks, each weighing about 15 pounds, to the Ciudad de las Casas market in sausage-shaped straw containers. He comes from Ixtapa, 18 miles away, where brine is dipped out of wells and evaporated in dugout logs (page 648).

Zotzil Women Wear Folded "Blanket Hats" Summer or Winter

They are selling pottery on the plaza in Chamula during a New Year's festival (Plate IV). Shapeless woolen blouses and heavy skirts bunched around the waist are their only apparel. The thick scarf, lapped across the forehead like an eyeshade, cushions the brow when a woman slings a 30-pound load of pottery across her back and supports it with a strap around her head (page 648).

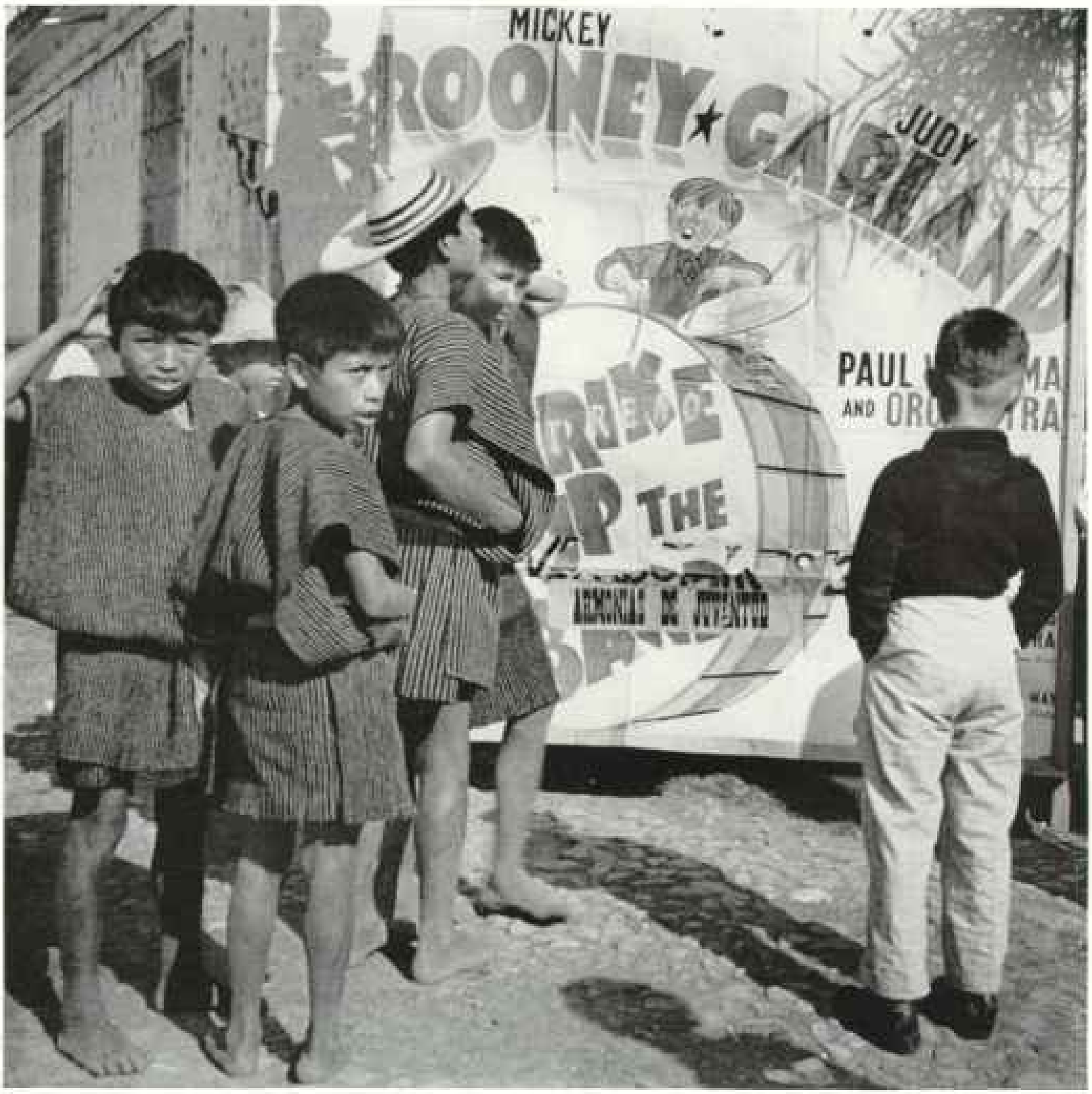
These beautiful stone carvings are all remarkably well preserved, especially when one considers that the stones are usually thoroughly permeated with moisture and when in this condition are quite soft.

The temples at Palenque are surmounted with roof combs, an architectural feature reminiscent of the false fronts on many of our early western stores and boom-town buildings. Elaborately constructed of a masonry skeleton, these ornamental combs were covered with elaborate decorations in stucco.

The exteriors of all of the buildings likewise are almost completely covered with stucco designs of elaborately costumed human figures or mythological animals. The stucco is as hard as rock and still presents a smooth surface. Damage these designs have suffered is probably due to early vandalism.

On the edge of the bench on which the site is located are four more temples on pyramids, with their backs to the magnificent view over the forested plain below. The hieroglyphs and stucco reliefs on these buildings have suffered so much damage that only traces of them remain.

Well into the gorge south of the main group is a small detached temple on a very steep



Mickey Rooney or the Camera? Two Magnets Divide Attention

Zotzil Indian boys come to Ciudad de las Casas on market day, wearing their striped serapes. To read either Spanish or English on the billboard is impossible for them. Standing aloof is a 12-year-old city boy in casual "man about town" outfit.

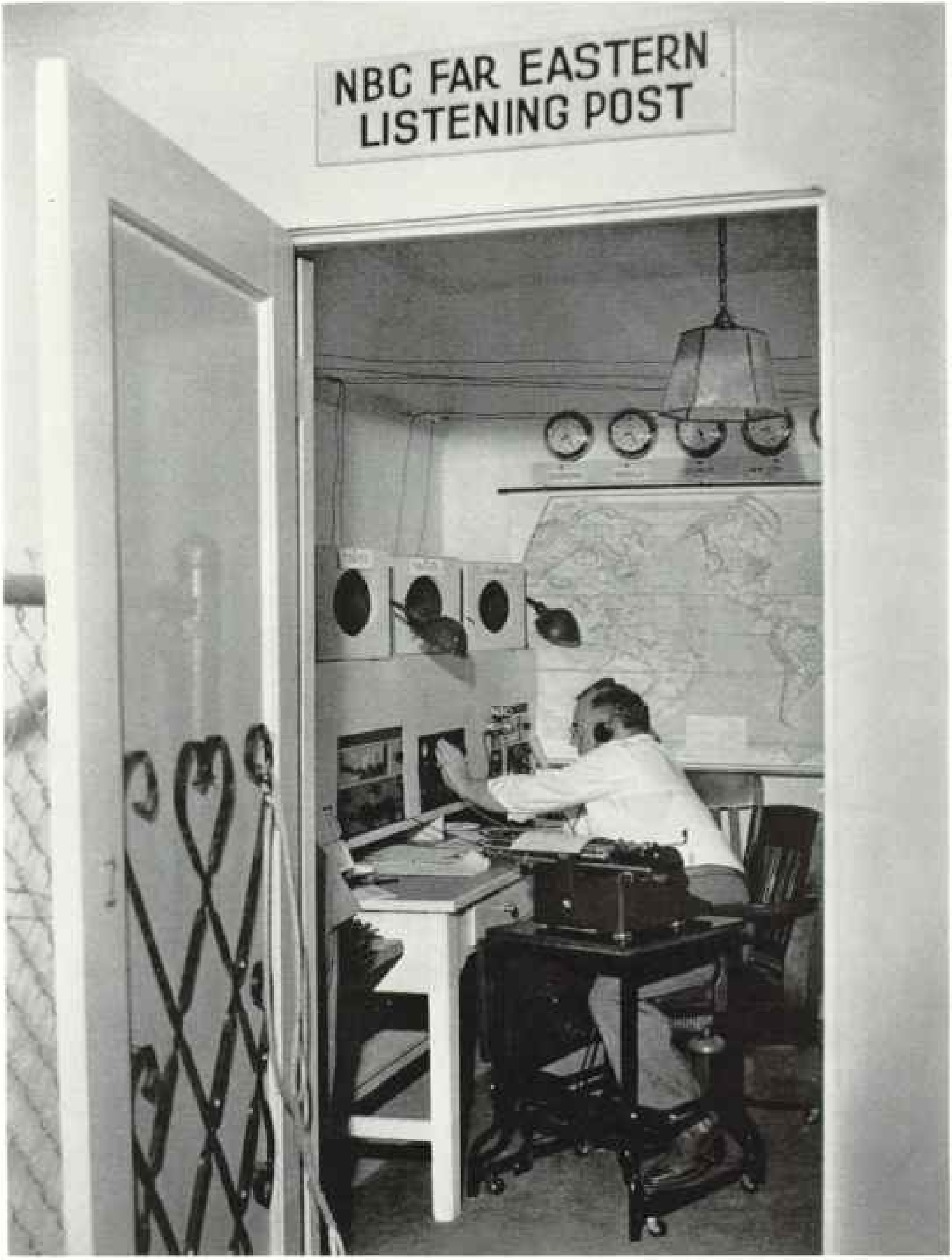
hillside. It has a trap door in the floor leading to a subterranean room with an exit on the hillside below. This building, officially called the Temple of the Beau Relief and known locally as the Temple of the Tigers, had on its back wall a stucco relief of a male figure seated on a jaguar throne.

Early travelers considered it the most beautiful example of Maya art. Now little remains except the jaguar throne.

The jungle around Palenque is so thick that undoubtedly many buildings remain undiscovered near by. One could easily pass within a few yards of an important structure without knowing of its existence.

At last our time was up and, mounting our horses, we rode leisurely back to the village. We encountered a little excitement when Stewart got mixed up with a swarm of bees while he was trying to make a moving picture of a monkey taking a midday siesta in a tree. As it turned out, most of the motion developed at the wrong end of the camera!

After spending the night with our hosts in the village, we left next morning for the "airport." At one o'clock we took off on the first stage of our trip back to Mexico City, filled with a new respect for Mexico's Deep South and the "glory that was Maya."



What Are the Latest Lies from Tokyo? He Eavesdrops on the Whole Far East

Short-wave broadcasts from all over the Orient are picked up and recorded for translation and study at the National Broadcasting Company's listening post in North Hollywood, California. Clocks above the map show the time in Chungking, Manila, Hollywood, and New York. Many such listening posts are maintained by the Federal Communications Commission, broadcasters, and press associations (page 664).

Winged Words—New Weapon of War

By F. Barrows Colton

"WILL a man risk his life to hear the words I'm writing?" This sign in a New York short-wave radio station stares as a constant reminder at writers of news broadcasts to be sent to German-occupied Europe (page 670).

In the heat and dust of the battle of Libia, British officers hear, over their field radios, the voice of German Field Marshal Rommel himself, radioing orders in person across miles of desert to his speeding front-line tanks.

Nothing could show better how radio has utterly revolutionized war. It has made words into weapons as vital as bullets and bombs. Modern war, it almost could be said, is fought at the speed of light, 186,000 miles per second, for that is the terrific pace at which words travel on the lightning wings of radio waves.

Words play a double role in today's war. They spread ideas, which can be more potent than bullets; and they rush commands or information, which may win or lose a tank battle, air fight, or naval clash within a few minutes in this high-speed conflict.

Guns cease firing now and then, and soldiers take time to sleep, but the War of Words never stops. It shouts and chatters all around the globe, not only over the fighting fronts of Russia, Africa, and the Pacific, but over Tibet, South America, and the Far North, where physical battles are still remote.

Voices of the War of Words

Tune in on it at random, and you'll hear a babel of millions of words, in every language; voices of men, women, and children, and the shrill, insistent "dit, dit, dah, dah, dit" of countless messages in code. Listen to the voices of the War of Words:

"Command post to Third Tank Company. Attack machine guns 1,000 yards north."

"Hello, China. This is An-lin Wang, speaking from Boston, U. S. A., bringing the greetings of Wellesley College to China and Madame Chiang Kai-shek . . ."

"SSS. A submarine is shelling us . . ."

"How is Pufflow, Mummy? There's a dog here in America just like him . . ."

A missionary in remote Tibet writes to a San Francisco short-wave station: "We can hear your broadcast very plainly each evening . . . We are almost directly on the other side of the Northern Hemisphere . . ."

In Norway a girl crouches beside a hidden radio and thrills to a voice in Boston relaying a message from her sweetheart somewhere at sea. "Tell Laura in Oslo that Ola is well."

Actual bombing of Manila is heard by armchair listeners in the United States, 9,000 miles away.

Crew of an American aircraft carrier,* 150 miles from where their planes are fighting Japs, hear plainly by radio the shouts of their dive-bomber pilots in action: "Looks like the battleship blew up. Put 'em all smack on the button! Good hit! Good hit!"†

Not only through the air but along the ground and under the sea the War of Words rattles on. Visualize the vast spider web of wires and cables that covers the earth like a net around a pumpkin. You can fairly hear it hum with the word traffic of war.

A man in Seattle telephones Washington: "We've got to have more aluminum to step up production of Flying Fortresses."

In London an American reporter types: "Bulletin . . . One thousand British bombers last night flattened the industrial district of Bremen. . . ." In ten minutes it's through the censor and ticking out on the teletype in New York, 3,400 miles away. How different from the exhausted runner who brought the news of Marathon!

On a lonely hilltop near the coast a chilly civilian watcher jumps suddenly to a telephone. "Army flash!"

"Army. Go ahead."

"Flash! Many planes. Bimotor. Very high. Bound in. Overhead."

The air-raid warning network is in action. Orders leap along more telephone wires. Anti-aircraft gun crews race to stations. Fighter pilots dash to planes and take the air to meet the enemy bombers. Air-raid sirens howl in near-by cities. Lights go out. Thanks to the world's greatest telephone network, reaching to America's remotest corners, we have a highly efficient air-raid warning system all along our shores (page 672).

Deliberate Jamming Rare

Short-wave radio is so important that nations on both sides in the present war are usually careful to use only the wave lengths that were assigned to them by international agreement years ago. Should two nations use the same wave length at the same time, they would "jam" each other. Deliberate jamming of an enemy station is done much less than is generally believed, radio people say. Much so-called "jamming" is mere static.

* See "The New Queen of the Seas" (Aircraft Carrier), by Melville Bell Grosvenor, National Geographic Magazine, July, 1942.

† By permission of United Press.

AP from Pictor Assn.

Radio's Miracle Carries His Voice to All the World, in Many Tongues

When President Roosevelt speaks, he can be heard wherever there is a short-wave radio receiver (page 682). While he is talking, his words are read in translations so that all may understand. To Italian listeners, the "voice of Roosevelt" from NBC is that of a woman.

Strange profession of this modern war is that of the short-wave radio monitor, who tirelessly eavesdrops on the world, listening to all the jumble of words that flashes unendingly through the ether from foreign stations in Japan or Ethiopia, in London or Berlin.

In soundproof rooms, with earphones clamped to heads, they sit by the hour, turning dials, listening. Now and then they jot down on a typewriter a summary of something that has just been said.

Five stations of the Federal Communications Commission alone analyze a million words a day, out of the air (page 662).

Much of what they hear is in English, aimed at this country. Foreign-language broadcasts are recorded and translated. Out of the torrent of words, the monitors get news, hints of future enemy moves, and plenty of propaganda. Distortions of American news are corrected on our own short-wave broadcasts, sometimes within two hours.

See how radio has changed war:

In 1857 the distant wail of bagpipes of an approaching army brought the first glad news of rescue to British defenders of besieged Lucknow in India. But in a 1942 short-wave program, Britishers in Taunton, England, heard far more clearly from 3,000 miles away the encouraging roar of a steel furnace in Taunton, Massachusetts, U. S. A., making munitions for besieged Britain.

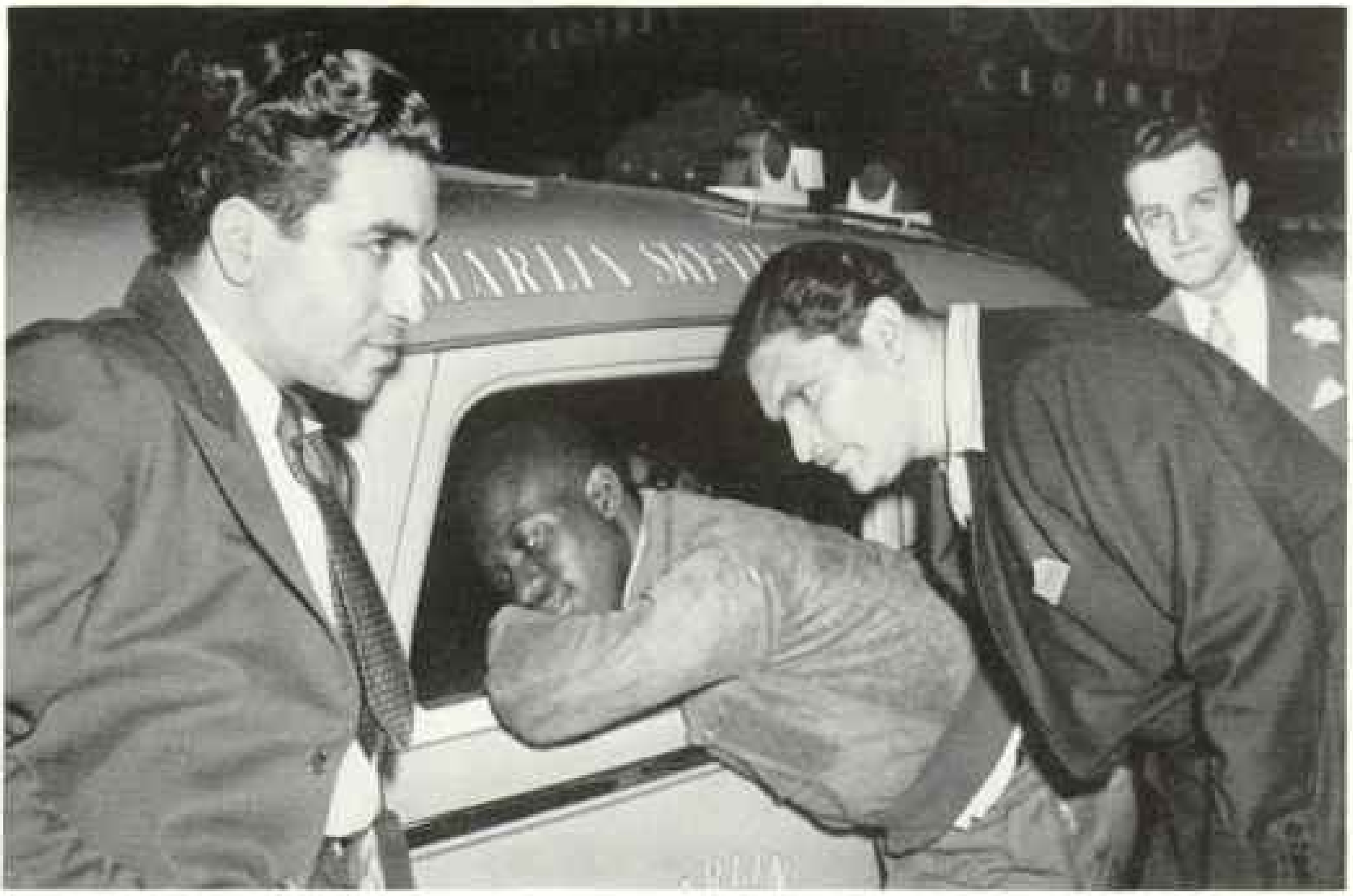
The Battle of New Orleans was fought two weeks after the War of 1812 ended because news traveled so slowly. But when this war is over, the doings of the peace conference will be able to reach the far corners of the earth, by short-wave radio, before they are heard at the other end of the hall.

And one 1942 top sergeant forbids his men to use electric razors in barracks at certain hours, so there will be no interference with his favorite radio program!

When Sherman's army marched through Georgia in 1864 it was completely cut off from home, but today American soldiers and sailors send cable and radio messages home from all over the world.

Since often they aren't allowed to say where they are, the messages by long custom bear the dateline "Sans Origine" (French for "without origin").

Cable and radio offices have many inquiries from people who say: "My boy just wired he's safe, and the message is dated Sans Origine. Where is that?"



Wide World

On Street Corners, in Public Squares, in Secret Hide-outs, Everywhere, They Listen

Radio waves penetrate the whole world, from the millions of sets in the United States, to South America where people often listen in groups in cafes and public squares, to the hidden, forbidden receivers of occupied Europe, to lonely homes of missionaries in Tibet, and the Far North.

The sun itself, 93 million miles away, has a finger in today's war because of radio. Sunspots, breaking out on the sun's face, cause "magnetic storms" on earth so severe that at times all short-wave radio fades completely, and wire and cable messages are garbled.

Sunspots May Lose a Battle

It is possible that a severe sunspot outbreak might help decide a battle, by interfering with a radio message at a crucial moment. To paraphrase the old jingle: "Because of a sunspot the message was lost; for want of the message, the battle was lost."

Even the condition of the atmosphere 100 miles over our heads is a military secret in this war. There, high above the stratosphere, the sun's ultraviolet rays break up atoms of the air and create an electrified, or ionized region, known as the ionosphere.

Short waves of radio, shooting up from earth, strike the ionosphere and are reflected back down, strike the ground again farther on, and again bounce back upward. Thus they travel around the world in a series of gigantic bounces between earth and sky.

From daylight to dark and from season to season, however, the height and density of the ionosphere vary. It flaps up and down like an awning in the wind. So radio wave lengths must be changed from time to time, to insure that signals go through clearly.

Daily the National Bureau of Standards explores upward with special radio waves and records the ionosphere's changing behavior. Its changes can even be predicted. But this knowledge would help the enemy's short-wave broadcasts, so it's kept as big a secret as the design of our best bomb sight.

Our Army today has an Electronics Battalion, whose scientific soldiers are fighting this war with electrons, parts of atoms, so small nobody ever has seen one, and so mysterious nobody knows just what they are. It's enough to make practical soldiers like Stonewall Jackson and U. S. Grant turn over in their graves!

But those keen old fighters would sit up and take notice if they could see what the electron has done for war. The electron, Prof. F. G. Fassett, Jr., of Massachusetts Institute of Technology, told me, is "by long odds the mightiest weapon in the arsenal of democracy."

Electrons do their work inside the vacuum tubes of radios. There, in a nearly perfect vacuum, millions of them dance back and

Staff Photographer B. Anthony Stewart

Changing a Radio Beam's Direction Is as Easy as Hanging Your Coat on a New Hook

Wires leading out from the transmitter of the General Electric's short-wave stations at Schenectady, New York, are merely hooked to a different upright to change the direction of the radio beam. Connections marked "North Africa," "Latin America," "Europe," and "Australia" go to antennas aimed at those areas (maps, pp. 678-9).

He's Watching a Prize Fight by Television and Describing It in Spanish!

Boxing fans in South America are given a blow-by-blow account of a fight in New York City by NBC's sports announcer, Eli Canel. Watching the television pictures on the screen in the background, he then relays the story via short wave to his audience from 2,000 to 6,000 miles away.

forth between two metal electrodes. Nobody knows for sure whether the electron is a tiny particle of matter or an infinitesimal wave of energy, but it works. Radio tubes by the millions are as essential in this war as bullets.

"Walkie-talkie" in Action

One day I watched a famous division of our Army on maneuvers. On a hilltop a regimental command post was hidden in the scrub growth. Near the colonel squatted a soldier carrying a peculiar-looking pack on his back and listening on a telephone handset. Suddenly he spoke into it, and handed it to the colonel. "Captain Jones of B Company, sir."

"Yes, Captain? You've reached your objective? Good! Consolidate your position and let the men have chow."

Captain Jones was miles away on another hilltop, beyond two ridges, and no wire was strung between him and the colonel. It would have taken a runner hours of hot, sweaty travel to bring the message the captain had just spoken over the air.

Such is the "walkie-talkie," a two-way radio telephone light enough for one man to carry, and with which he actually can talk as he walks, to other sets miles away (page 689). Parachute troops use a similar set that weighs only five pounds.

But that's a small-time job for the electron. Jeb Stuart, whose far-ranging cavalry served as "eyes" for General Robert E. Lee, would have laughed at the idea of reaching out into space with invisible fingers, through fog or clouds or dark of night, and locating a winged enemy 100 miles or more away in a fraction of a second.

Yet the electron, used in the uncanny radiolocator device, does that very thing. Groping through space like a giant ghostly hand feeling for a light switch in the dark, radio waves spot enemy planes unerringly in the sky, and even show their position on a screen.

U. S. Army Signal Corps

Radio Waves Leaped 7,000 Miles to Bring Cheer to Besieged Heroes of Bataan

Bing Crosby's programs were beamed to the embattled peninsula when General MacArthur requested them. News broadcasts brought the half-starved soldiers their only knowledge of the outside world.

As soon as the enemy's position is determined, defending planes take the air to attack and are in turn guided by radio to the enemy. Today these electron sentries are being installed all along our coasts.

When peace comes the radio locator will have new uses in revealing icebergs endangering ships in fog or darkness and for warning planes of mountains ahead.

Reasons for Secret Research

Best brains of the Nation are working all-out for war in tightly guarded laboratories.

"If we even so much as admitted we've learned how to do a certain thing, the enemy would know it could be done, and would find the solution for himself that much easier," said one scientist.

"Men in adjoining rooms don't know what the others are doing. One Army school that trains soldiers for scientific warfare is so secret that its bowling teams, competing in tournaments, have to do without a name. Research men today are working on developments which will prove as startling when peace returns as were the telephone and electric light in an earlier generation."

Generals used to complain about the "fog of war," the maddening uncertainty, the lack of positive information. Thanks to the electron, more and more we are able to penetrate the fog of war. Flyers and ground scouts alike now can take photographs or draw maps of enemy positions or bombing targets and send them back in a few minutes by radio or wire facsimile apparatus to headquarters. Television pictures have been sent experimentally from planes.

Pictures of war on the Russian front now travel by radio in a matter of minutes from Moscow to New York, 4,615 miles. A plane would have to fly 21,300 miles an hour to equal that speed (page 673).

Most important of all, the electron has enabled people everywhere to speak and be heard by others at the ends of the earth; to give President Roosevelt's "fireside chats" a world audience. Radio waves can leap over frontiers and forts. Bombs cannot destroy them.

No wonder that Japan permits no short-wave radios to be used by her people, and that in Germany, Italy, and many Nazi-occupied countries, listening to short-wave radio brings severe punishment.

But the truth gets through. From fourteen great short-wave broadcasting stations in the United States alone, not to mention those of

America Is Fine, but His Mother's Voice Can Make a Young Britisher Homesick!

Through the miracle of radiotelephone, English children sent to the United States for safety can talk with their parents across 3,000 miles of submarine-infested seas on the "Friendship Bridge" and other programs.

our allies, it flows out in a continuous flood to all the world. Short-wave stations in the United States are operated by the National Broadcasting Company, Columbia Broadcasting System, General Electric, Westinghouse, Associated Broadcasters, Crosley Radio Corporation, World Wide Broadcasting Foundation, and WCAU Broadcasting Company. The Government is planning closer direction of short-wave programs, and more stations.

"We believe," said an official, "that the best propaganda the United States can put out is the truth."

It works. From occupied countries of Europe and friendly Latin America as well, letters come in, saying: "Only from your broadcasts do we learn the truth. We are so thirsty for truth."

Short-wave radio stations are the big guns in this battle of the War of Words. Each has a cluster of poles and masts, supporting aerial networks of pencil-sized copper wire.

In closely guarded buildings near by, engineers keep watch on banks of dials and meters. So great is the energy generated in the amplifiers to carry the human voice 10,000 miles or more that the heat would be enough to melt some of the metal parts, if they were not constantly cooled by water.

Standing among the slender towers, you hear no sound. But actually from their tops the voice of truth is shouting to all the world. When President Roosevelt, Prime Minister Churchill, or—yes—Herr Hitler, make an important speech, the energy generated by their voices in the microphone may be amplified 400 million billion billion billion billion billion times, to make it heard via radio short waves by people everywhere.

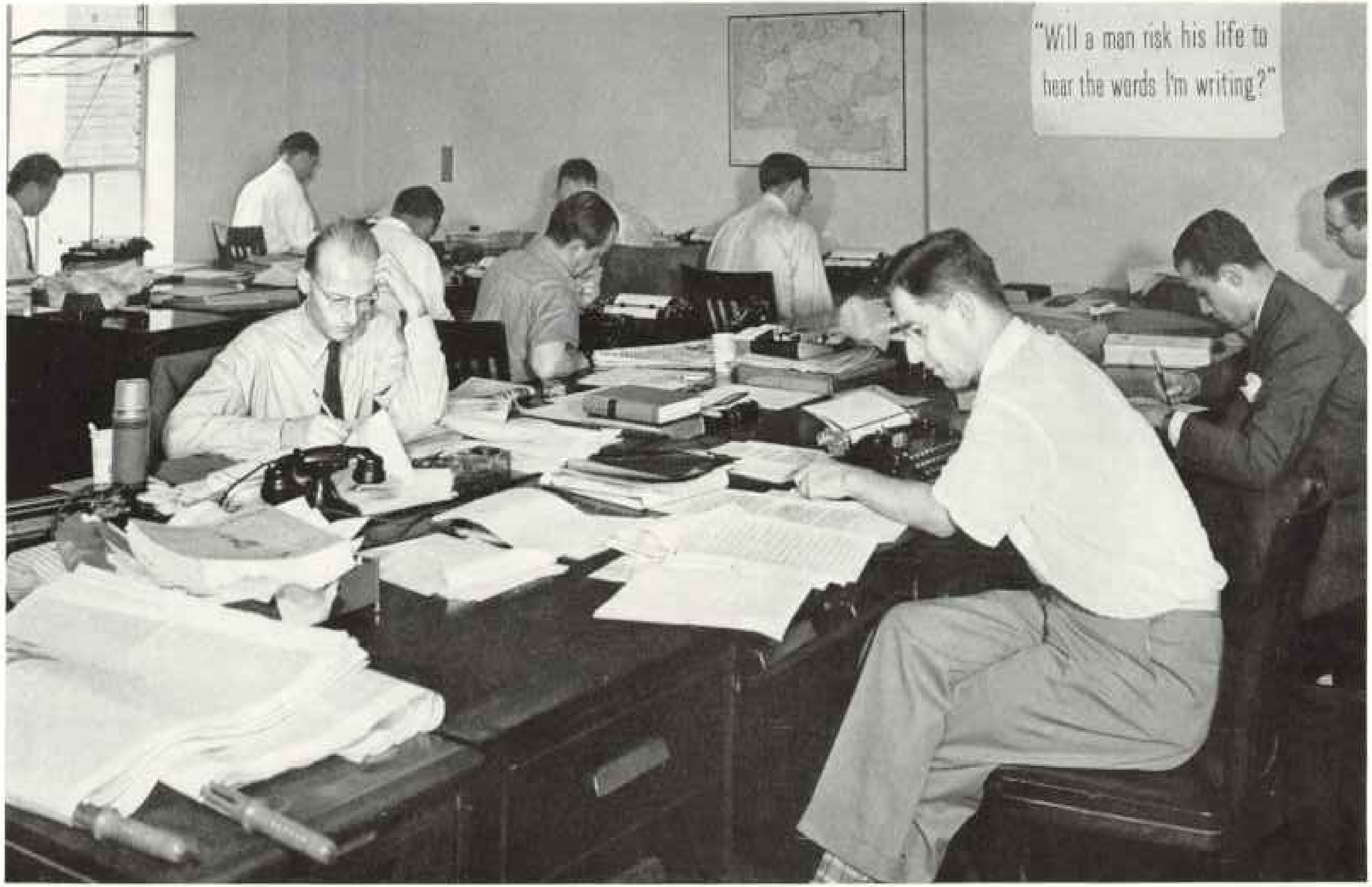
And thanks to the radio beam, the bombardment of words can be aimed at any spot desired, where it will do the most good (page 666).

Radio Beam Like Searchlight

An ordinary radio station sends out waves in all directions like a light, or like the ripples that circle outward when you drop a stone in a quiet pool. But a radio beam is like a searchlight—antennas serving as reflectors concentrate most of the waves in one direction.

You can aim a short-wave radio beam anywhere, except over the poles. In those regions the sending is poor because the magnetic poles interfere. Radio short-wave beams follow straight lines over the earth's surface—the great circle routes (pages 678-9).

Always, however, a little of a short-wave



The Sign in This Radio Station Is a Constant Challenge to Men Who Relate History in the Making

Programs of news and comment to be broadcast in many languages by short-wave radio to occupied Europe are being prepared in the newsroom of the Columbia Broadcasting System, New York (page 692). The National Geographic Society's map of Europe hangs on the wall.

Letters and National Geographic Maps, at NBC, Show Where Short-wave Programs Are Heard the World Over

Covering an entire wall of the international audience mail department of the National Broadcasting Company in New York are letters from listeners in hundreds of places shown on The Society's maps of the Atlantic, Pacific, and Indian Oceans.

Army

In the Deadly Game They Play on the Air-raid Warning Filter Board, Every Move May Mean Life or Death

If enemy planes approach Los Angeles, their progress is charted on this huge map of the area, as spotters telephone in reports. From here Army officers flash orders to fighter squadrons, antiaircraft batteries, and air-raid wardens (page 663). All coastal regions have such centers.

Staff Photographer J. Baylor Roberts

By Radio, a Chinese Teaches English to Latin Americans!

Miss Pin Pin T'an, of the World Radio University in New York, broadcasts lessons in Basic English, a simplified form of the language, to students throughout South and Central America. Hearing lessons by radio enables students to learn correct pronunciation (pages 679, 681).

Pictures Fly by Radio in 20 Minutes from Russia

In that time a photograph can be radioed from Moscow and received on this machine in New York. A photographic film is placed on the cylinder at left and radio impulses, transformed into light, expose it. In this illustration a finished picture shows the position of the film.

Bigelow

Across Prairies and Mountains This Tractor Train Plows a Furrow and Lays Transcontinental Telephone Cable in It

Moving onward day and night, it buries twin cables three feet deep in a single operation. When completed, the line will provide new "highways of speech" across the United States, in underground cable all the way, safe from damage by storms.

Wilfred Price

Radio Blares Jap Propaganda in Conquered China

The loud-speaker on top of the column, in Hsinking, preaches the virtues of Confucius, the value of cooperation with Japan, and the "plots" of foreign powers. Characters on the column say "Manchukuo, safe and happy land." Below, a Chinese company advertises radio supplies.

Official Photograph U. S. Navy

Gas Mask Plus Telephone Gives a "Man from Mars" Look

A "talker" in a Navy gun crew, who receives firing instructions by telephone from the fire-control room, must be able to function even in a gas attack; hence he wears a special type of mask into which a telephone transmitter is fitted, while headphones fit over his ears (page 690).

Historic Picture: Elmer Davis Prepares to Tell America It Is at War

The noted radio commentator who now heads the Office of War Information scans latest bulletins at Columbia Broadcasting System newsroom on "the day that will live in infamy." Note calendar on the wall and battery of five teletype machines.

beam's energy leaks out in the opposite direction. So Polish-Americans in Minnesota often pick up programs aimed at Poland, French Canadians hear broadcasts to France, Portuguese in Massachusetts get programs going to Brazil. Chinese and Filipinos in the United States pick up the backwash of beams on the way to the Far East.

Not only can you aim the short-wave beams, but you can swing them from one target to another. When you change your target you change your ammunition, too, from Portuguese for Brazil to German, French, or Swedish for a north European audience.

Getting the ammunition through to the target is not simple. You must consider whether your radio beam will travel from daylight into darkness or from darkness into daylight; the state of the ionosphere 100 miles aloft all along the route; the distance the waves must travel, and what time it is at the point where you want your message to arrive.

To get your message across to your distant audiences, you must attune your transmission wave length to the seasons of the year because of the constantly changing periods of daylight, twilight, and darkness. In some parts of the year, short-wave transmission from the United States to South America has an advantage over that from Europe; at other times, the Axis has the advantage.

Beams Cover Wide Areas

Wave lengths that are perfect for sending at night may be absorbed in the ionosphere in daytime and never reach their destination.

When it's 9 p. m. and dark in Berlin, or Paris, the time of day when people are at home and can listen to their short-wave radios, it's only 3 p. m. in New York and still daylight. So the short-wave engineer must pick a wave length that can start out in daylight and still get through to the end of its journey

United China Relief

When China Speaks, It's His Job to Listen—and Not Miss a Word

Serving as the official receiver for Chinese Government short-wave broadcasts from Chungking is the task of Dr. Charles E. Stuart of Ventura, California, a dentist who is also a radio amateur (page 690). The messages are recorded on disks and later transcribed. Entire text of a book on China's part in the war to date, recently published, was sent by radio through this station.

in darkness, without getting lost along the way.

Sending to South America is easier because for the most part beams can go all the way in daylight or darkness.

Radio beams fan out like searchlight beams, enough to cover wide areas at their destinations. For instance, we aim a beam at Brazil, largest of South American countries, and the only one which speaks Portuguese.

The strongest part of the beam hits the neighborhood of Rio de Janeiro, but it can be heard all over Brazil. Luckily the configuration of the Continent of South America is such that another beam, aimed at Buenos Aires, Argentina, covers almost all the rest of the continent except Brazil. On this beam Spanish-language broadcasts are sent.

Europe is so small that you can cover most of it, including the British Isles, with one or two beams. Still other beams from our Pacific coast take in the whole of southeast Asia, including China, Burma, Malaya, and the Netherlands Indies. A beam aimed at Japan also reaches Korea and parts of northern China.

Translations in Dialects, Too

Though most of South and Central America speaks Spanish, the language varies somewhat in each country. People like to hear what they're accustomed to. You wouldn't address an American southerner in a cockney dialect if you wanted to make a good impression. So broadcasters to Latin America use a "general Spanish" equally well received everywhere.

Short-wave broadcasts go out in three dialects of Arabic to different parts of the Arab world, in Persian, Turkish (different from Arabic), Armenian, Finnish, Italian, Greek, Serbian, Croatian, Polish, Norwegian, Danish, Dutch, French, German, Czech, Slovak,

Short-wave Radio Beams Follow Great Circle Routes over Surface of the Earth

This map and the one opposite illustrate how broadcasting stations send their messages directly to a country in its own language. For instance, broadcasts for Latin America are sent from San Francisco in English, Portuguese, or Spanish to cover Central America and South America. People living outside of that sector do not ordinarily pick up the messages. Paths of the beams fan out from the sending station. On the maps they appear as straight lines, traveling the shortest distance between the station and any other point. Although this azimuthal equidistant projection distorts shapes of continents, it has two advantages: all distances from the center are accurate; and every point is in its proper great circle direction from the center.

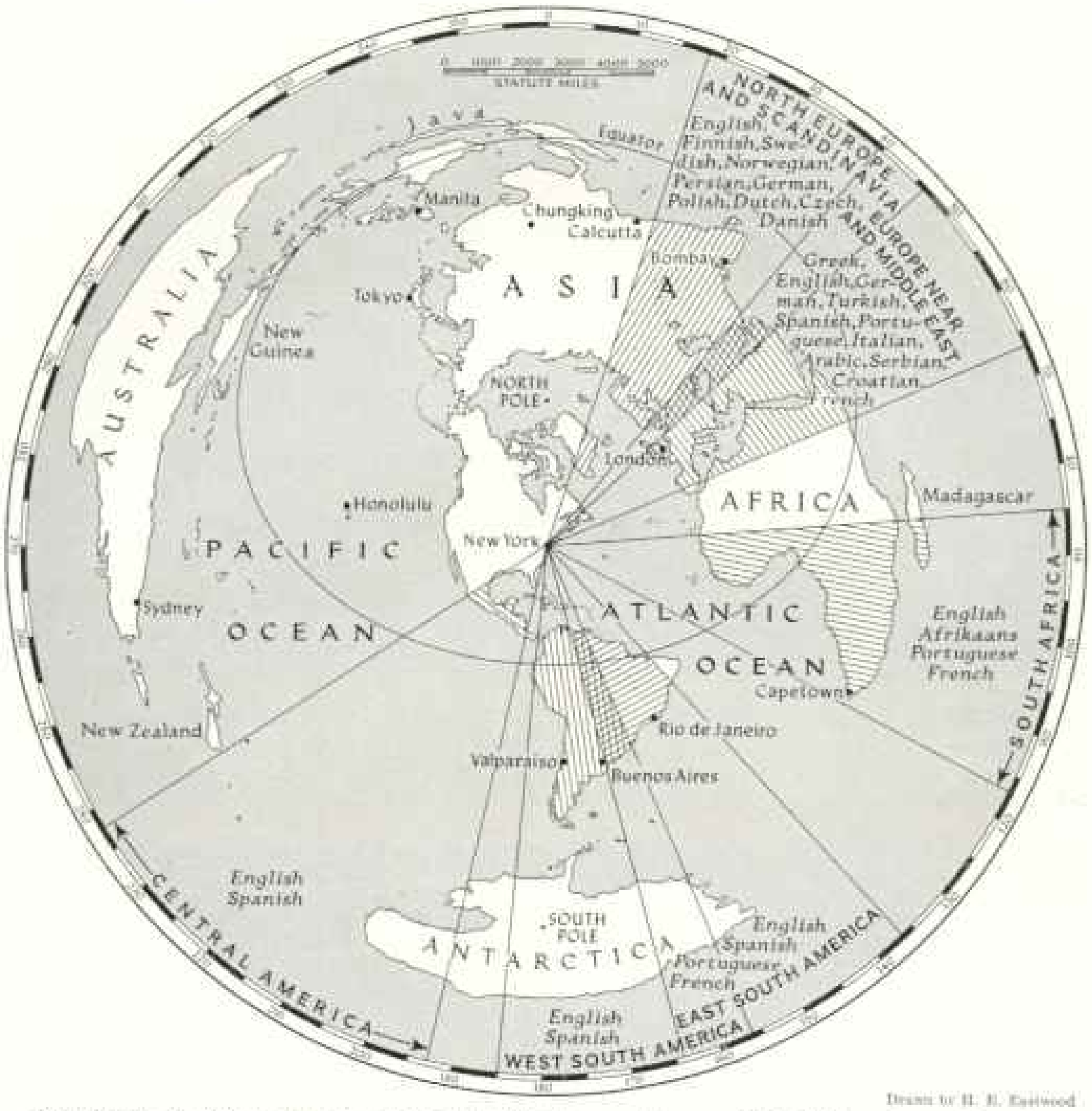
Albanian, Swedish, Portuguese, Spanish, Tagalog, Japanese, Chinese, and Thai.

Voice of a Man Officially Dead

Fascinating stories lie behind the voices that speak in all these tongues on American short-wave beams. A bearded Italian astronomer knows 31 languages, which he learned so he might study foreign astronomical literature, but now he has little time for the stars. The voice of a Swiss Frenchman, broadcasting news of the fall of France from New York, brought first word of it to his brother-in-law, an officer in the retreating French Army.

A man officially dead in his homeland, where the Gestapo does not know of his escape, brings tidings of hope to his fellow countrymen. Among others are a Serbian revolutionary, a Polish diplomat, an Arab physician, a German anti-Nazi, even a mysterious Japanese, who never even comes to the studio but records his broadcasts at home.

Two audiences listen to American short wave. One is furtive and fearful, composed of



Drawn by R. R. Eastwood

Broadcasts in Many Tongues Ride the Short-wave Beams, Which Sometimes Overlap

Beam paths shown on these maps are typical of those used by all short-wave radio stations of the United States, which for the most part are concentrated on the east and west coasts. To show beams emanating from a single point as straight lines, the projection must be centered about that point. Hence two maps are used, with New York and San Francisco as centers. The broadcast horizon, or the azimuth, marked in degrees on the edge of each map, shows the direction from the center to all other points. Scales show correct distances in statute miles from center to any point. Languages listed in italics on the various beams are those used in a typical day's short-wave broadcast from stations of the United States.

people in Germany, Italy, and the nations they have conquered, who risk severe punishment to listen. For them, only straight news and comment are sent out. No one in Occupied France or Poland wants to risk his neck to hear a concert or comedian. Only occasionally, now that we're in the war, are these listeners heard from—in anonymous letters, handed in silently at radio stations in New York by newly arrived refugees; by mail that has traveled months around the world by circuitous routes.

An Italian family sent a group photograph and paw prints of its dog! A letter signed by two dozen Greeks and smuggled to Egypt says American broadcasts are their "only source of hope and life."

Second and larger short-wave audience is the free one, the people of our friends and allies, in Latin America, England, China, and the Free French territories. To them we send, not only news and comment, but entertainment of the sort they like, and programs that promote mutual understanding.

AP from Press Assn

Voices of U. S. Parachute Troops, Coming from the Sky, Fascinate "Winnie"

Prime Minister Churchill closes his eyes as he listens to commands being given to soldiers jumping at Fort Jackson, South Carolina. He is holding a "handie-talkie" radio used for conversation between ground points and planes in the air (page 667). In center is Brig. Gen. William C. Lee, commander of the paratroops.

Staff Photographer Willard R. Culver

Your Soldier's Letters, Sent by V-mail, Go Through Here on the Way to You

Original letters, written on special blanks, are photographed in miniature on rolls of movie film. Seventeen hundred letters can be sent in a roll you can hold in one hand. Arriving in the United States, the films are developed and printed in readable size. Then rolls are cut and individual letters mailed.

To Latin America we even send lessons in English, taught by, of all people, a Chinese girl! (Page 673.)

There's really a third great short-wave audience, too—American soldiers and sailors, at all their far-flung outposts and on the seven seas. A marine at a distant base wrote: "Hearing Jack Benny again gave us a lump in our throats." And what a thrill to a boy from Brooklyn to hear a broadcast of a Dodgers' game while he sits in a desert camp somewhere in Australia! To them familiar programs are rebroadcast from records, timed to reach Iceland, Iraq, India, or Trinidad when the day's work or fighting is done (page 668).

Selecting ammunition for this great War of Words is an intricate, delicate task. Axis and Axis-occupied countries are given straight news, but presented according to the hearers' psychology. To emotional Italy, on the day after Pearl Harbor, went a broadcast containing these lines: "Italians! America has entered the arena. . . . The world knows . . . that the Italians are really on the right side of the barricades. . . . The great factories, the great industries, keep their production lines rolling. . . . And the streets are filled with the tramp of the marching people, armed!" Note the fiery, passionate appeal.

To the more stolid Germans go the cold, hard, unemotional facts about America's growing power.

It's no secret that, in the last five minutes of the last broadcast to Germany each day from one short-wave station is sent information intended for the German "underground" radio and subversive newspapers. This material is read slowly, with names carefully spelled, so it can be taken down by the listeners.

U. S. Army Signal Corps

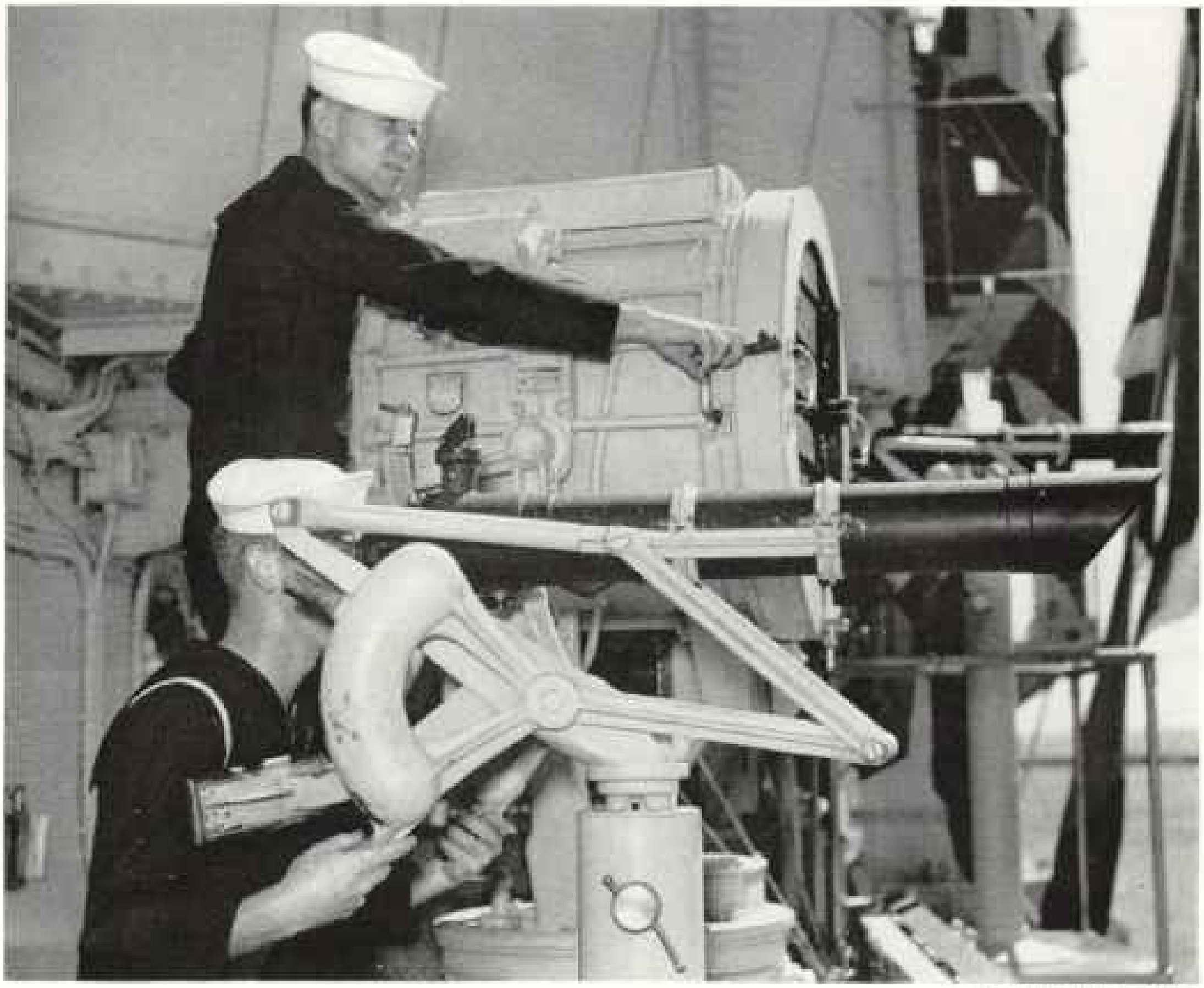
Have Enemy Shells Broken a Line? He's Testing to See

All the telephone wires of a division pass through this test board, hung on a tree. The soldier keeps testing different lines to make sure they are working. If a line goes dead, repairs are started at once. Tags identify the circuits and are usually written in code to baffle the enemy in case the board is captured (page 683).

Giving Latins What They Like

Our Latin American friends are told much about our growing production, the size of our armies and air fleets. But we must be careful how we speak of war sacrifices. A poor Indian who walks wherever he goes will not be impressed by tales of hardships in giving up tires and gasoline!

Brazilians love our hot swing bands. Latins in general have an even greater liking for opera and symphonies than we North Ameri-



Official Photograph U. S. Navy

"Enemy Sighted, Man All Battle Stations!"

Signalman on the flagship of a United States naval force flashes an order to an accompanying ship with the signal searchlight. The sailor below watches through a powerful telescope to see if the other vessel receives and acknowledges the message. Dot-dash signals are sent with the searchlight both day and night. This method is particularly useful when radios must remain silent.

cans. But an Argentine will grind his teeth at many a Yankee orchestra's version of his native tango.

Latin countries also are learning more about each other from our short-wave programs. Colombian or Peruvian music is becoming familiar at last to Argentines and Uruguayans. Books by Latin authors are reviewed. Bob Ripley goes on the air with "Believe It or Nots" about the United States for the Latins.

Urging a President of the United States to finish writing his speeches earlier is something probably nobody ever tried until short-wave radio came along!

But short wave has given the President the power to speak in many tongues—at least vicariously. When he goes on the air in English, other speakers broadcast his speech simultaneously in a dozen or more other tongues—German, French, Spanish, Portuguese, Tagalog, Mandarin (page 664).

To make good translations, they need time to work over the speech: hence the pressure on the President to finish earlier.

Broadcasters who read the President's speeches in foreign languages must know both English and their own language so well that they lose none of the fine shades of meaning in translation and delivery. They must understand such Americanisms as "sold down the river." If translated literally into Italian, for example, it means nothing. So the Italian broadcaster makes it "sold for a plate of lentils," which is equivalent to "sold for no value."

A Woman Broadcasts to Italy

Incidentally, a woman is NBC's "voice of Roosevelt" to Italian listeners.

Even after the President goes to bed, his speech continues to go out on the short waves in many tongues, timed to reach distant parts

of the world when people are listening to their radios there.

Diathermy machines, used by doctors to generate radio energy for producing heat to treat ailments within the body, could be used by enemy agents to send radio messages. Some have been seized by the F. B. I.

When the United States entered the war, all amateur radio sets were ordered off the air by the Federal Communications Commission. Under the concealing screen of hundreds of amateur stations, it would be much easier for a spy or saboteur to send valuable information by radio, for "amateur" sending sets nowadays are powerful enough to span the oceans.

Signal Corps Is Army's Nervous System

Radio has altered the whole technique of war. Today, with tanks and truck-borne infantry speeding at 40 miles an hour and bombers flying at 300, delivering orders safe and fast is more essential than ever before.

That's why, at Fort Monmouth, New Jersey, great training center for the U. S. Army Signal Corps, you see everywhere the motto, "Get the Message Through."

And the Signal Corps aims to get it through, whether by radio, by improvising a telegraph line out of a barbed-wire fence, by telephone, pigeon, or messenger, by flags, flares, pyrotechnic candles, horns, whistles, or cloth panels laid on the ground to signal to planes. One soldier even suggested using smells, with various odors having different meanings!

When an army goes into the field today, it has a vast network of communications—its nervous system—branching out from the "brain," the commanding general's headquarters, to the "fists" with which it fights, to every gun battery, tank unit, bombing plane, right up to the fox holes of the front lines.

In this network are radios, big ones on trucks, smaller ones in officers' command cars and tanks, down to the 26-pound "walkie-talkie." Fighter planes have two-way radios. Big bombers have several, to talk to the ground, to each other, and for direction finding.

For the ground forces, also, there are hundreds of miles of wires, strongly insulated to take punishment, over which travel telephone, teletype, and telegraph messages; smaller wires, almost threadlike, which a man can unreel from a spool on his back as he crawls far forward to scout the enemy; even cables and multiple-wire lines, strung on poles or trees far back of the front (page 691).

Every army headquarters has a "message center," from which orders are sent out by the best and quickest channel available. A complete field message center with radio, telephone, teletype, telegraph, and homing pigeons can be set up and working in ten minutes.

Sometimes the message center officer must make difficult decisions. Radio can be intercepted by the enemy, and, even if coded, codes can be deciphered. Or using radio may give away the army's position. Radios always are silenced before an attack. Wire? Well, the teletype channels may be jammed already. How about telephone? But there's reason to think one telephone channel is tapped. How about the other? It's cut in three places, and enemy snipers are picking off the repair men as fast as they try to mend the breaks. But to all such objections, a harassed general once replied: "To hell with your communications! Get that message through!"

Somehow, in a capsule on a pigeon's leg, or in the mind of a man squirming on his belly through mud and brambles, or speeding through enemy fire on a motorcycle or "jeep," it does go through.

And overnight, in advance or retreat, all this vast network of wire and radio may have to be picked up, moved many miles in the dead of night, and set up again elsewhere, so that the general, picking up his telephone next morning, will find everything working as usual.

How Message Center Works

Modern war has produced a new kind of soldier, the radio intelligence man. His job is intercepting enemy radio messages and trying to decode them, sending false messages to deceive the enemy, and locating enemy radio stations by goniometry, which is the science of measuring angles.

One day on maneuvers I saw a command post message center in action. Driving into a patch of woods, at first we saw nothing. Then a big truck became visible under its camouflage. In it was a regular two-place switchboard, like that of a small hotel, manned by soldier-operators, busily plugging in and speaking quietly into mouthpieces.

"Yes, we pick men with good voices and train them to speak distinctly, just like the telephone company's girls," said my guide.

From another truck, also carefully hidden, came the "chunk, chunk, chunk" of a teletype machine, exactly the same as those used in newspaper and telegraph offices. A soldier at the sending keyboard, which works like a typewriter, rapidly tapped out messages.

"We can send 80 to 100 messages an hour this way," a captain explained. "It's faster and surer than the telephone, and we have a written copy. We prefer to use wire rather

U. S. Army Signal Corps

A Mere Man May Operate a Tank's Radio Set, but It Takes a Lady to Repair One!

A girl "trouble shooter" works on a damaged radio in a medium tank at Fort Monmouth, New Jersey. Specially trained women serve there as instructors to teach soldiers to operate and repair radios, and test the behavior of sets under service conditions in tanks, reconnaissance cars, jeeps, and other Army vehicles. They show special aptitude for the work and replace men needed elsewhere.

U. S. Army Signal Corps

An Officer Reports by Radio While His Armored Scout Car Is on the Move

While the machine gunner trains his weapon on a hostile patrol, the lieutenant in the front seat delivers a message by radiotelephone, perhaps requesting reinforcements or giving the enemy's position. Operator in the rear seat with headphones adjusts tuning dials of the set.

than radio when we can, because it's free from static, and can't be intercepted, so we don't need to bother with code. It may take an hour to put a message in code, send it, and then decode it at the other end.

"Of course, if the enemy taps your telephone wire you can talk in Choctaw, as we did in France in 1918. Every order, too, must be understandable to the dumbest man in the outfit."

Just then a wire-laying truck drove up, loaded with reels of field wire and a wooden boom projecting from the rear. "How fast can you lay wire?" I asked the lieutenant in charge. "Follow us and we'll show you."

Can Locate Breaks in Wire

The truck started off down the road at full speed. A soldier swung the boom over to one side and wire paid out from the end, lying neatly in the ditch. In two minutes one mile of wire was laid.

"In war, of course, we lay wire only at night and across country, avoiding crossroads, because enemy artillery concentrates on them," said the captain.

"We have another wire layer, too, that throws wire farther out to the side, or up in trees, out of the way. Wire up off the ground has a longer talking range. The wire is shot out between two rollers. A sergeant got the idea for the rig from his wife's clothes wringer. If the wire breaks after it's laid, we have a device that tells us where the break is, within 200 or 300 yards. Field wire is so well insulated we can even lay it in water."

A steady, faint hum of "dah, dah, dit, dit, dah, dah, dit" from many earphones is heard as you enter one of the crowded classrooms at Fort Monmouth, where thousands of soldiers are being trained as operators and repairmen for radio, teletype, and telephone.

"What makes a good radio operator?" I asked an instructor.

Official Photograph U. S. Army Air Forces

So Large Are Modern Bombers That Their Crew Members Talk by Telephone

The navigator, in foreground, gives directions to the pilot by phone. Likewise the bombardier, down in the belly, and the rear gunner, far back in the tail, converse by telephone with the pilot. The system is a "party line," for all the crew can hear everything that is said. Silence when a crewman is called on the phone may bring the first intimation that he is unconscious or dead.

"A musical background helps, because it gives a sense of rhythm. Men who are trained typists often are good, too. Those who've done heavy labor with their hands sometimes find it hard to get the delicate touch necessary for sending.

"In the field all messages are printed, not written, as they're taken down. The Army can't risk mistakes that may cost lives or battles. At big fixed stations, of course, typewriters are used.

"A trained operator doesn't count the dots and dashes in a letter. He learns to recognize the sound of the whole letter and even that of entire words."

In battles of today, radio enables cannon to drop shells on targets the gunners cannot see. An observation plane circles high over the target. First salvo is usually a miss.

"Reference point 500 yards left, 100 short," the observer will say into his radio.

Miles away the battery commander corrects his aim:

"Battery adjust. Base deflection left, one five zero; shell: mark one; fuse long; elevation four three five; battery, one round (fire) at my command."

Then to the plane: "Battery is ready."

The plane circles into position to watch, and radioes: "Fire!"

Down drops the battery commander's hand. The guns roar.

"On the way," says the ground radio.

Far below him, the observer sees geysers of flame break among the enemy troops as the shells land. "Target!" he radioes back, meaning a direct hit. With the help of airplane spotting, artillery usually can get on their targets after two or three salvos.

When tanks are tearing across country at 40 miles an hour, fanning out behind the enemy's lines, it's vital for the commander

Army

Electrical "Ears" Detect Enemy Bombers Long Before Human Ears Can Hear Them

In the eerie setting of a cemetery, an Army listening device stands ready to spot the distant roar of hostile raiders. The apparatus amplifies the faraway sounds and shows from what direction they are coming. Even more efficient is the radio locator, which can spot approaching planes 100 miles or more away (page 667).

to know where they are, and what they're doing, so that supporting forces and supplies can be moved to keep up with them. Radio is the only answer.

Throat Microphone Used in Tanks

Tank radio operators wear earphones inside their padded helmets to keep out the deafening noise of engines, clatter of steel treads, and rattle and roar of machine guns and cannon. In sending they use the throat microphone, which picks up vibrations from a man's Adam's apple as he talks and transmits them as words. Other noises are screened out.

Fighter and bomber pilots, roaring into action with motors wide open and half a dozen guns emitting a deafening "rat-a-tat-tat" use the throat "mike," too (page 688).

Big bombers have their own internal telephone systems. A pilot may hear his rear gunner call over the phone: "Look out! Three Messerschmitts on our tail!" But he must keep straight on his course, for his bombardier down in the belly has just telephoned, "Hold her steady. . . . On target." Then the cheering words, "Bombs gone!" and from the rear, "Tallyho! Two down!"

When two fighter planes, each traveling around 400 miles an hour, swoop down on an enemy from opposite directions, their relative velocity toward each other is about 800 miles per hour, close to the speed of sound, Professor Fassett told me. In such split-second maneuvers, only radio, moving with the even greater speed of light, can be of any use for talking between planes, or for giving orders to them from the ground.

Pigeons Used in Emergencies

All armies still use one of the most ancient means of communication—the homing pigeon. (The term "carrier" pigeon is incorrect. The

Western Electric Co.

With the Throat Microphone He "Talks Through His Neck"

Two small buttons held snugly against the airman's throat enable him to converse by radio in battle without the conventional microphone. The buttons pick up vibrations of the vocal cords but transmit no noise of wind, guns, or motor. Also, it leaves the flyer free to use oxygen at high altitudes (p. 687).

"carrier" is now only a show bird and has lost its homing instinct. It is named for the way it carries itself in the show ring, not because it carries messages.)

Pigeons are used only in emergencies, when radio or telephone lines break down.

In the pigeon lofts of the Signal Corps thousands of birds are being bred for speed, endurance, and ability to find their way home through fog or dark or storm or snow.

What is the secret of their amazing homing instinct? The Army doesn't know, nor especially care, so long as it works. But the Army has improved on Nature. It now has a "two-way" homing pigeon, which not only can find his way home from a strange place, but can deliver a message to a place he never has visited before!

Army pigeons weigh about one pound, can fly 500 to 600 miles between dawn and dark at 45 miles an hour, can go for three days without food, and can find their way back even when released 1,000 miles from home.

Pigeoneers Crazy About Their Jobs

"What kind of men are the best pigeoneers?" I asked a lieutenant.

"Well, they're all a little crazy, or should be," he laughed. "Most of our men were pigeon fanciers in civil life. They work with their pigeons all day, and then keep on playing with them when they go off duty. A pigeoneer regards his birds as friends.

"We have boys who come in here from the country, who've never seen a big city before. On their first week-end leave they head for New York. But not to see the sights. They look up some New York pigeon fancier they've corresponded with or heard of, and spend all their time looking at his pigeons!

"Our pigeons carry messages in little capsules about the size of a woman's lipstick holder, attached to one leg with a snap fastener. No, there's nothing to the story about breeding pigeons with parrots so they can deliver messages verbally!"

Pigeons travel with the Army in the field in big trailer lofts towed behind trucks. The loft stays with headquarters, and birds are sent out in small numbers with advance units, even in tanks, from which they will fly back to the home loft if released with messages. World War I had its pigeon heroes, such as Cher Ami, who came home with one leg shot away, the message tube hanging on a tendon.

Codes and ciphers, vital in the War of Words, are taught by the Signal Corps to men who show aptitude for this work, which makes crossword-puzzle solving look like child's play.

Men with precise minds, adept at mathematics or accounting, make the best code men. Not content with working on codes all day, they spend their evenings solving cryptograms published in newspapers! There's no end to the codes that can be used. To change a code you need only to change the key, and the keys can be endless. Codes are changed often, to keep the enemy guessing.

U. S. Army Signal Corps

"Enemy Patrols Just Over the Ridge, Sir"

With the radio-telephone of the "walkie-talkie," the sergeant makes an instantaneous report to his commanding officer, saving precious time. The two-way set is carried like a knapsack and has a collapsible metal aerial (page 667).

Our Navy Pioneered in Radio Science

Radio dots and dashes, "beep, beeping" shrilly across thousands of miles of ocean, have revolutionized naval war. From Washington the Navy Department today can send messages direct to its ships anywhere.

Three U. S. Navy vessels were used by Marconi in radio experiments as early as 1899, and from then on the Navy played an important part in radio development. By 1905 the Navy was broadcasting time signals, hydrographic information, and weather reports.

The first radio broadcast of music was made from phonograph records on a naval vessel when the United States Fleet made its famous voyage around the world in 1907-9. Two-way radio communication between a seaplane and a ship was accomplished by the Navy in 1912.

Radio telephones were developed in the World War for use between submarine chasers, which needed instantaneous voice communication as they tracked down their prey. In 1922 the U. S. S. *Iowa* was controlled by radio from a distance as a moving target for gunnery practice. The same year the Navy broadcast a speech by President Harding.

Time signals, accurate to one or two hundredths of a second, go out daily by radio from the Naval Observatory in Washington. Scientists use them to regulate delicate instruments, ships at sea listen for them to calculate their longitude, and thousands of public clocks are adjusted to them.

Loud-speaker Systems Aboard Ships

In today's war, when our fleet approaches an enemy all radios are silenced, for otherwise bearings could be taken on the signals, reveal-

Staff Photographer Willard R. Culver

Nerve Center of Our Fast-growing Army Is This Maze of Cords and Switches

At the War Department Message Center in Washington radio communications from posts and units all over the United States pour in night and day. The staff sergeant at this switchboard routes them to various teletype and tape-printing machines, on which they are recorded and sent to the proper destination.

ing the ships' positions. But once the enemy is contacted, radios open up again, and orders crackle forth from the flagship.

Over loud-speaker systems bugles sound the hurried, exciting notes of "General quarters." Sailors rush to battle stations.*

But no longer does a leather-lunged skipper bawl orders through a speaking trumpet. In each gun turret stands a "talker," wearing earphones and a telephone headset (page 675). Over the wire from the fire-control room comes the quiet order:

"Report when your station is manned and ready."

"Turret one, manned and ready, sir."

Electric signals flash data for setting the range. Then:

"Stand by——Commence firing!"

Secret, sinister, and often unsung are the ways of spies, who must get their messages through by devious means. When they can, they use radio, but radio's weakness is that it betrays itself.

Keen ears of listeners at radio intelligence stations of the Federal Communications Commission pick up sooner or later the signals of unauthorized senders. Direction finders that point automatically in the direction of the signal can fix their locations within a few square miles. Then mobile detector units track them right to their doorsteps.

Amateurs Good "Radio Detectives"

Years before this country's big short-wave stations became active, thousands of American "hams," or amateur radio operators, were using short wave to talk to one another and to other hams all over the world. They furnished a priceless reservoir of trained personnel for the War of Words.

Radio amateurs of today are not small boys using homemade sets in the attic, but men

* See "Life in Our Fighting Fleet," by F. Barrows Colton, National Geographic Magazine, June, 1941.

U. S. Army Signal Corps

Deftly He Conceals the Wire Beside the Road While the Truck Ahead Unreels It

A field telephone line is laid at high speed along a road by Signal Corps soldiers. Man in foreground is using a pike pole to place the strands out of sight in the bushes where they will not easily be detected by the enemy. On fighting fronts, wire is laid at night, to avoid spotting by enemy planes (pages 683, 685). Each reel contains a mile of wire.

and women, often operating the best equipment that money can buy, in voice and code.

War brought a sudden demand for expert "detectives of the air waves," people who could comb the ether for signals of suspicious or disloyal radio stations and help track them down.

Long years of listening and dial-twisting had given many amateurs an almost uncanny sort of sixth sense. Signals from a certain station might sound hollow, and amateurs knew that at certain times of the year signals from certain regions had that sound. The station might identify itself as South American, but the listener, knowing South American signals weren't sounding hollow then, would be suspicious at once.

A good amateur often can tell where a station's signals are coming from without waiting to hear its identifying signal. A station may claim to be in France or Mexico, but the listening monitor, from experience, knows that if it were in either of those places it could not be heard at that time of day, or perhaps on that particular wave length.

Of the 60,000 licensed hams 15,000 already are in uniform. An equal number are producing and operating war radio equipment as civilians. Others will serve in the emergency radio networks being set up by the Office of Civilian Defense for use in case regular telephone and telegraph lines are broken in bombing raids.

United States Leads in Amateur Radio Operators

About two-thirds of all the world's amateur radio operators are in the United States, with Great Britain second. Germany had several thousand, sponsored by the Government, Japan only a few, and Italy none. Some German amateurs tried to put over propaganda

in talks with American hams, and sometimes posed as United States amateurs. Hams in occupied countries have sent valuable information by radio to the United Nations.

So vital are words in this war, and the channels by which they travel, that for the first time in history people are being urged not to order new telephones!

Even though our telephone system is the world's greatest, it's none too large for our huge war effort.

For every fighter plane of a certain type that comes off the assembly line, 450 local and 15 long-distance telephone calls are made.

Another plane manufacturer in the West told me: "Just the other day we called London to straighten out a little matter, and Washington, D. C., is virtually a 'local call.' "

Not only are long-distance circuits loaded, but large numbers of new telephones and thousands of miles of wire and cable are needed for mushrooming Army camps, Navy bases, and war industries, where telephone facilities big enough for cities of 40 to 50 thousand must be installed almost overnight.

Strange problems arise. With telephone installations being rushed at one Army camp while mud was still deep everywhere, mules had to be used to haul equipment. So deep was the muck that the exhausted animals frequently lay down to rest, and the drivers had to hold their coats under the mules' noses to keep them from drowning!

At another camp, when the heat hit 100 degrees wire crews' shirts became so soaked with perspiration that they temporarily shorted circuits.

10,000 Messages a Day for One Company

One large steel company working on war orders has a telegraph-wire network 4,700 miles long connecting its 61 offices in 46 cities, over which now move 10,000 messages a day! Telegraph traffic in and out of Washington has doubled since the war began.

Because one bomb hit or one saboteur could easily destroy a vital telephone or telegraph cable, alternate lines have been constructed to connect key centers. Experience in England shows, incidentally, that overhead telephone wires strung on poles are less likely to be damaged by bombing than underground cables, which suffer from earth shock (page 674).

And there's the story of an air-raid rescue worker, carrying a victim to an ambulance, when another bomb blew him onto some telephone wires 30 feet above the ground. The wires sagged under his weight and lowered him gently. Who said the telephone isn't a lifesaver!

Army and Navy both need telephone equipment in enormous quantities. And with it all, there's a shortage of copper for wire, lead for cable sheathing, rubber and silk for insulation.

Old pieces of wire and cable are being spliced together. Old upright telephones are going back into service. Telephone dial wheels are being made of steel, saving many tons of aluminum.

The Flow of War News

Over both cable and radio channels, war news moves in a continuous stream from all the fighting fronts to newspapers everywhere. War news now makes up about one third of all wordage carried by press associations and newspapers (pages 670, 671, 676).

Today from remote Chungking, China, to New York, news comes by radio in one to two hours, and most of that time is taken up by passing through the censor! Sometimes the news sent by radio from Russia comes in backwards on the teletype and has to be read from right to left! Puzzled operators in New York can only guess that it's because the Russian operators don't know English.

Just before the war, in 1939, you could send a radio telegraph message from the United States to 41 different points abroad by direct circuits.

Since then, 15 circuits to enemy countries, or those occupied by the enemy, have been suspended, but 21 new ones have been added, even in the midst of war. And the 15 suspended circuits are still available for use, even if not operating.

Whenever Berlin, Rome, or Tokyo get ready to give up, all they need to do is send us the signal for attention, "CQ CQ. . . ."

We're ready for it any time!

Notice of change of address of your National Geographic Magazine *should be received in the offices of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your January number, The Society should be notified of your new address not later than December first.*

NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDINGS

SIXTEENTH AND M STREETS NORTHWEST, WASHINGTON, D. C.

ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded fifty-four 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 $35,000, 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.

This is the time to *Write!*

Now is the time for all good men and women to come to the aid of their country — with frequent letters to those we know in the U. S. Services at home and afar. You'll be well repaid, too, for you'll get letters back. W. A. Sheaffer Pen Co., Fort Madison, Iowa; Toronto, Ontario, Canada.

* * *

Above: Sheaffer's newest *Lifetime* *, CREST "TRIUMPH" TUCKAWAY, for men or women, carries safely in all positions in pocket or purse, $18.75 for the set. Other Sheaffer pens, all colors, $2.75 and up.

*All *Lifetime* pens are unconditionally guaranteed for the life of the first user except against loss and willful damage — when serviced, if complete pen is returned, subject only to insurance, postage, handling charge — 35c

Listen to SHEAFFER'S WORLD NEWS PARADE
with UPTON CLOSE
NBC Complete Network — Sundays, 3:15 P.M. E.W.T.;
2:15 P.M. C.W.T.; 1:15 P.M. M.W.T.; 12:15 P.M. P.W.T.

SHEAFFER'S

1917 WAR RUN BY TELEPHONE

1942 WAR RUN BY RADIO

For Instance . . .

. . . during the battle of Midway the men in the radio room of an American aircraft carrier got a chuckle. They overheard two very excited Japanese talking—and they didn't sound happy . . .
(news item)

. . . there were 81 enemy bombers—swarms of fighters above and below . . . when they were spotted the call went out over the radio—
. . . the Marines piled into them.
(news item)

Interesting!

Watch for radio use in the war news—you'll find it in the air—on the ground—and at home!

WITHOUT radio, the movement of war would still be anchored by telephone lines—the physical hazards of the courier and visual signals.

Now war moves swiftly over the whole face of the earth—instantaneous radio communication thru the ether instead of over copper wires has blasted the barriers of space and time.

So today all our radio production centers on war use.

But what of tomorrow—what effect will this have upon the future—after victory?

One thing is certain—it will revolutionize and speed the great new future form of transportation.

Radio has never been universally necessary in transportation before. In automobiles—on trains—it has been entertainment—in boats it has been a great aid but not an essential.

But today for the future, in that great, new universal transportation that is forming itself—the airplane—radio is essential as the engine itself.

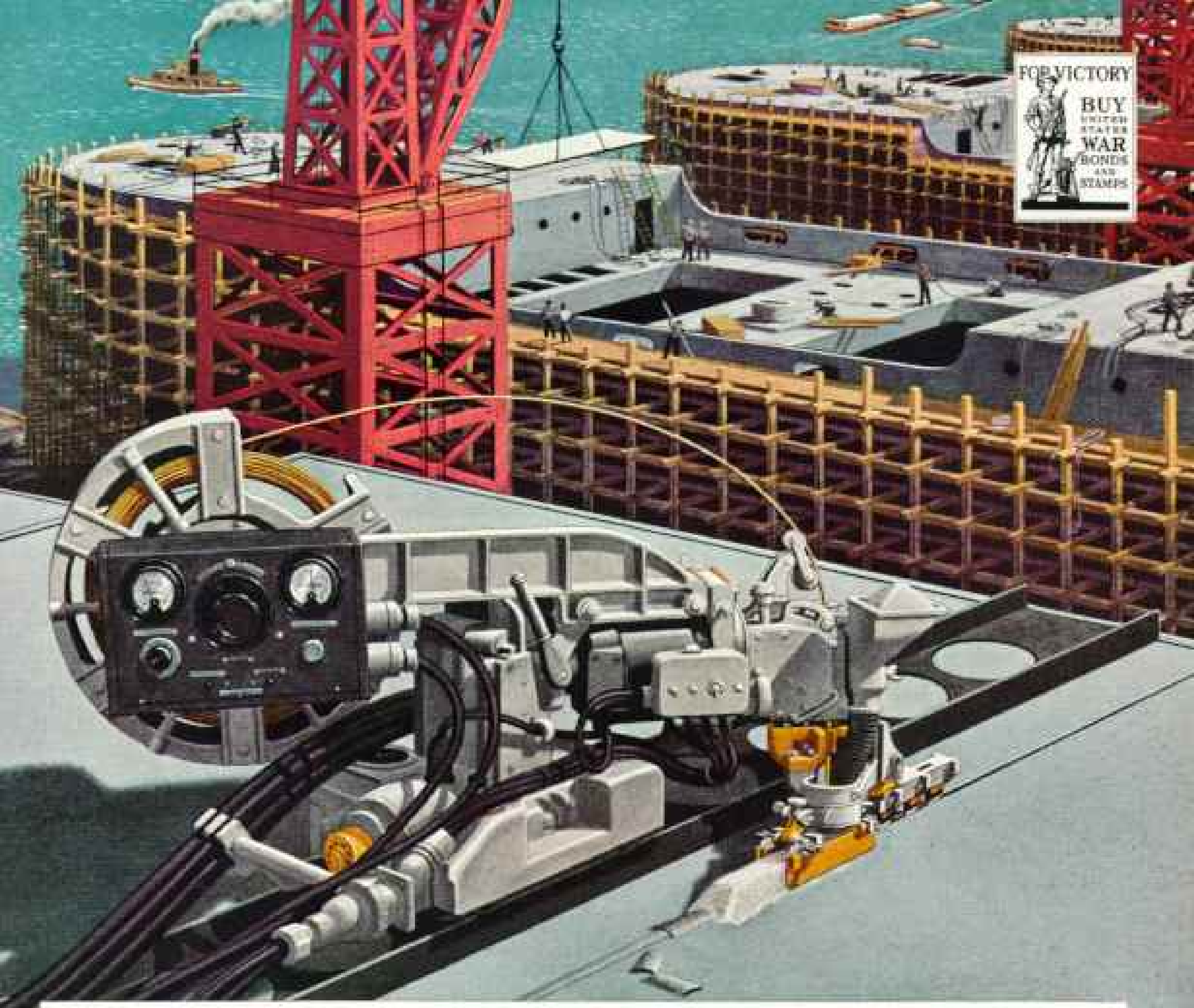
And—mark this well—airplanes and radio are two of the four *great* industries destined to lead this country back to business normalcy after the peace is won.

—a Zenith Radio Dealer near you is giving reliable service on all radios—regardless of make.

ZENITH RADIO CORPORATION—CHICAGO

Zenith's leadership in the radio industry has been established by a constant achievement of "firsts." Repeatedly, ideas "broad new" when Zenith "first" introduced them, later became essentials on all radios. And that same "forward thinking" of engineers and factory and organization now concentrates on war production of the thing we know—radio—exclusively. radio. We are progressing—we learn every day—and this new experience will inevitably reflect itself when Zenith again produces for peace.

ZENITH
LONG DISTANCE RADIO
RADIO PRODUCTS EXCLUSIVELY
WORLD'S LEADING MANUFACTURER



MAKING ONE-PIECE SUITS FOR *SHIPS!*

THERE'S NEWS on America's shipways today . . . an amazing machine that unites steel plates without noise, fuss, sparks or visible arc! A process that is helping to construct those marvels of speed, strength, safety, and carrying capacity . . . "all-welded" ships!

This process . . . known as "Unionmelt" Welding . . . joins steel plates of any commercial thickness as much as *20 times faster* than any other similarly applicable method! And it produces uniformly high-quality welds!

How does it work? A special welding composition . . . "Unionmelt" . . . flows from a hopper and blankets the edges to be joined. Within this granulated mixture, intense concentrated heat is generated by electric current. A bare metal electrode and the edges being welded are melted and fused. Some of the "Unionmelt" melts and remains as a temporary protective coating over the weld.

The process is completely automatic. Special apparatus feeds the "Unionmelt," the welding rod, and the electric current. Speed and current values are adjusted by an operator.

"Unionmelt" welding is also speeding up the construction of fighting tanks and chemical tanks . . . artillery mounts and aircraft parts . . . pressure vessels and locomotive boilers . . . pipe and pipe lines . . . and all kinds of heavy mechanical equipment.

Working with this unique process is an astoundingly fast Linde method of preparing steel plates for welding. Whitehot oxy-acetylene flames . . . cutting simultaneously at different angles . . . bevel and square-up steel plates as fast as they are needed! Together these two processes are speeding up the fabrication of key equipment at a remarkable rate.

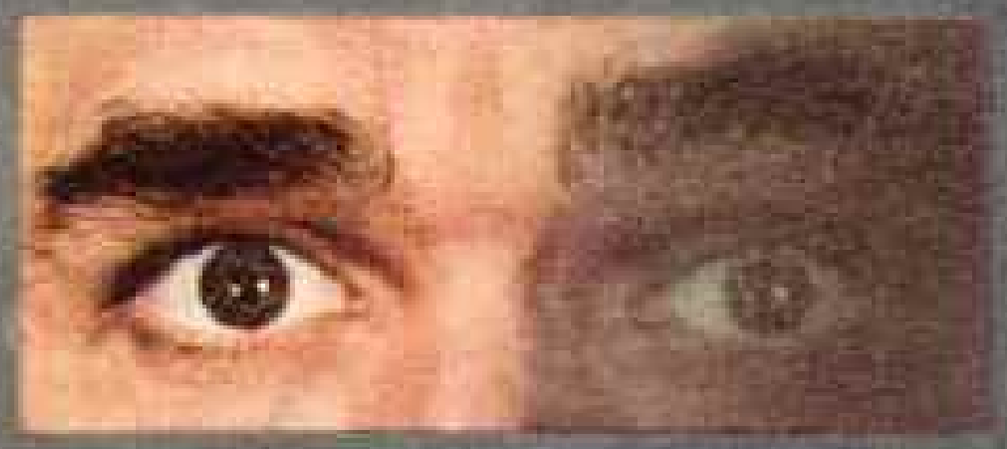
Many years of research into welding, flame-cutting, flame-fabricating, and flame-conditioning of metals have given Linde engineers a vast store of useful knowledge about these methods. Have you a war production problem which might be solved by this "know how"?

The important advances in the cutting, conditioning and fabrication of metals made by The Linde Air Products Company have been facilitated by collaboration with Union Carbide and Carbon Research Laboratories, Inc., and by the metallurgical experience of Electro Metallurgical Company—which companies also are Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

General Offices: New York, N. Y. **Offices in Principal Cities**



Ever try to look through Pea Soup?

General Electric Electronic tubes will lift the fog from sky, sea, and land!

Fog coming in!

Ships crawl. Planes are grounded. Cars hug the side of the road. You can't see for the "pea soup."

But General Electric is "lifting" the fog!

Tomorrow, amazing electronic devices will tell the ship captain the position of reefs . . . permit the pilot to land blind . . . warn the locomotive engineer of danger on fog-drenched tracks. Ship and plane and train will ride as safely in fog as in sunlight!

The exact nature of these miraculous inventions must remain a war secret. But General Electric research has developed a thousand other electronic devices that add to your health and comfort!

Electronic tubes, basically the same as the ones in your General Electric radio, can distinguish 2,000,000 shades of color. An electronically controlled welder stitches together metal parts of war planes as easily as your sewing machine stitches cloth. By electronics, you can study the stresses in an airplane wing during a power dive, or make photographs with the exposure automatically determined.

Production of General Electric electronic equipment is limited today to businesses engaged in war activity. If electronics can be applied in your plant, write General Electric — Radio, Television, and Electronics Dept., Schenectady, N.Y.

GENERAL ELECTRIC

Leader in radio, television, and electronic research

Every General Electric radio is an electronic instrument

This is a General Electric electronic radio tube, similar to those used in all G-E radio sets. The miraculous electronic tubes that will "see" through fog tomorrow will be essentially of this kind.

THE Army's Air Transport Command recently made a decision of far-reaching significance. It called in the commercial airlines and assigned to them the task of operating air routes to combat areas all over the globe.

The response was characteristic—the result electrifying. Already 17 airlines are operating scores of new routes to foreign lands. *Hundreds of flights are now scheduled daily, with the number rapidly rising.*

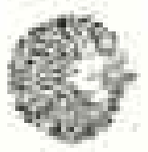
Hundreds of new transport planes, ordered by the Army over a year ago, have already been turned over to the airlines for these operations. Hundreds more are to come. Airports are being carved out of jungle and desert; maintenance bases set up; communications systems established; and trained flight and ground personnel provided . . . a global air transport system being created with masterful speed and efficiency.

Yesterday America's aircraft manufacturers teamed up with the military to perform a miracle of production. Today America's commercial airlines are called upon by the military to perform a miracle of transportation. *A new chapter is being written in the dramatic story of air power.*

• • •

Pratt & Whitney air-cooled radial engines power the vast majority of these transports. Hamilton Standard propellers drive them all.

UNITED AIRCRAFT CORPORATION
EAST HARTFORD CONNECTICUT


Pratt & Whitney Engines


Vought-Sikorsky Airplanes


Hamilton Standard Propellers

★ Five of the first fifty-three Army-Navy Production Award pennants . . . for plants with the highest achievement in the production of war equipment . . . have been awarded to Westinghouse.

To Westinghouse men and women, for "an outstanding contribution to victory"

IN ANNOUNCING that five of the first fifty-three Army-Navy Production Awards go to Westinghouse, James Forrestal, Undersecretary of the Navy, said, "The men and women in these plants are making an outstanding contribution to victory. Their practical patriotism stands as an example to all Americans and they have reason to be proud of the record they have set."

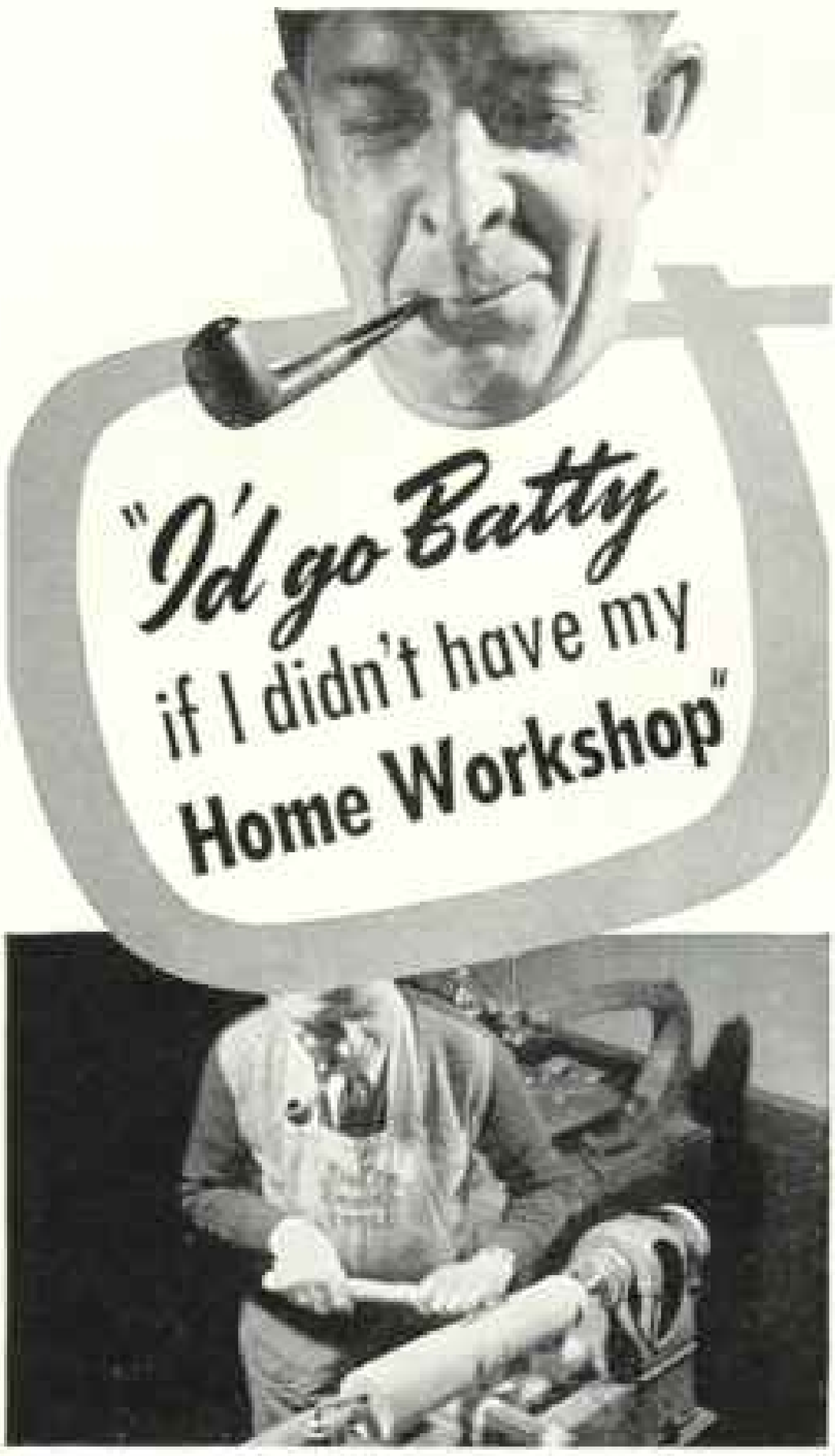
Westinghouse, one of the world's leading manufacturers of electrical equipment, is now producing war materials at the rate of 4000 carloads per month . . . enough to fill a freight train *37 miles long every 30 days.*

To this effort, we are applying the full extent of Westinghouse "know how" in scientific research, in engineering, and in production. As a result, production, on a man-hour basis, is 95% ahead of the mid-1940 rate. In some divisions, production is up more than 300%.

This is the record to date. We hope to make it still better tomorrow.

Westinghouse

Westinghouse Electric and Manufacturing Company,
Pittsburgh, Pa. • Plants in 25 cities—Offices Everywhere



"WHETHER you're the big boss or just one of the 'deck hands'....industrialist, professional man, military brass hat, bookkeeper or draftsman . . . there comes a time when you've got to get away from the strain of modern life—or go nuts!

"As for myself, I'd go batty if I didn't have my home workshop! My doctor tells me that working with my hands has a 'therapeutic value'. My friend who's a psychologist says he's been turning out gadgets in his own workshop for years because that's nature's way of obtaining 'release'."

Creating things by hand has been a normal part of human routine ever since the first Neanderthal man began chipping flint arrows. That's why thousands of industrial leaders, professional men, army officers and desk slaves are finding new happiness and relief from desk jitters by adopting a creative hobby.

Send for FREE Booklet

"Happiness is in Your Hands." It gives full details of how happiness can be obtained through creative hand work—and contains practical suggestions for hobbies within the reach of all. Write for your copy today! The Delta Manufacturing Company, 674 E. Vienna Avenue, Milwaukee, Wisconsin.

DELTA
MILWAUKEE

Yes, it's the same friendly, colorful Valley of the Sun— the same delightful (and now) *Certified-Climate**–you've enjoyed in seasons past. If the war forces you to forego Phoenix' sun-time and fun-time this season, you can be glad Uncle Sam's lads are here making hay while the desert sun shines! Meanwhile, buy War Bonds and begin post-war planning for the winter vacation of a lifetime!

* This climate was literally "certified" when the Valley of the Sun was chosen for one of America's foremost aviation training centers because of its unexcelled climatic conditions —high percentage of clear, warm, sunny days; low humidity, wind velocity and rainfall; ideal altitude.

Phoenix Arizona

For free, profusely illustrated booklet and cartograph map, write Valley of the Sun Club, 426 Chamber of Commerce Bldg., Phoenix.

In the Valley of the Sun

BOOKS

Insects and Spiders

● 500 insects and spiders in exact color; 161 monochrome illustrations; fascinating stories about the life of bees, ants, beetles, bugs, flies, butterflies, moths, and spiders. Tan cloth binding; 252 pages (7 x 10 inches). $2.50 in U. S. and Possessions; elsewhere, $2.75.

Wild Flowers

● 128 pages of flower paintings in full color; biographies of 250 species. Forest-green cloth binding; 243 pages (7 x 10 inches). $3 in U. S. and Possessions; elsewhere, $3.25.

Wild Animals

● Intimate studies of big and little creatures of the mammal kingdom in North America; 122 full-color portraits; many monochrome engravings and track sketches. Mulberry cloth binding; 254 pages; 7 x 10 inches. $2 in U. S. and Possessions; elsewhere, $2.25.

Cattle

● Story and descriptions of domesticated and wild varieties in many lands; 45 subjects in full color; 94 monochrome illustrations. Moleskin-made binding; 142 pages; 7 x 10 inches. $1.50 in U. S. and Possessions; elsewhere, $1.75.

POSTPAID. OBTAINABLE ONLY FROM

NATIONAL GEOGRAPHIC SOCIETY

DEPT. B-V, WASHINGTON, D. C.

Photograph of a Flying Fortress—seven miles up

This is the way a Flying Fortress* looks to the enemy, on its way to the bombing objective. At six and seven miles up, an airplane is invisible to the naked eye, and one of the reasons for the success of the Flying Fortress in combat is that it strikes with deadly precision from regions above the effective range of anti-aircraft fire, and beyond the reach of most enemy planes.

Seven miles is 36,960 feet. Problems of flight that high increase with every hundred feet. The air is colder than Siberia in winter, and atmospheric pressure falls off sharply. Until recently, one of the major problems has been maintaining of communications.

A year ago 19,000 feet was the ceiling for plane-to-ground voice communication. Above that, somewhere in the substratosphere, the radio-telephone died. Radio-telegraph was good up to 26,000. From there, you could receive, but you couldn't send.

Here was a problem for Boeing acoustical and electrical engineers. Years ago, Boeing led the development of the first plane-to-ground short-wave radio-telephone system. Now, with Boeing Flying Fortresses operating six, seven and more miles above the earth, it was necessary to provide two-way radio voice communication at these levels. . . . This, Boeing engineers did.

Working in the laboratory and "upstairs" in the stratosphere, Boeing engineers have gradually pushed the communications ceiling higher and higher.

Today the men in the Fortresses, cruising over the roof of the world, know that their communications system is the best available. The work of Boeing engineers is helping our Air Forces to speak terse, well-chosen words for democracy.

The sure advance of radio communication . . . both for peace and for war . . . is only one of the many different projects which form a constant part of the Boeing engineering schedules at Seattle and in the Middle West and Canada.

DESIGNERS OF THE FLYING FORTRESS • THE STRATOLINER • PAN AMERICAN CLIPPERS **BOEING**

*THE TERMS "FLYING FORTRESS" AND "STRATOLINER" ARE REGISTERED BOEING TRADE-MARKS

Burberrys

NOW AS
ALWAYS

So long as there are discriminating men who know the smartest in style and the greatest in value, there'll be Burberry coats to satisfy them. Fall and Winter models that maintain in every way the Burberry standards of excellence are now being displayed by your Burberry Dealer. We'll gladly give you his name.

BURBERRYS Ltd.
18B East 38th St., N. Y. C.

BURBERRYS
of London

THESE ATTRACTIVE BOOKCASES MAKE EXCELLENT XMAS GIFTS

Globe-Wernicke bookcases are convenient . . . useful . . . beautiful and economical . . . fine examples of wood craftsmanship. They make excellent Christmas gifts . . . ideal for office, home, studio and library. Choice of several styles and finishes. FREE . . . Ask our dealer for 32-page booklet, "The World's Best Books," or write direct to us.

The Economy . . . sectional bookcase . . . "grows as your library grows."

The Ardmore . . . solid end bookcase . . . smartly styled . . . adjustable shelf.

The Globe-Wernicke Co.
CINCINNATI, O.

JACKSONVILLE

invites you to enjoy its sunny pleasures

If you can't leave your desk for a refreshing holiday this winter, send your family anyway. A gloriously healthful, comfortable visit to Jacksonville may actually cost less than keeping your family at home.

War work offers opportunities for jobs here. Superb recreation facilities including world's widest, whitest beaches. Fine hunting, fishing. Plenty of excellent accommodations of all types at reasonable rates. Send coupon today for details.

Tourist and Convention Bureau
55 Hemming Park, JACKSONVILLE, FLORIDA

Please send me FREE illustrated booklet about Jacksonville

Name _____

Street No. _____

City _____ State _____

MAPS OF DISCOVERY

EXCELLENT FOR GIFT PURPOSES

Superb color reproductions of N. C. Wyeth's map-murals which adorn the walls of The Society's Hubbard Memorial Hall. These maps, one of the Western Hemisphere and one of the Eastern Hemisphere, are, in effect, time-colored Fifteenth Century charts, tracing the courses of Columbus, Magellan, De Soto and other discoverers. 18 x 15⅝ inches. *Each Hemisphere, 50c in U. S. & Poss. Elsewhere, 75c. Framed print, 19½ x 17½ in., each Hemisphere, $4 in U. S. only (shipment abroad not advised).*

POSTPAID. OBTAINABLE ONLY FROM

National Geographic Society

DEPT. B-V, WASHINGTON, D. C.

"What they see... they GET!"

"WHAT *you see, you get*"—for many years a tradition with owners of FILMO personal movie equipment built by Bell & Howell—assumes a new and tremendously important wartime meaning. The fraction of a second can be the difference between victory and defeat in today's high-speed combat. Our fighting men must be better trained and better equipped than ever before.

Motion pictures are proving indispensable to both tasks. Men in training learn faster through motion pictures—because *what they see, they get.* In combat, each engagement recorded by the eye of the camera and re-enacted on the screen, proves achievement and provides the key to building better weapons.

The craftsmanship of Bell & Howell which in peacetime made "*what you see, you get*" an honest slogan, is now providing our fighting men with the finest motion picture equipment and sighting devices American skill can devise.

Filmo

Bell & Howell Company, Chicago; New York; Hollywood; Washington, D. C.; London. *Established 1907.*

MOTION PICTURE CAMERAS AND PROJECTORS

PRECISION-MADE BY

Bell & Howell

catch up with a new lease on life...in SUNNY, DRY

TUCSON

Take time out to relax in the soothing warmth of Tucson —America's healthiest winter resort. Its tonic, *dry* desert air works marvels. Come to rest or play—refresh yourself in Tucson! *Write now. Reservations advisable.*

• Excellent private schools • University of Arizona • 500 miles inland • Nearby Old Mexico • Outdoor sports • Guest ranches

TUCSON *Sunshine* CLIMATE CLUB

4204-B Rialto, TUCSON, Arizona

☆ *Please send me your free descriptive booklet.*

NAME_____

ADDRESS_____

Judd & Detweiler, Inc.

(Established in 1868)

Printers

ECKINGTON PLACE AND FLORIDA AVENUE

WASHINGTON, D. C.

THIS MAGAZINE IS OUR INDORSEMENT

USE

LAVORIS

As A Gargle

It is safe, thorough and most refreshing

Free Catalog Now Ready

These Emkay Candle designs will add beauty, joy, glamour and romance to your table and room settings. There are special styles, colors and sizes for every occasion. Write for free catalog. *Address Dept. N.*

EMKAY CANDLES

Syracuse, N. Y.

DON'T PULL HAIR FROM NOSE

May Cause Fatal Infection

Use **KLIPETTE** *New Invention*

You can cause serious infection as a result of pulling hair from nose. Use of scissors is also dangerous and impractical. No better way to remove hair from nose and ears than with KLIPETTE. Smooth, gentle, safe and efficient. Rounded points can't cut or prick the skin.

Guaranteed to Satisfy or Money Back

So Simple! Just turn end. Surplus hair comes out easily, gently.

$1. *Made from finest surgical steel. Chromium plated.*

HOLLIS CO., 11 Commerce St., Newark, N.J., Dept. 287 + Enclosed is $1.00 for KLIPETTE. If I am not entirely satisfied, I may return it and my $1.00 will be refunded.

Name_____ Address_____

WHAT'S IN A NAME ?

ALEXANDER

means "helper of men"

DOROTHY

means "gift of God"

GEORGE

means "farmer, husbandman"

ETHYL

is a trade mark name

It stands for antiknock fluid made only by the Ethyl Corporation. Oil companies put Ethyl fluid into gasoline to prevent knocking.

The Ethyl trade mark emblem on a gasoline pump means that Ethyl fluid has been put into high quality gasoline and the gasoline sold from that pump can be called "Ethyl."

What does your name mean?

The meanings and origins of over 900 masculine and feminine names are given in the fascinating illustrated booklet, "What's in a Name?" It's free—no obligation—just mail coupon.

FREE ILLUSTRATED BOOK OF NAMES

ETHYL CORPORATION
Room 3309, Chrysler Building, New York City

Please send me a free copy of "What's in a Name?"

Name _____
(PLEASE PRINT)

Address _____

City _____ State _____

"Our Navy Ships"

8 FULL-COLOR PRINTS
IDEAL FOR FRAMING

THE TIMELY GIFT! Responding to continued requests, The Society makes available at cost a limited number of these remarkable sets. They include eight full-color prints of Arthur Beaumont's original paintings of United States Navy Ships, prepared especially for the GEOGRAPHIC MAGAZINE. Each of the eight dramatic pictures (averaging 7 x 10 inches) is brilliantly reproduced on paneled art paper, 11⅞ x 15½ inches overall. Inserted with frontispiece in heavy corrugated carton, the colorful sets are ideal for Christmas giving or personal use. $3 the set in U. S. & Possessions. Elsewhere, $3.25 in U. S. funds. Postage prepaid. Mailed with presentation card if desired.

National Geographic Society, _____ 19__
Dept. B-V, Washington, D. C.

Enclosed please find _____ for which send me _____ sets of "Our Navy Ships"—8 full-color prints to a set. ($3 in U. S. and Possessions; elsewhere, $3.25 in U. S. funds. Postpaid.)

Name _____

Address _____

"PLOUGHED EARTH," painted by Rudolf Wehrenberg

Things you can count on . . . The goodness of the earth. The coming of Spring. What else? In America, thanks to the Almighty, *lots* else. Even with total war, even with dozens of daily sacrifices, and extra sweat put into our work—still, *lots* else.

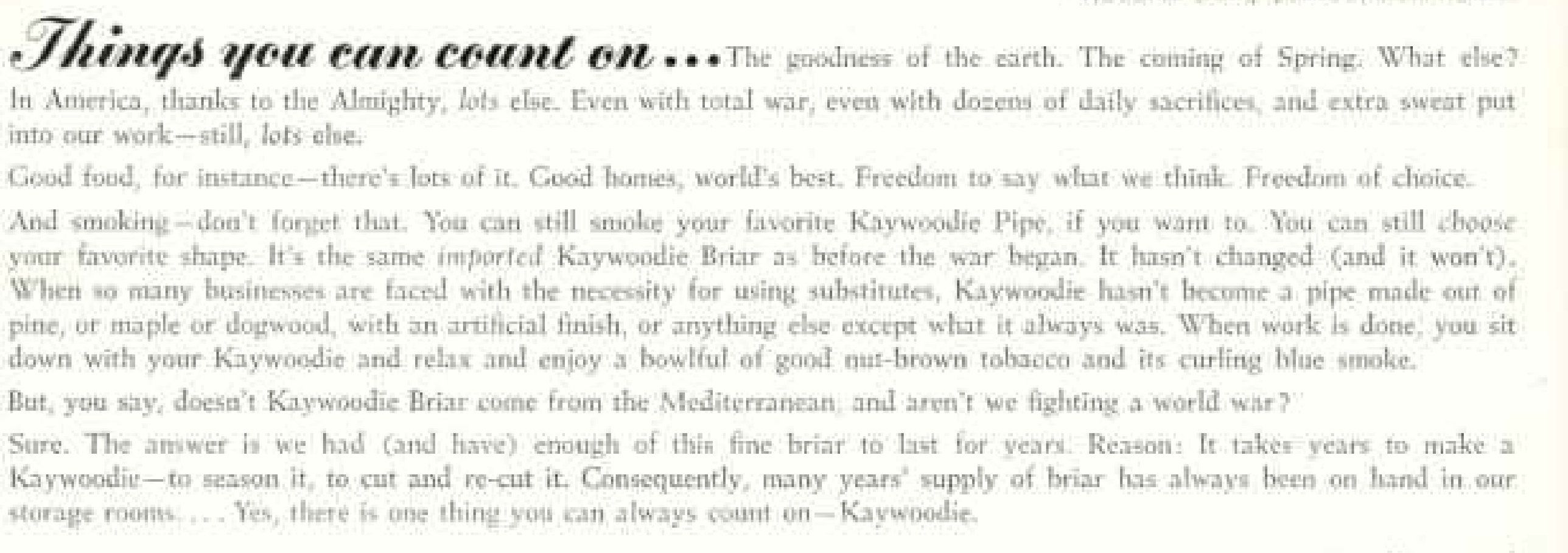
Good food, for instance—there's lots of it. Good homes, world's best. Freedom to say what we think. Freedom of choice.

And smoking—don't forget that. You can still smoke your favorite Kaywoodie Pipe, if you want to. You can still *choose* your favorite shape. It's the same *imported* Kaywoodie Briar as before the war began. It hasn't changed (and it won't). When so many businesses are faced with the necessity for using substitutes, Kaywoodie hasn't become a pipe made out of pine, or maple or dogwood, with an artificial finish, or anything else except what it always was. When work is done, you sit down with your Kaywoodie and relax and enjoy a bowlful of good nut-brown tobacco and its curling blue smoke.

But, you say, doesn't Kaywoodie Briar come from the Mediterranean, and aren't we fighting a world war?

Sure. The answer is we had (and have) enough of this fine briar to last for years. Reason: It takes years to make a Kaywoodie—to season it, to cut and re-cut it. Consequently, many years' supply of briar has always been on hand in our storage rooms. . . . Yes, there is one thing you can always count on—Kaywoodie.

Billiard Shape, Kaywoodie Flame Grain Briar with Imitation Bowl of Meerschaum, $12.50 [⅔ actual size]



GEOGRAPHIC WAR MAPS—timely, accurate!

Follow the War with These Ten-Color "Victory Maps." Here Is a Complete List, Including Map Indexes and a Handy Map File

USE the convenient coupon below to order the same NATIONAL GEOGRAPHIC War Maps that are serving America on its battle fronts everywhere. Map Indexes—for quick location of places in the news—available for maps marked *. All maps come on either paper or linen.

• • •

The World: 41 x 22 inches; ideal to determine quickly the "lay of the land" wherever news happens.

***Theater of War in Europe, Africa, and Western Asia:** 26½ x 31 inches; combines geographic features of three maps into one revealing picture.

***Theater of War in the Pacific:** 26½ x 20½ inches; gives 861 air distances between strategic points.

National Geographic Society 1942
Dept. B-V, Washington, D. C.

Please send me the items indicated below:

■ All Maps come on either paper or linen. *Indexes are available for Maps marked with asterisk*. All items are sent postage prepaid.

	How Many Copies Desired		
	Paper Maps 50c each in U. S. & Poss. Elsewhere 75c each	Linen Maps $1 each in U. S. & Poss. Elsewhere $1.25 each	Indexes 25c each in U. S. & Poss. Elsewhere 50c each
The World			
*Theater of War in Europe, Africa, & W. Asia			
*Theater of War in Pacific			
*Pacific Ocean			
Indian Ocean			
Atlantic Ocean			
*United States			
*Europe and Near East			
*Central Europe and the Mediterranean			
British Isles			
*Asia			
*Bible Lands			
*Canada			
*Africa			
*Mex., Cent. America, and West Indies			
*South America			
*North America			
*Classical Lands of the Mediterranean			

Also ____ copies of Map File (50 ¢ in U. S. & Poss. Elsewhere, $1.50)

I enclose remittance of $____ payable in U. S. funds.

Name _____

Address _____

***Pacific Ocean:** 38 x 31 inches; has 72 insets of islands, harbors; shows reef formations, time zones.

Indian Ocean: 32¾ x 25½ inches; includes eastern Africa and Australia; insets of Suez, Philippines, Guam, Singapore, Hong Kong, New Zealand.

Atlantic Ocean: 25 x 31¼ inches; includes large part of the four continents bordering the Atlantic.

***United States:** 41 x 26½ inches; shows military divisions, defense data, 8,838 place names.

***Europe and the Near East:** 39 x 34 inches; all Europe and large part of Russia; 9,052 place names.

***Central Europe and the Mediterranean:** 36½ x 26½ inches; on a large scale for easy reference.

British Isles: 29 x 35 inches; decorative design; many directing symbols to historic places.

***Asia:** 38¼ x 31 inches; includes all of Russia; 6,500 place names; shows comparative size of cities.

***Bible Lands and the Cradle of Western Civilization:** 35 x 25 inches; modern developments, ancient sites.

***Canada:** 40 x 27 inches; shows important highways, railroads, general elevation, etc.

***Africa:** 29 x 31½ inches; 7,162 place names; gives railway routes, highways, and other data.

***Mexico, Central America, West Indies:** 41 x 24 inches; shows Caribbean defense bases, Panama Canal.

***South America:** 26½ x 37¼ inches; shows chief natural resources, railways, air lines, etc.

***North America:** 26½ x 33 inches; includes all adjacent areas related to hemisphere defense.

***Classical Lands of the Mediterranean:** 35¼ x 26 inches; features 342 historical notes.

***INDEXES:** Available for all maps marked with asterisk *; bound in protective covers, 7 x 10 inches; contain alphabetical listings and location keys of all place names on corresponding maps.

HANDY MAP FILE: Bound like a book, 7¾ x 10¾ inches; 10 Manila pockets in indexed order accommodate 20 folded paper maps or 10 maps and Indexes; library-buckram covers embossed in gold.

• • •

Prices: Please refer to coupon for separate prices in "U. S. & Poss." and "Elsewhere." Remittances should be payable in U. S. funds. All items sent postage prepaid.

Obtainable only from the **NATIONAL GEOGRAPHIC SOCIETY**, Dept. B-V, Washington, D. C.

DIABETES...a disease that prefers plump, middle-aged people

Twenty years ago people with diabetes were virtual invalids. The basis of their treatment was a "starvation diet," so drastic that life was gloomy, indeed. Most of them survived only a few years. Then, in 1921, medical science produced the modern miracle—*insulin*. Overnight, diabetics were given a new lease on life.

Today, largely because of insulin, the life span of people with diabetes—and especially of diabetic children—has increased remarkably. Hundreds of thousands of diabetics are able to lead practically normal lives. Many successfully carry heavy responsibilities.

The vital factors in controlling diabetes are proper diet, insulin in its several varieties, and exercise (which includes work). The diabetic who studies his disease and co-operates with his physician has a good chance of living as long with diabetes as he might without it.

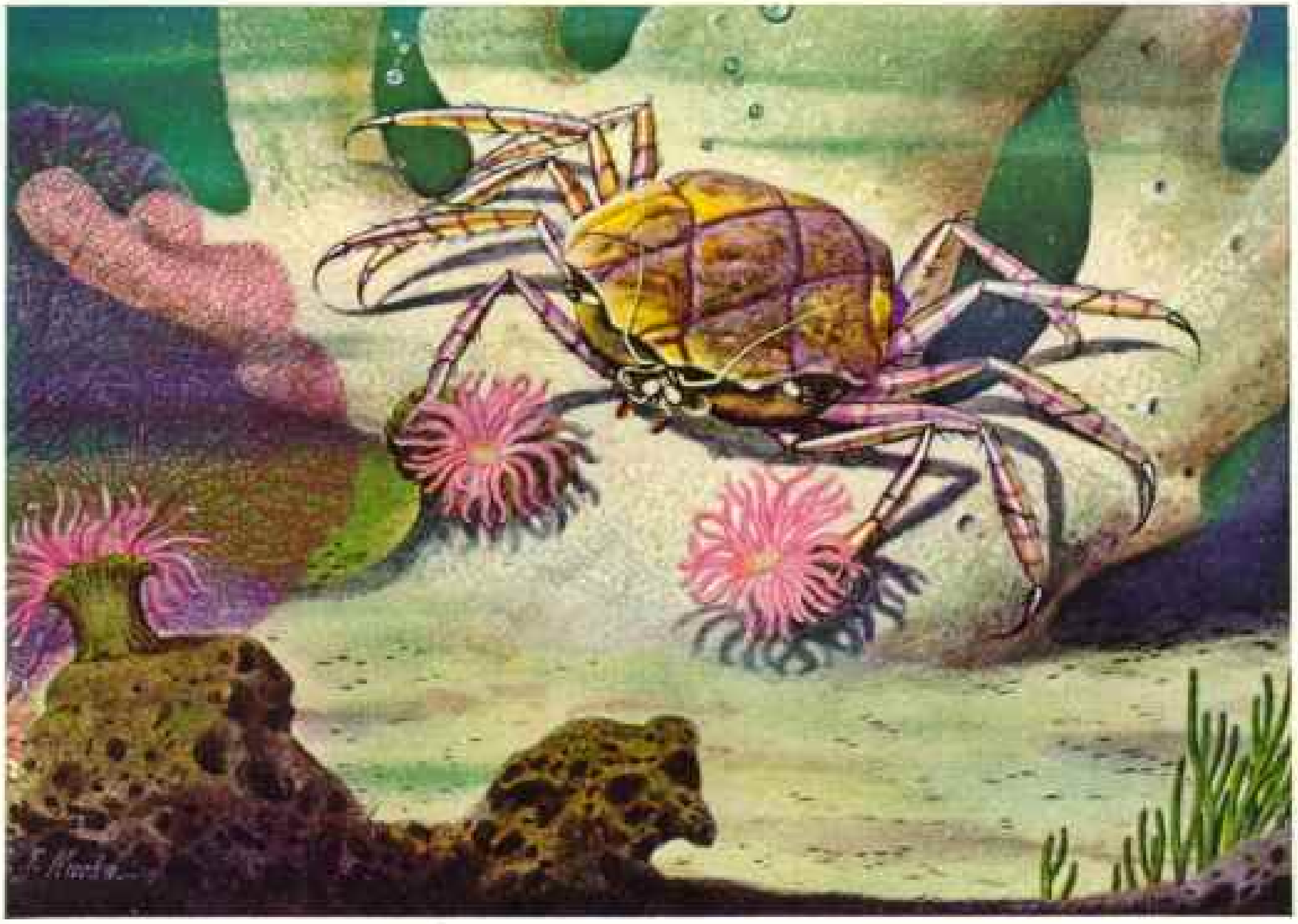
DIABETES SEEMS TO RUN in families. A diabetic should educate his relatives in preventive measures, counseling them against overeating and overweight, and encouraging them to obtain periodic health check-ups.

Diabetes may occur at any age, although it begins most frequently in those who are past 45 and overweight. More women than men get diabetes.

Typical signs of the disease are usually absent in early or mild cases. At that stage it may be detected by abnormal amounts of sugar in the urine and the blood. That is why it is advisable for everyone with a family history of diabetes, *especially if overweight*, to have periodic health examinations.

The first obvious symptoms are usually excessive thirst, constant hunger, frequent urination, and unexplained loss of weight and strength. Among middle-aged and older people, boils, carbuncles and sores which resist healing (especially on the feet or toes) may first lead to its discovery. Prompt treatment prevents serious and sometimes fatal complications.

To learn more about diabetes and its treatment, send for Metropolitan's free booklet, 112-N, "Diabetes."



The Submarine Grenadier

A CRAB OF THE INDIAN OCEAN, *Melia tessellata*, has feeble claws, ill-suited for defense. He isn't a particularly large crab either, nor does he have an extremely hard shell. And his enemies are many.

Hordes of hungry fish hunt food in the coral reefs where this crab makes his home. These undersea raiders have strong teeth, and they like crabmeat.

But those, who seek to make a meal of *Melia tessellata*, discover to their pain that he travels armed. In each of his feeble claws, he carries something that serves as a hand grenade. It is a sea anemone and it can deliver a very painful sting.

When the crab is going to be attacked, these living weapons warn the foe away. Then, if the warning is ignored, the aggressor feels the stinging tentacles of the anemones.

So *Melia tessellata* is left pretty much alone, and thrives amidst many dangers. The stinging anemones give him the protection his own physical makeup lacks. Ingenious as this protective device is, however, it is feeble in comparison to man's.

Man has not only developed countless weapons for protection from the many dangers that threaten him, but he has even found a way to keep the accidents he can't escape, from costing him a lot of money and worry. This device is called accident insurance.

Suppose a speeding car knocks you down as you cross the street; or a rug slides out from under you and you break a leg. Accident insurance will pay your doctor and hospital bills. It will care for your family while you are laid up and unable to earn a dollar. These expenses, particularly when an accident puts you on the shelf for weeks or even months, are almost always heavy, and can easily run into thousands of dollars.

Any well-planned insurance program should give you protection from unexpected accidents. In planning this program, you'll find the experience and training of your Travelers agent or your insurance broker a great help. He'll be glad to sit down with you and work out a common-sense plan that fits your personal needs.

Moral: Insure in The Travelers. All forms of insurance. The Travelers Insurance Company, The Travelers Indemnity Company, The Travelers Fire Insurance Company, Hartford, Connecticut.

STOP HOARDING PETTICOATS, SOPHONISBA!

One G-E Automatic Blanket will keep you warm as toast all winter!

Aunt Sophie's beach-umbrella silhouette is the mark of a vanishing American — who doesn't know that *one* soft, deep-napped, zephyr-light Automatic Blanket *alone* will keep her whole bed at just the warmth she selects, no matter how the bedroom temperature rises or falls!

Imagine — *warmth without weight* every night, all night! And how you sleep! You rest relaxed, uninterrupted, protected from weather changes as if by an ever-watchful nurse.

Choose your Automatic Blanket today at a department store, electric company or other dealer. We're much too busy with war work to make them today, but the last we made are now in the stores — in limited quantity.

Warmth without Weight! One zephyr-light blanket instead of mountains of heavy covers. More comfort for both when two sleep together.

Uniform Warmth All Night! The warmth you select, no matter what the bedroom temperature. A special blessing if you are keeping your home cooler than usual to conserve fuel!

Warm Bed When You Retire! No chilly sheets if you switch on the Blanket *before* retiring.

Bed Warm All Over! No cold zones when you change position—no muscular kinks or cramps when you wake.

Refreshing, Relaxing Sleep! Wake really rested—you haven't wasted energy trying to keep warm in bed.

GENERAL ELECTRIC

The Automatic Blanket makes up like any fine blanket. 72 x 86 inches—ample for double beds. Popular colors: Blue, Green, Cedar, Gold, Wood Rose and Beige reversible. Washable, of course.

For information or name of nearest dealer, write General Electric, Dept. OG-1121-16, Bridgeport, Conn.

$34.50 plus excise tax. Pacific Coast and Rocky Mountain area prices slightly higher. Prices subject to change without notice.

KODAK MINICOLOR PRINT
ACTUAL SIZE

A Christmas Remembrance

that only you can give

THERE must be several names on your list—or perhaps a particular one—to whom you'd like to send something special. And nothing else could be as personal, thoughtful, and appropriate for Christmas as color snapshot prints of someone close to you.

If you use a miniature camera, you can send Kodak Minicolor Prints—those beautiful full-color enlargements made from miniature Kodachrome transparencies. Above, in a Protecto Case, is the small size . . . there are also larger sizes, ideal for framing.

Or, if yours is a roll-film camera, you can send Kodacolor Prints, the full-color prints you get of the snapshots you take with Kodacolor Film.

If you haven't any suitable pictures now, shoot some new ones for the purpose. But, do it right away—in time for Christmas—and you'll give something no one else can send.

And for your Christmas cards, black-and-white Photo Greeting Cards are also "your own"—entirely personal. Your Kodak dealer will show you the styles and make them for you—take him your favorite black-and-white negative. . . . Eastman Kodak Company, Rochester, N. Y.

Time is short. See your KODAK dealer now

Non-Refillable!

MACMILLAN PIONEERS AGAIN!

New 1-Quart Container Without Metal for RING-FREE MOTOR OIL!

HERE IT IS! The quart container for motor oil which motorists and dealers have been expecting!

And it's Macmillan who pioneers again! A "can" without metal for RING-FREE!

With the steel mills converted to war purposes, the supply of metal cans for oil has dwindled and virtually disappeared. That was natural and right.

But motorists, wanting to be sure of getting RING-FREE—in its own quickly identified quart containers—have been hoping that this difficult packaging problem would be solved.

Now the new quart is ready! Now every *independent* dealer selling RING-FREE can open this new container before your eyes and put in the fill of RING-FREE your car has been thirsting to get!

Among other things, Macmillan pioneered with RING-FREE motor oil ten years ago. There never has been an oil like it. There can't be, because it's refined by an exclusive, patented process. That's why it removes carbon, saves as high as 10 per cent on gas, reduces friction fast, saves wear and repairs and lengthens the life of your car.

Now Macmillan pioneers again—after months of search and research—bringing you a metal-less container to assure you of getting RING-FREE!

Watch for the Macmillan sign at *independent* filling stations, garages and car dealers. Drive in and get your fill of RING-FREE today!

• • •

MACMILLAN PETROLEUM CORPORATION
50 W. 50th St., New York • 530 W. 6th St., Los Angeles
624 South Michigan Avenue, Chicago

MACMILLAN
RING-FREE
MOTOR OIL

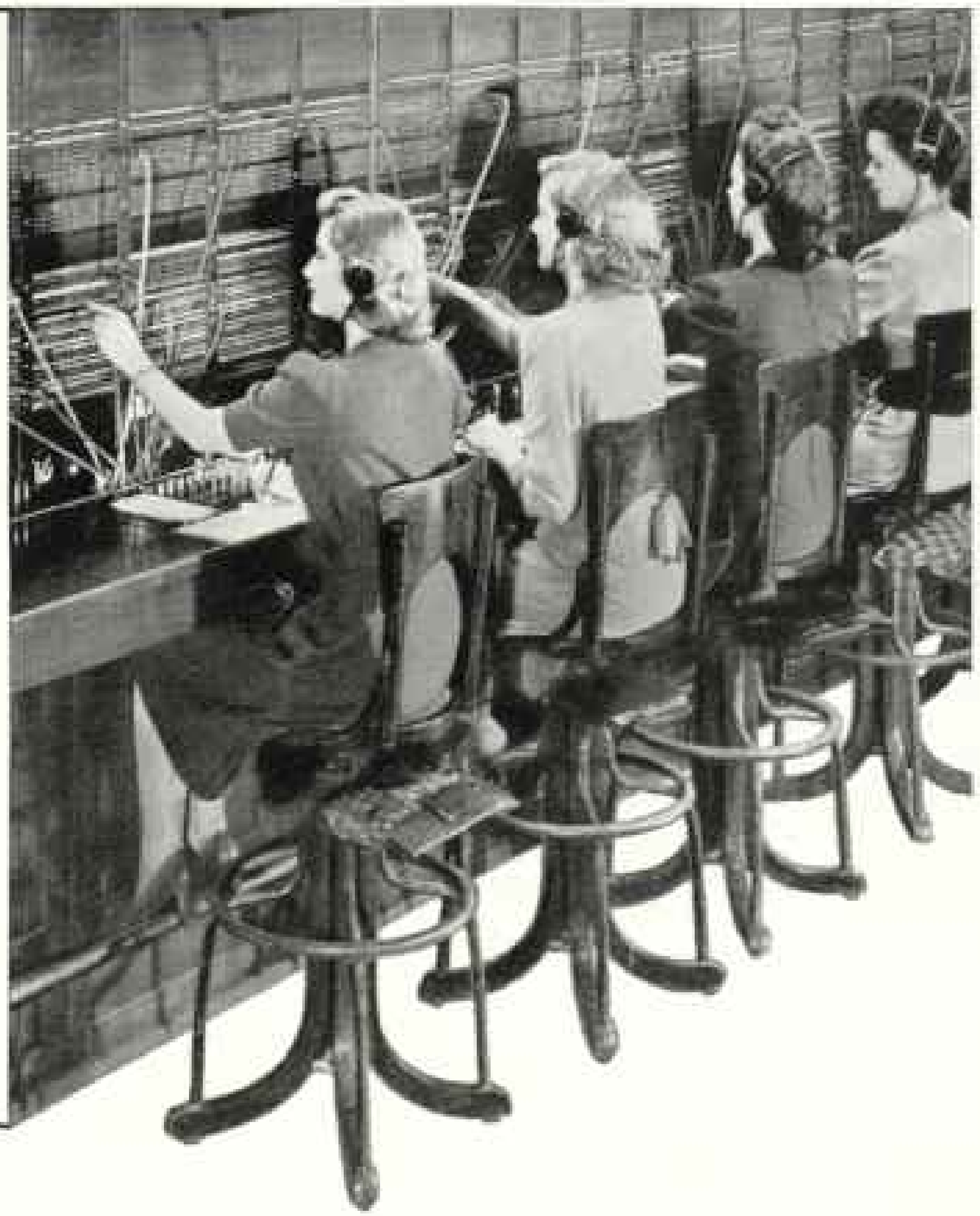
35c
A QUART IN U. S. A.

THIS IS A LONG DISTANCE SWITCHBOARD

We can't get materials to build enough of them. And those we have now are crowded with war calls.

So please do not make Long Distance calls to centers of war activity.

These girls are at battle stations on the telephone front. They have as much as they can do to get the war calls through.



BELL TELEPHONE SYSTEM

WAR CALLS COME FIRST

...dish it out!

In the skies...and from the skies... your warplanes dish it out, America! Your fighters...and your bombers...now sweep the skies they choose. They're blasting on the offensive...not taking it according to Axis schedule.

But at home, America...you've got to dish it out, too. In this fight, the pay-off is for dishing it out on *all* fronts of total war...everywhere.

America's planes have *quality*...and your flying forces are getting them in *quantity*. Backed up by a united, fighting America, they're a combination that can make inevitable the air mastery of the United Nations.

For this mastery, Lockheed builds the P-38 Lightning, the world's fastest two-engine fighter...*officially*...and the Lockheed Hudson bomber. Lockheed Aircraft Corporation...Vega Aircraft Corporation...Burbank, California.

for protection today, and progress tomorrow, look to

Lockheed

FOR LEADERSHIP

Member Aircraft War Production Council, Inc.